

Designing of Digits Recognition Technique Using Neural Network

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Abstract—Handwriting Digit Recognition (HDR) has been research widely and there are many associated work in pattern recognition. Different commercial software’s are also available in the Market. The major focus is on the improvements in the accuracy levels. In this paper, we have investigated different HDR systems and their implementation for digits in English. Lastly we have experimented digit recognition through artificial neural network using supervised deep learning.

Index Terms—Handwriting Digit Recognition, Image processing, Neural Network, MNIST

I. Introduction

In Handwritten Digit Recognition, the digits written are initially converted into machine readable format. Then observation, segmentation and classification methods are applied through different pattern recognition algorithms. Broadly, there are online and offline recognition types. [1]. In offline recognition, handwritten digits are converted into image and then to codes which are the inputs for different recognition applications. In this paper we are focusing on offline digit recognition only. The major challenge in offline digit recognition are different shapes, variations in symbol drawing, inclinations, different styles of writing. [2]

In handwritten digit recognition system, the major task is to identify the digit from differentiating it using features and extracting. For this process of locating different regions many sampling methods are used. [3]. Due to this exact feature extraction is focused more for higher performance of HDR. It has wide range of application use towards automatic identification of postal codes, bank cheques and license plates etc.

In his paper we have an investigated some digit identification with respect to digit classification and recognition systems from existing databases. A standard process of handwriting digit recognition is depicted in the following figure.

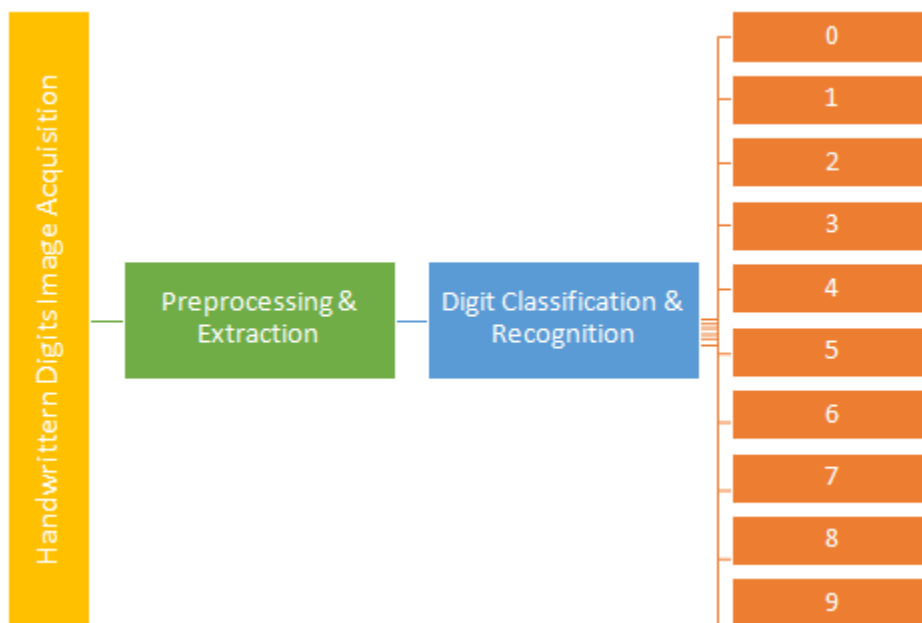


Figure 1. Handwritten Digit Recognition Process

II. Handwriting Digit Recognition (HDR)

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Handwriting digit recognition was very difficult problem due to variation in different size, height, width and angle. In these cases, Artificial neural network is extremely useful for the process of classification of the digits. Classification is categorized into:

1. Learning through Supervised: In this process, initially machine learns different tasks which we can associate with from an input to output through pairs [8]. We also consider association from training set for learning with some data [9] For this type of learning there is one single correlated association from an input to expected output. This algorithm different associated mapping with unlearn examples and create required optimal results from unlearn model or data. [10]
2. Learning through Unsupervised: In this type of learning. Machine tries to study the given sample data which may not be labeled or classified but tries to categories it. Unsupervised learning learns different common factors from data and try to learn new object with similar piece of information from it. Sometimes reinforcement can also be used for this association [11]

Some Machine Learning Techniques used for HDR are as follows:

1. Multilayer Perceptron MLP – This is feed forward ANN. It consists of minimum 3 layers. But for input node it uses non-linear activation function. MLP utilizes a supervised learning technique called back propagation for training. [4]. MLP can differentiate between multi layers and non-linear activation. [5]
2. Support-vector machine – SVM analyzes the data using supervised learning models. In SVM the classification as well as analysis from regression is carried out. It can be used with two models, first one is non-probabilistic model. In this model binary linear classifier is used. The second is statistical probabilistic based. In this model, all the examples are shown using different examples likes dots in plane which can be mapped. These mapped points can be divided as separable for differentiation. We keep on adding another examples to this mapping and try to predict the category for new set of data for the same into previous mapping [6]

III. Experimental Results

We have used the MNIST database. This database is subset of NIST database. In this sample, 784 (28*28) pixel gray-scale images are used. Total dataset of 70K images are separated into set of 42k for training and of 28k for testing as well as validation. We have used MNIST dataset for this experiment.

We have initially created neural network for training the dataset of 42k samples. Then we have used test dataset of 28k for performance, validation and accuracy. The preprocess dataset image of 28*28 pixels saved loaded into the model. The network architecture was tuned with 250 hidden neurons for the best results.

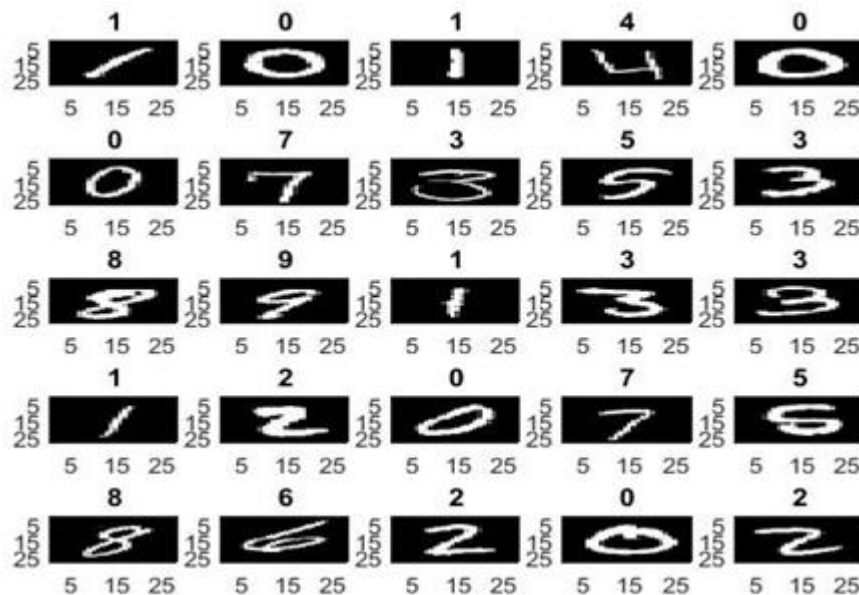


Figure 2. A Sample of Handwritten Digit Recognition

In the below figure, as the number of hidden neurons increases accuracy increase accordingly. Initially there is high increase in accuracy from 0 to 50 hidden neurons. After increase in 50 neurons to 100 moderate accuracy increases. From 150 neurons to 250 there is continuous increase in accuracy. At 250 neurons we were able to

achieve 96% (approximately) accuracy. After 250 neurons again accuracy decreases slightly. Hence, 250 neurons are considering optimum result with said accuracy.

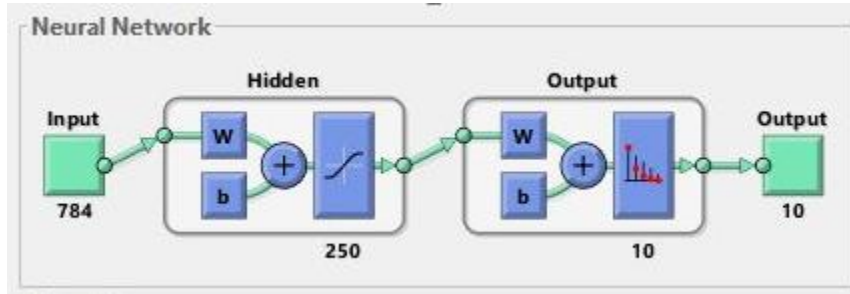


Figure 3. A Neural Network for Handwritten Digit Recognition

In the below figure, as the number of hidden neurons increases accuracy increase accordingly. Initially there is high increase in accuracy from 0 to 50 hidden neurons. After increase in 50 neurons to 100 moderate accuracy increases. From 150 neurons to 250 there is continuous increase in accuracy. At 250 neurons we were able to achieve 96% (approximately) accuracy. After 250 neurons again accuracy decreases slightly. Hence, 250 neurons are considering optimum result with said accuracy.

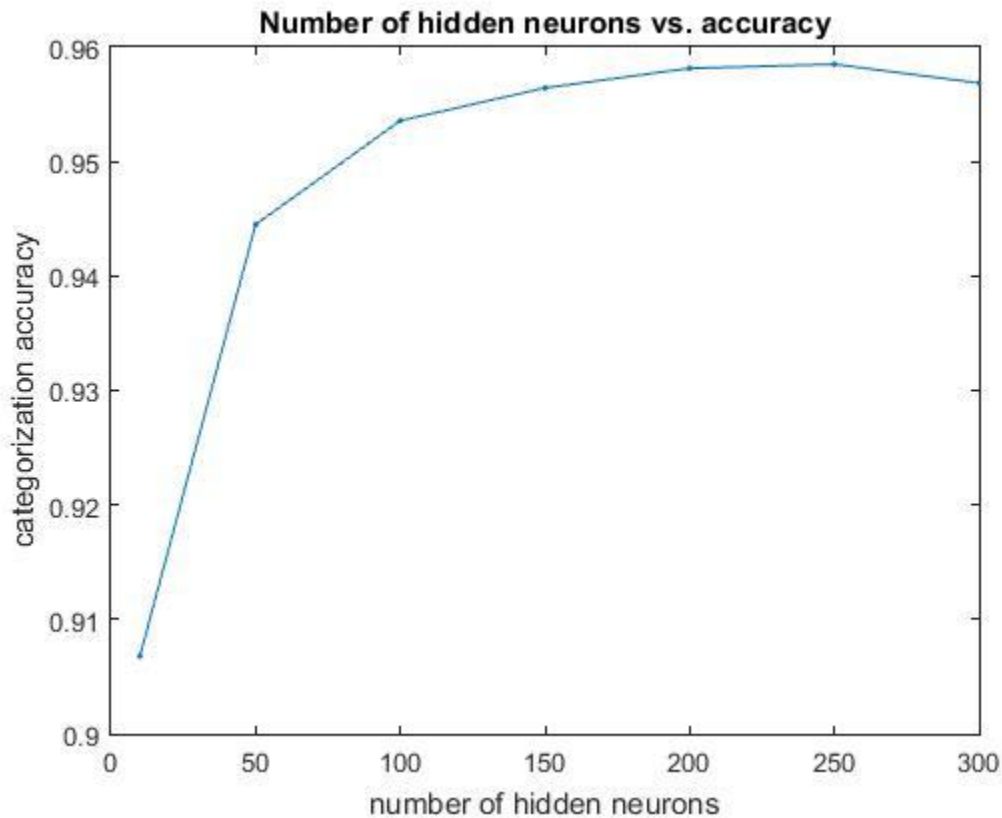


Figure 4. Result Graph: Number of hidden neurons Vs. Accuracy

IV. Conclusion

Handwritten digit recognition is important part of pattern recognition. The HDR is challenging because of different writing styles and forms. Some of the different methods like supervise and unsupervised learning are discussed. Also, few technologies like SVM and MLP were introduced. We have performed experiment using NN and experimental details are shared. Using our Neural network with supervised learning we were able to achieve good accuracy of 96%.

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Fertigation - Nutrient Dispensary Management Using Internet on Things, A Novel Approach

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Abstract : Use of technology in agriculture sector is increasing day by day. The Internet of things is emerging technology that incorporates many technologies from different areas. The Internet of things is transforming the agriculture industry. Fertigation or fertilization is supplying fertilizers to produce the quality crops with higher yields. This is done manually. Iot technology can be effectively useful for fertigation. In this paper, five different papers', abstracts are given. In the paper, different methods, implementations or algorithm for fertigation system using Iot are described. In these designs, Iot is used to easily visualize the data and take actions.

Keywords- Iot, fertigation, soil PH sensor, relay, Wi-Fi module, ZigBee module, Wireless Sensor Network, Cloud.4

Introduction:

Agriculture plays a vital role in the development of agricultural country. In India, about 70 % of the population depends upon farming. One third of the nation's capital comes from farming. Issues concerning the agriculture have always been hindering the development of the country. India is dependent on agriculture for people's livelihood. Agriculture is both, a source of income and food security for multitude of poor income and endangered sections of society. To overcome the problems in agriculture sector, we must opt smart agriculture. For that there is need of modernizing the current traditional methods. There is a major need for reformation of agriculture research. It will help farmer resulting a sustainable growth in the domain.

There are lot of drawbacks of supplying fertilizers manually. As farmers use antiquated techniques, it leads to underuse or overuse of fertilizers. If more amount of fertilizer is used, it will affect the human health as well as nature of soil. The underuse will not meet plant's needs sufficiently.

Controlling of fertigation operation is done through any remote smart device or computer connected to internet. Soil PH is measured using PH sensor or electrical conductivity sensor or fibre optic sensor. Other sensors used are moisture sensor and temperature sensor. Sensors along with needed actuators are interfaced with microcontroller like Rasberry Pi or Arduino. Analog PH values data is converted to digital using analog to digital converter. Network like Wi-Fi or ZigBee modules or hotspot are interfaced with microcontroller for communication between system devices. The relay Microcontroller performs corrective actions according to the results of sensors and intimates the corresponding relay. The relay in turn triggers the motor and fertilizer is supplied appropriately to the plants. These system designs are remotely operatable.

This paper aims at studying different papers having design for smart fertigation.

1. Involuntary Nutrients Dispense System for Soil Deficiency using IOT [1]

This paper describes the system the macro nutrients are measured with the help of pH sensor. The system aim is to develop a web surveillance system using a RASBERRY PI port. It is a single board computer having credit card size. It uses a SD card for booting and long term storage. The analog input from the pH sensor is converted into digital input and send to the controller called Raspberri Pi. Nutrient dispense system block diagram is shown in the Figure.. From the pH value the NPK content in the soil can be obtained. Then it is compared with the already stored threshold value and if the obtained value is less than the threshold value then the relay circuit for corresponding nutrient is switched ON.

The obtained value is not actual PH value. The PH value is calculated by dividing the obtained value by 14. Here, the PH sensor is made up of electrode with a glass electrode & a reference electrode. The PH measuring range is 0-14. From the digital input, NPK values are obtained. It is compared with threshold value already stored in microcontroler. If the NPK values are less than the threshold values corresponding relay will be switched on & message will be displayed on LCD display.

Relay, is switching device placed between controller and the nutrient tank. The fertilizers needed to increase nitrogen, potassium and phosphorus are mixed with water and then stored in the nutrient tank.

Liquid level sensor(UM 0022) is used to detect the level of liquid in tank and send data to machine.

If the PH range is between 3-5, the nitrogen content is not available in soil. If the range is between 8.4-9.1, potassium content is not available in the soil.

NPK content need varies for each plant. So, the threshold values of the nutrients are set based on plant cultivated. The PH values are measured and displayed on mobile application.

An efficient irrigation system is used to inject specified solution. And nutrient less in content is balanced. All the process is controlled using Raspberry Pi.

As this is a web based system, farmer can get information from anywhere.

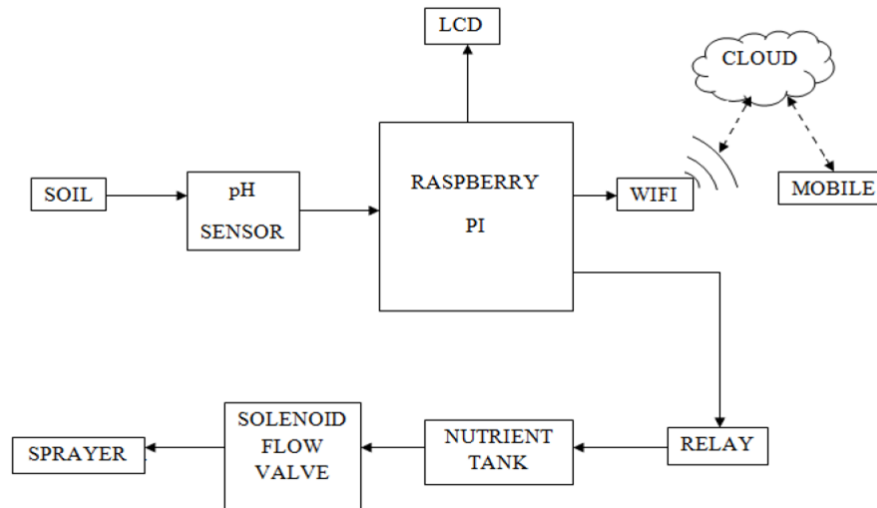


Figure 1. Block Diagram of nutrient dispense system

Conclusion : This paper concludes following points.

- The soil is preserved health from land pollution and water pollution. This is implemented using Internet of Things.
- The data obtained from sensor are stored in the cloud storage. The data along with a message is sent to the user through mobile phone. This reduces manpower in the agricultural field.
- For particular crops, a person must monitor the crop for frequent number of times in order to manage their water content, nutrition level, etc.,.
- If any of the nutrient content is less in the soil structure, it is balanced by injecting the specified solution for increasing that nutrient content through irrigation system. Here an efficient irrigation system is used and all these process are controlled by Raspberry Pi.
- The nutrient dispense system can easily reduce the amount of pesticides used in the soil structure.

2. Fertigation System to Conserve Water and Fertilizers Using Wireless Sensor Network. [2]

This paper describes a crop monitoring system for citrus tree which maintains soil proper PH level and soil water content. Wireless Sensor network is used to communicate between sensory unit and main station. The ZigBee network is used for communication. Main sensors used are moisture sensor and soil PH sensor.

The entire fertigation system shown in figure will be set up at main station. The GUI is built up using VB software. Sensory data will be displayed on GUI. Also, it has an alert alarm for wrong soil water content and soil PH value. User can control the entire system manually from main station.

As shown in block diagram, sensors are interfaced with MSP 430 microcontroller. It is 16 bit RISC processor. Microcontroller processes all input sensory data and sends it to Zigbee module located at sensing unit means microcontroller's end

Where as at main station ,ie. receiving end ,another ZigBee module will be receiving sensory data which is displayed on GUI of computer. User can start and stop the system from GUI. GUI have full control and command over entire fertigation system.

When water scarcity occurs, relay of submersible motor pump in tank 2 will trigger and pour water to plants through drip irrigation pipelines. In the same way, when soil PH is not adequate for citrus tree (5.5-7.0), necessary soil improver fertilizer will flow through tank 1.

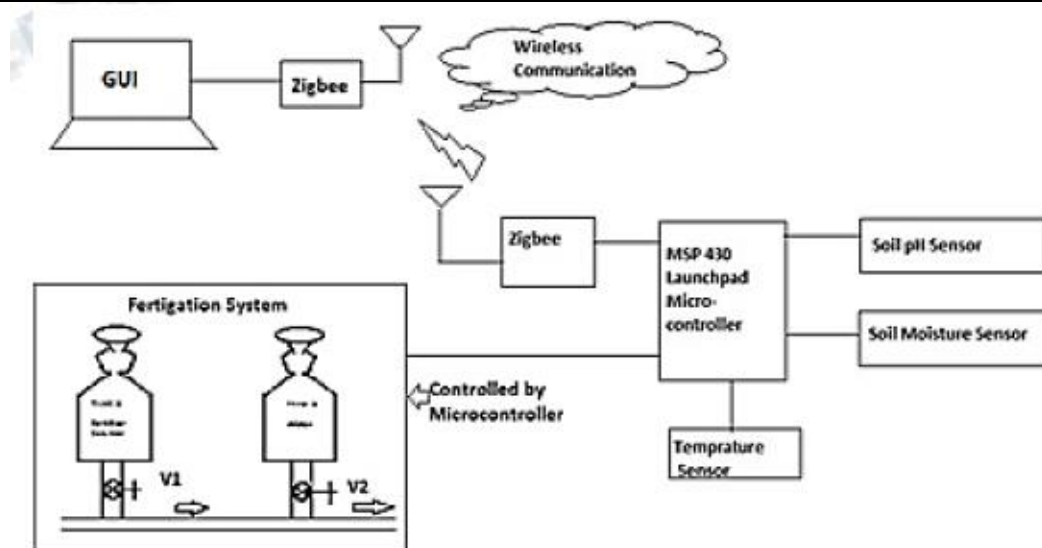


Figure 2. Fertigation System using WSN Diagram

Conclusion: This paper concludes following points.

- Fertigation System Using MSP 430 launch pad microcontroller, soil moisture sensor, soil pH sensor, Temperature sensor and wireless sensor network for communication using Zigbee modules is designed.
- Using Soil moisture sensor we have controlled the valve of water tank to avoid excess water supply to Citrus plants.
- And using soil pH we controlled the valve of water soluble fertilizer tank. As soil pH value 5.5-7 is considered to be suitable for citrus plant the programming is being done on MSP 430 microcontroller such that when the soil pH is below 5.5 i.e. soil is acidic so valve of fertilizer tank will be opened to make the soil pH between 5.5-7 i.e. by pouring alkaline solution, when it reaches value.
- 5.5-7 valve will be closed and vice versa for very alkaline soil.
- Therefore by controlling water supply and water soluble fertilizer supply adequate amount of water and fertilizer will be needed for farm fields. Hence we can conserve the Water as well as can avoid over use of fertilizer.
- All sensory data from sensing unit have successfully sent to the receiving terminal i.e. remote location. All data has been displayed on VB based GUI at remote location.

3. Implementation of Automated Organic Fertigation System by Measuring the Plant Parameters [3]

This paper describes an autonomous irrigation system of soil with features like determining PH levels using electrodes, minerals, type of fertilizer to be used. Here nutrition level of plant is balanced using PH value. The temperature and moisture of soil using the sensor is measured and monitored. Depending upon the results of sensors Arduino microcontroller performs corrective action and intimates the relay. The action is displayed on LCD. This action is nothing but selection of percentage of fertilizer to be fed for corresponding PH range. The relay module's on off timing is already programmed. Then the relay triggers with the motor with the indication of fertilizer supply duration. The solenoid valve is turned on or off according to relay on off timing. The continuous monitoring can be viewed in the web page.

This paper also states the tables for suitable PH value for particular crops, PH denomination for particular PH and PH required for tomato plant.

Hardware components used are Arduino UNO, PH sensor, LM 35 temperature sensor, soil moisture sensor, relay, LCD, Wi-Fi module, solenoid valves, power supply.

Arduino IDE software is used.

Conclusion : This paper concludes following points.

- This system is feasible and cost efficient for optimizing nutrient supply as well as it will also maintain a balanced nutrient content in the soil using pH sensor.
- Precision irrigation will minimize the waste of water and energy, while maximizing the crop yield also it dispenses fertilizers in proper proportion.
- It is time saving, led to removal of human errors in adjusting the soil moisture level.

- Continuous monitoring of recorded process by the web page created through IoT is used to analyse the net profit of the crops.
- This Fertigation system allows cultivation in places with water scarcity thereby improving sustainability.

4. Remote agriculture and automation control using internet of thing (Iot) design and implementation [4]

This paper the conceptual Design of the system, Remote and and automation layers model, and system implementation using IOT technology is presented.

Conceptual Design:

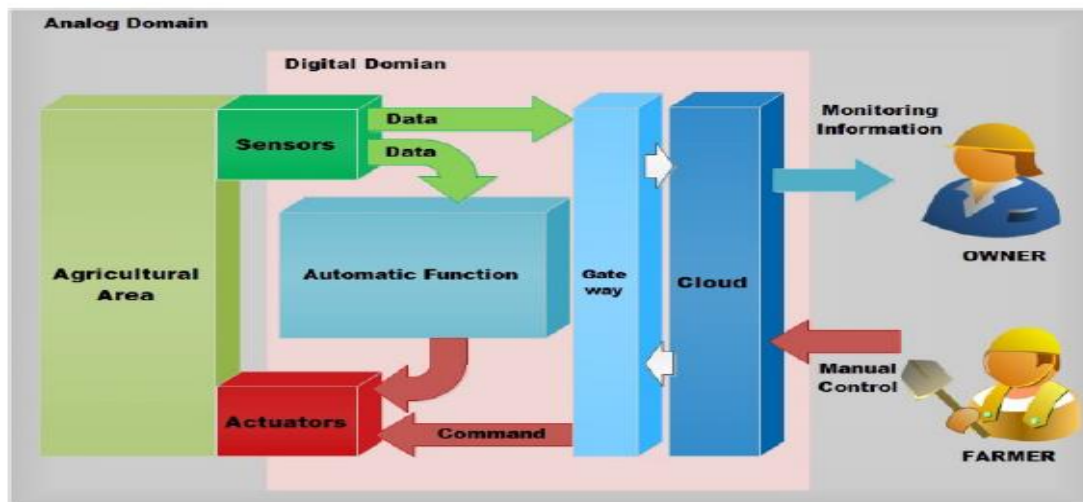


Figure 4. Conceptual Design of Fertigation System

Figure shows the connections from farmland to sensors and actuators. The point of gathering information from the agricultural area is through the internet connection with the cloud system. Information is provided to the farmers to make decisions in handling unexpected events.

The system consists of 1. routing basic functions of agricultural system with automation. 2. Data input from sensor device 3. Equipment to handle the farmland according to requirement set. 4. Internet is used to send data to cloud database. 5. The data retrieved from the cloud is displayed. 6. Farmers analyse the data.

3. Remote and automation Layers Model



Figure 5. Layers Model

- 1> Perception Layer :consists of sensors and models
- 2> Control Layer: consists of microprocessor ,ports required to connect to sensors and actuators. It has ability to convert analog data to digital and digital to analog. The control layer is distributed into sub nodes, if the system is large.
- 3> Network Layer: Consists of LAN and WAN depending upon agricultural area & cost of internet connection. In LAN owner manages the connection. Internal data transmission takes place. Low power wireless connections can be included. The internal device is connected using WSN. The control layer is then transferred to WAN connections.

WAN depends upon ISP (Internet service provider) in that area. It may be a direct connection from node sensors or a connection from LAN.

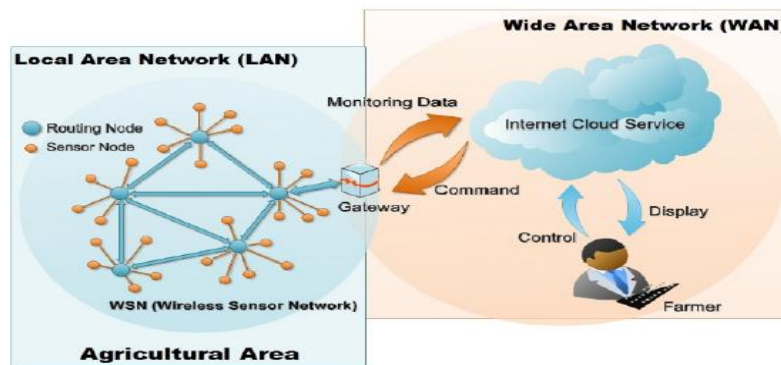


Figure 6. Network Layer

4> Cloud Layer: IOT based agriculture is connected to the cloud service to store data on the cloud & use that data by web service. It needs the web or application interface to control access to the control layer over the internet.

JSON (Javascript Object Notation) is a standard text based format for representing the structured data. It is used for sending data between Iot devices and cloud services. JSON format is created and sent to JSON cloud database using microprocessor.

System Implementation:

Sensors used are soil moisture sensor, humidity sensor, EC (PH) sensor humidity, temperature, light sensor. Actuators are used with solenoid water valves and pumps. Fog pump control switch, temperature actuators, light actuators with light control switch are used.

Conclusion: This paper concludes following points.

- We have presented a conceptual design and implementation of remote and Automation agriculture using IoT Technology.
- It reduces the number of labourers are replaced with technology.
- But because of the complexity of agriculture, there are some factors that also depend on human experience and decisions.
- The system has both automatic and manual parts. Enhanced by the Internet through reduced distance.
- System development is at the heart of the performance of sensors and Node Microprocessor to be more capable.
- It can control more and more factors.
- There may be no human involvement in the system at all in future.

5. Soil nutrient measurement in paddy farming using IoT [5]

Continuous monitoring of soil done by interfacing fibre optic sensor. The data like soil mineral percentage and number of fertilizers to be added is uploaded to the cloud using wi-fi module in the NODE MCU. Soil parameter values are sent to farmers in real time using NODEMCU V3 through cloud Think Speak. The data is verified in the thing Speak cloud in the form of graphs. These values are displayed on farmers' personal account. As well as notification is sent to mobile phones. The data is then saved for weekly and yearly analysis.

Algorithm:

Step 1: Initializing the sensor to measure the values

Step 2: Collecting the values and send them to NODEMCU for further processing

Step 3: Data is sent to the cloud from NODEMCU for further processing

Step 4: Values of NPK are classified by their percentage. If the value is >65 %, nutrient levels are good. If the value is >45% & <65 % nutrient value is ok but low amount of fertilizer is suggested. If value is <40 % nutrient levels are poor immediate fertilizing is suggested

Step 5: Information is sent to the farmer through SMS.

Conclusion: This paper concludes following points.

- The system is farmer friendly.
- It consumes less power.
- It is cost efficient and suitable for any type of climate condition.
- Thus we have designed a low cost, efficient system which can help farmers in many ways.

Conclusion: Five papers are studied which present smart automated fertigation system. The systems designed are time saving.

- Less manpower is needed in comparison with manual procedures.
- These are user friendly having GUI or web page for communication.
- The systems are cost efficient also.
- They are easy to install.
- Hardware easily available.
- The systems promote precise agriculture by improving soil quality.

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IT System Alert Classification and Prediction of Standard Operating Procedures (SOP) using Machine Learning Algorithms

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Abstract—In IT operations, system alerts and their Standard Operating Procedure (SOP) are very difficult to predict because they vary based on project, component, environment, alert type, and hostname. Alerts and their SOP's are very crucial for the IT business to resolve any system issues. If we are able to predict SOP's with respect to the alerts, it would really help to prevent unexpected and critical system downtimes. Also it would assures reliability and high availability of business services for end users. This will also saves manual efforts and resolution time to figure out the issues and their possible solutions. This research work deals with efficient data mining process for predicting the recommended actions or solutions (SOP's) for the alerts from different IT systems , so mining the alerts data in efficient manner is a critical issue.

Keywords—Machine Learning Algorithms, Data Mining, Predictions, Alerts, Standard Operating Procedures (SOP)

I. Introduction

Data mining is the process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems.[1]Data mining is also called as Knowledge discovery, Knowledge extraction, data/pattern analysis, information harvesting, etc.Data mining helps to discover interesting facts, such as associations, anomalies, patterns , trends, changes and significant structures from large amount of data which is stored in either databases or any other repositories.[2] In the data mining process the former data is analyzed and future predictions are calculated by data analysis. Data Mining implementation process includes Business Understanding, Data understanding, Data preparation, Modelling, Evaluation, and Deployment. Data mining is useful in the field of IT operations as it can be used for classification of incidents, identify correlations, reduce alert noise, to reduce investigation time and to save human resources. There are various data mining techniques such as Classification, Clustering, Regression, Predictions, Association rules, Outer detection, Sequential Patterns.[2]

Data mining steps are as follows:

1. Data cleaning- Remove noise and inconsistent data.
2. Data integration - Combine multiple sources of data.
3. Data selection - Retrieve relevant data for analysis.
4. Data transformation - Consolidate and transform the data into appropriate forms for mining.
5. Data mining - Extract patterns from data.
6. Pattern evaluation –Identify the patterns which are interesting.
7. Knowledge presentation - Visualize and represent extracted or mined knowledge to the end user [8][9].

II. Related Works

Alert aggregation and verification are part of Alert correlation [4], but it has a different goal, to reconstruct incidents from the alerts. Alerts can be correctly labeled with the help of human analyst or researcher by alert fusion and alert generalization, which reduces the workload of the user considerably. Alert classification system assists the human analyst in identifying the false positives [3].Based on the machine learning algorithms, a real time alert correlation system has been proposed to detect live attack and predict the upcoming next step of a attack in real time[10]. An alert based decision or recommendation support system has been proposed to construct an alert classification model for online network monitoring. The architecture of decision or recommendation support system consists of multi phases: Alert Preprocessing, Model Constructing and Rule Refining Phase.[11]

III. System Architecture

In this research paper we describe a multi-phase alert classification and SOP prediction system. Figure 1 gives an overview about the system architecture. It's continuous learning, improvement and implementation process. We collect alerts which triggered from various IT system sources. IT system includes applications and databases. Usually alerts are not in specific and pure format, so we need to preprocess and make it ready for Machine Learning algorithms. Preprocessing has multiple phases like data mining (extracting patterns), labelling, pruning etc. After preprocessing raw alerts and before applying Machine Learning algorithms we decided class or expected output from extracted features. By analyzing and applying different machine learning algorithms (classifier), we tried to predict the recommended actions (SOP) with respect to triggered alerts. Based on these recommendations, respective admins can take implementation or remediation actions to resolve these alerts. It helps to reduce Mean Time to Detect (MTTD) and Mean Time to Recovery (MTTR) also it saves human efforts.

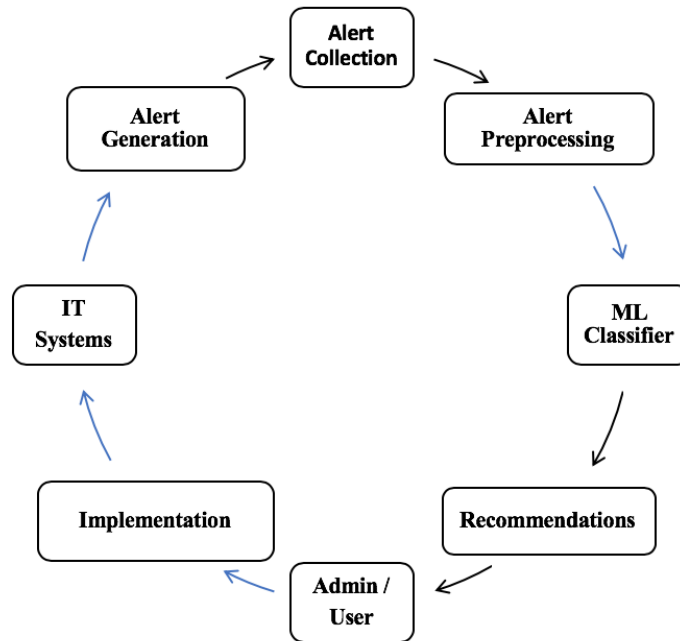


Figure 1. Continuous alert classification and prediction processing flow

IV. Experimental Setup

The system alerts are collected from sample set of real world systems and used as data set for this research work. This data set contains the information of alerts which generated from various systems and applications. The alert data set is collected through monitoring tool [7]. The supervised classifiers like modified J48, Random Forest, KNN, Naïve-Bayes etc. are implemented and analyzed to increase the accuracy rate of the data mining procedure. The open source data mining tool [3] has been used to perform research on IT system alerts data. Experimental results showed an insights of system behavior and significant improvement in prediction of solutions.

Most of the IT companies are having multiple projects, each projects has different environment setups like Development, Test, User acceptance testing(UAT),Quality Assurance (QA) , Staging , Production etc. As per Figure 2, we have designed below environment setup for this research experiment and focused on only Production and Staging alerts. From various projects, environments, component systems (like application and databases) and servers , we monitored and collected different system alerts and after labelling and pre-processing the raw alerts , we applied machine learning algorithms to classify and predict SOP's .

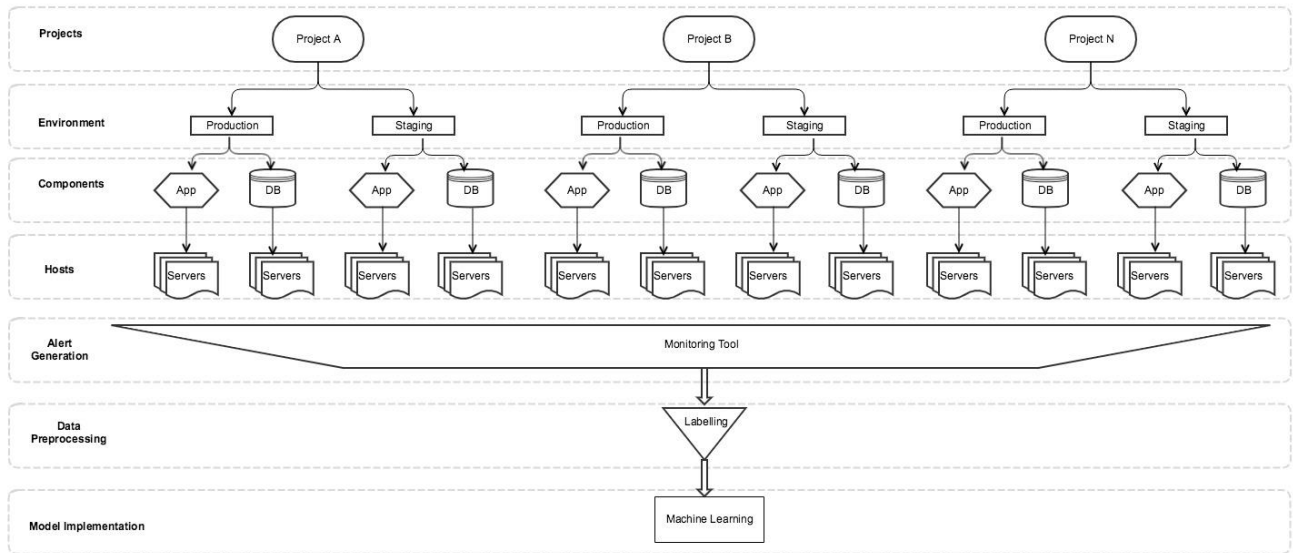


Figure 2. Experimental Setup to apply Machine Learning algorithms for alerts classification and prediction of SOP's

V. Implementation Details

Data Understanding

The sample system alerts triggered for a period of 6 months have been collected for the purpose of analysis and research work from various sample set of systems. The sample system alerts from multiple projects, data centers, environments and servers are combined and considered for preprocessing. The preprocessed alerts are then normalized with standard naming conventions for data mining. After normalizing, same alerts are grouped together for eliminating redundancy. After preprocessing we consider 8 attributes and 36885 alert instances for analysis and through statistics and visualization we got better data insights.

Table 1. Alert statistics after the first phase (preprocessing)

Alert Information	Count
No of Attributes	8
Instances	36885

From the collected alert data and attributes we derived below data analysis. As per Table 2 , from the collected alert data , we extracted important features to apply Machine Learning and predict SOP's. The sample alert data contains distinct information about 2 alert types (error and warning)2 data centers (m and d) , 392 servers(hosts), 2 environments (production and staging), 25 projects, components of application and databases like postgres, elastic search, hadoop, mysql, cassandra , nginx, apache, httpd, nuxeo, jetty etc. (58) , alert names (265) and labelled action names i.e. SOP's (72).

Table 2. Statistics of Extracted Attributed (Features)

Attribute	Distinct Count
alert_type	2
data_center	2
host_name	392
environment	2
project	25
component	58
alert_name	265
action_name(SOP)	72

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Data Labelling

For recommended actions of each distinct alert , we explicitly labeled SOPs to train the model on rule based or supervised machine learning algorithms.

Data Visualization

Data Visualization is a very crucial step in machine learning, but it often got ignored. Data Visualization is a method of representation of data in a pictorial or graphical form. It is not just attractive look for projects but very effective way of understanding the data. Data Understanding and Visualization is the first step of any Machine Learning implementation project. We should first visualize input data and understand it in depth and then decide the appropriate machine learning model to be used. This process of analyzing the input data is known as Exploratory Data Analysis (EDA).

As per below figures, we visualized all attributes and instances to get the intuition about the collected sample alert data. In Figure 3, we analyzed alert types and observed that there are more instances of error (33981) alerts and less warnings (2904) alerts.

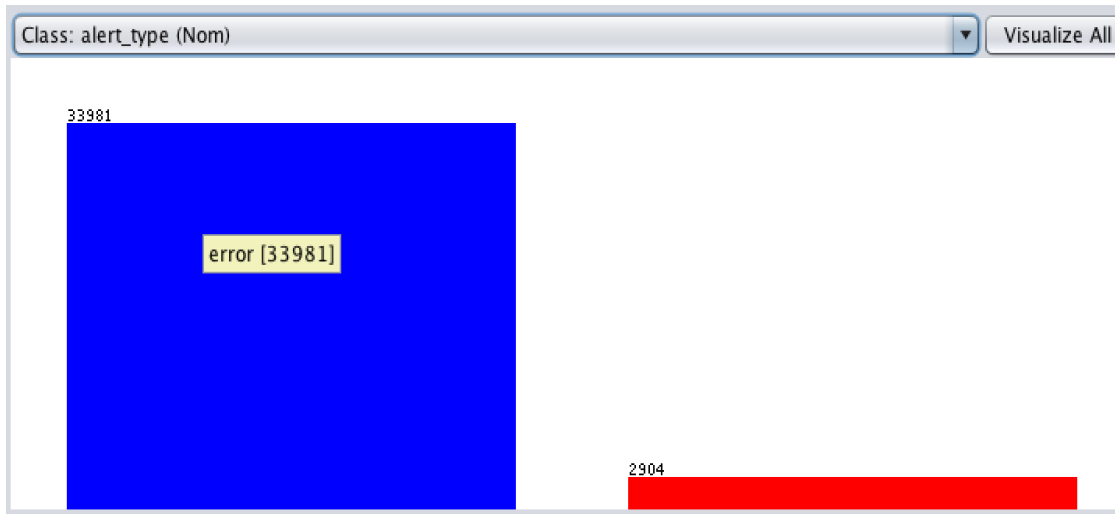


Figure 3. Visualization of Alert Types and it's instances

In Figure 4 , we analyzed data center information and observed that 33625 alerts triggered from *m* data center which hosts most Production systems and 3260 for *d* data center which hosts Staging systems.

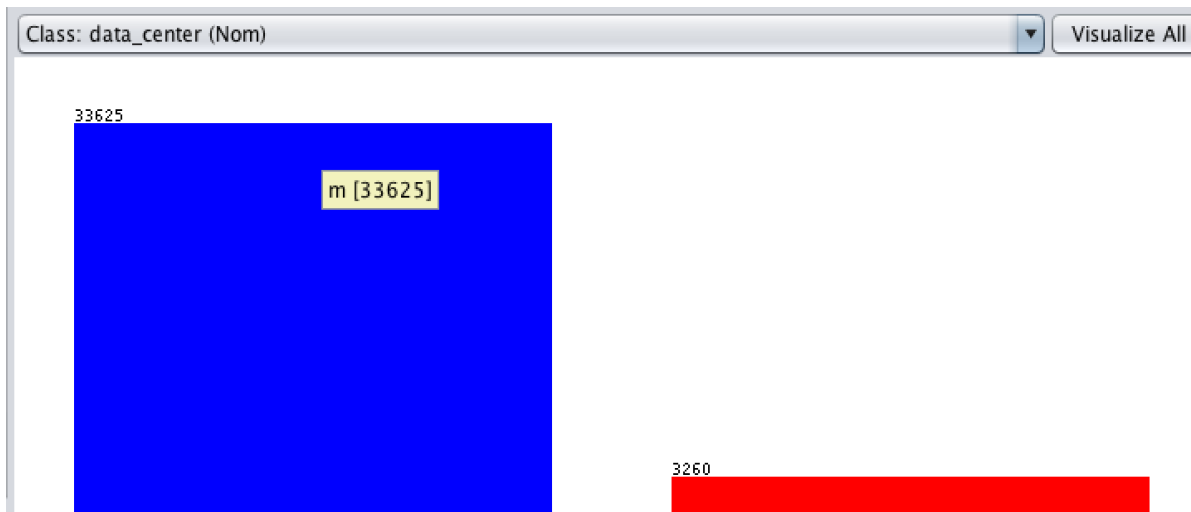


Figure 4. Visualization of data center and it's instances

In Figure 5, we visualized environment types and observed that 19883 alerts triggered for Production environments and 17002 for staging environments.

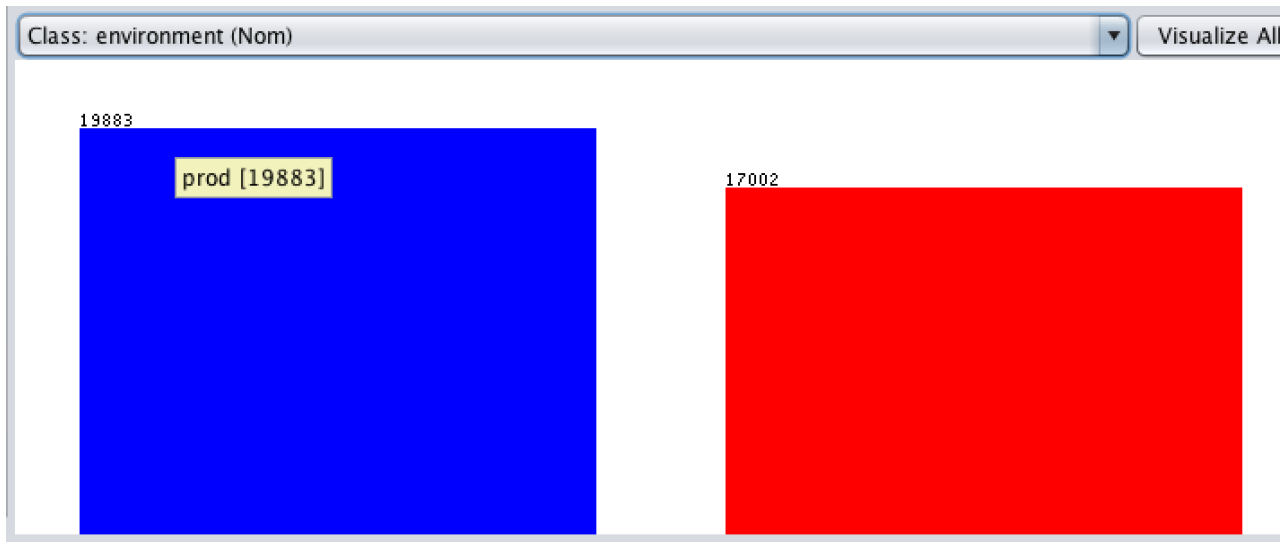


Figure 5. Visualization of environment types and it's instances

In Figure 6 , we visualized the different projects and distribution of alerts per projects. From graph we observed that few projects triggering more alerts.

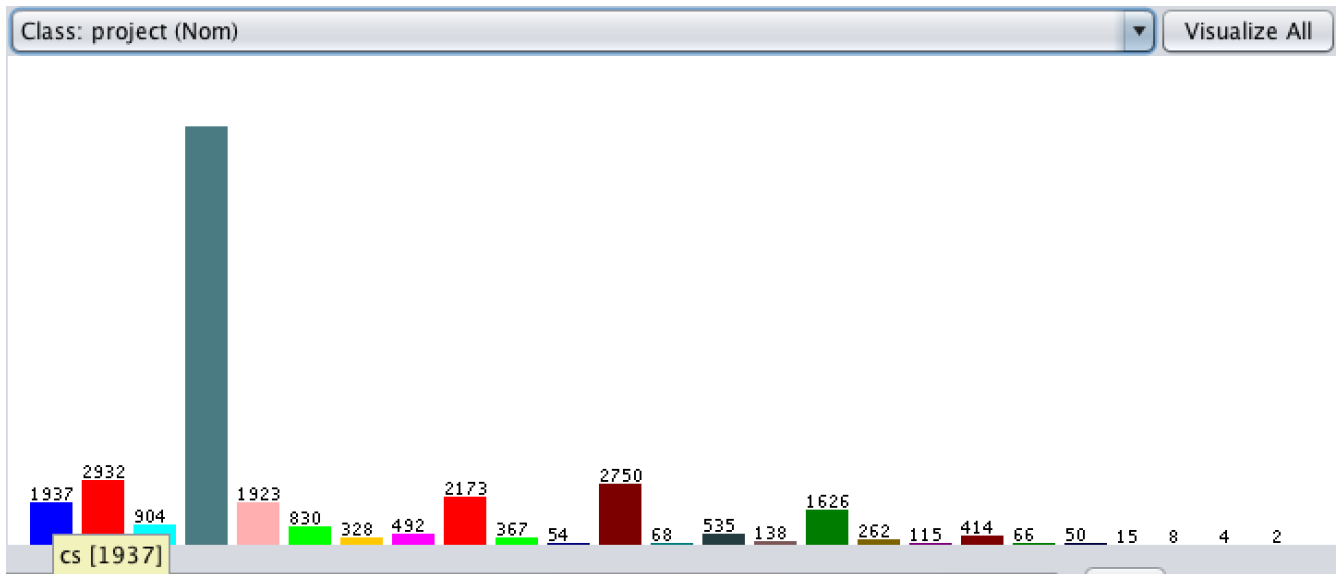


Figure 6. Visualization of projects and it's instances

In Figure 7, we visualized different components, which extracted based on hostname, like databases (elastic search, hadoop, mariadb etc), application (apache, nginx , httpd etc) and distribution of alerts per components. From the graph we observed that some components like hadoop, es etc. are alerting more than other components.

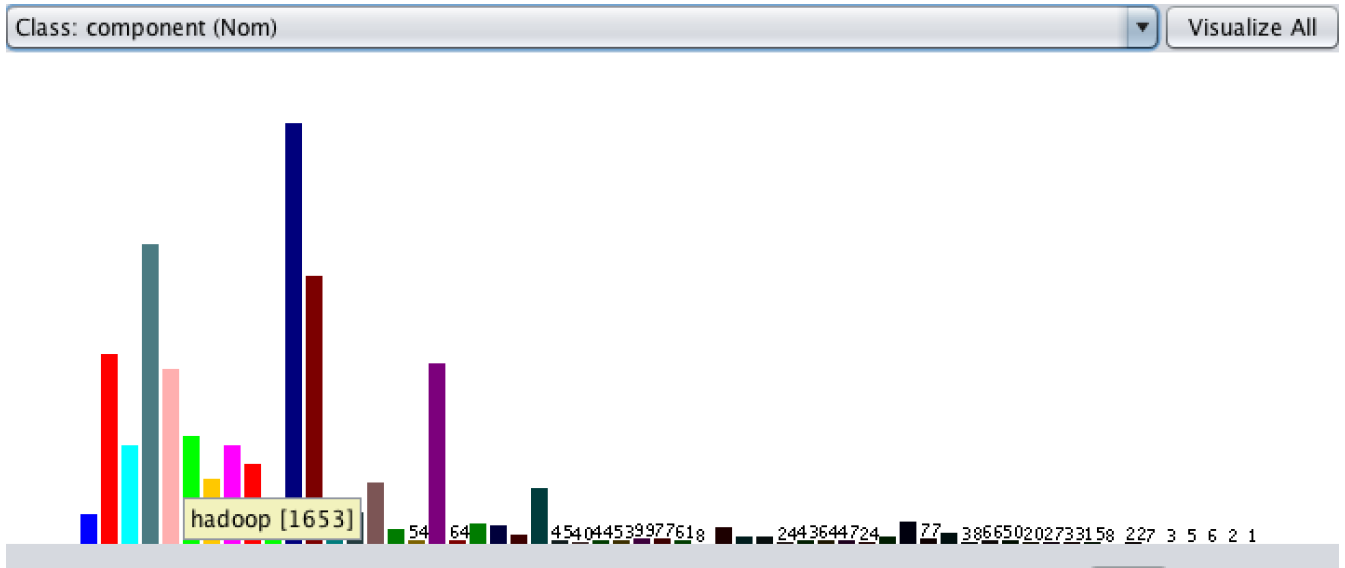


Figure 7. Visualization of component and it's instances

In Figure 8, we analyzed different hosts (servers) and distribution of alerts per hosts and observed that some hosts alerting more than the rest of the hosts.

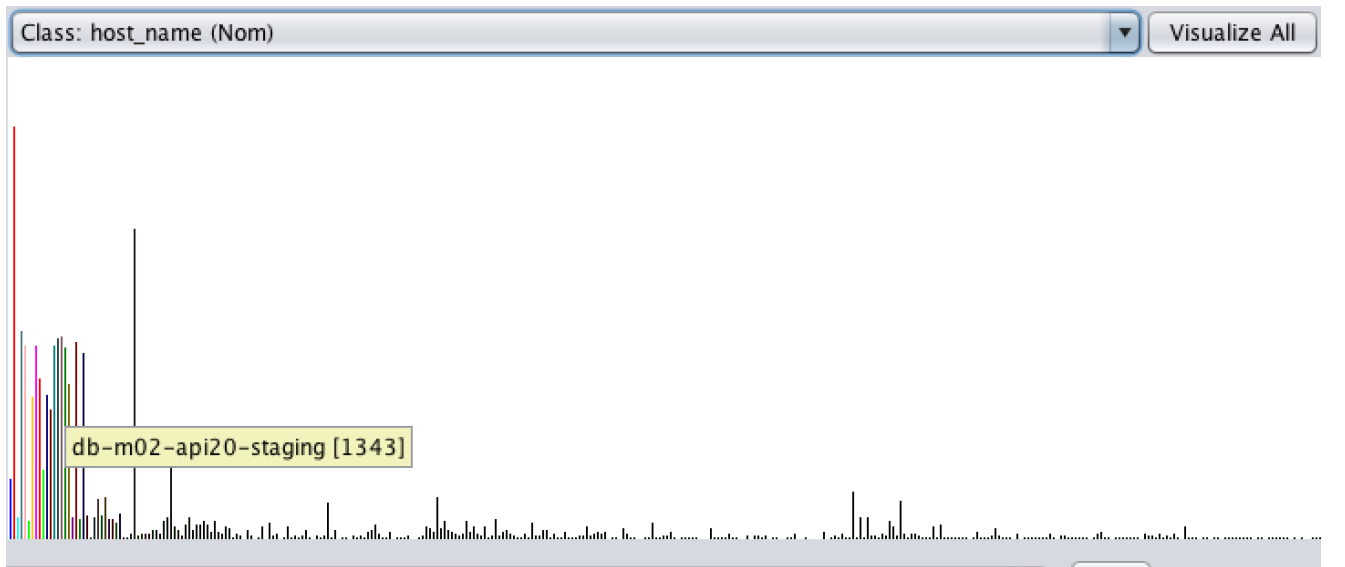


Figure 8. Visualization of host (Server) and it's instances

In Figure 9, we analyzed different triggered alerts and number of appearances or instances. From the statistics , we observed that one alert is triggered on most servers.

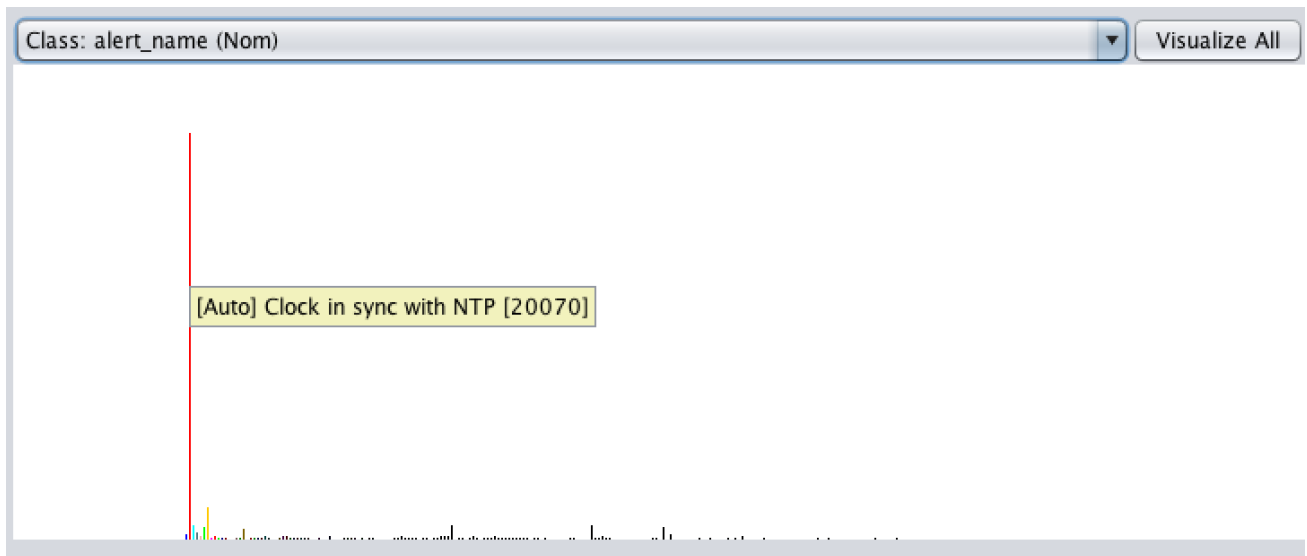


Figure 9. Visualization of alert and it's instances

In Figure 10, we analyzed labelled actions (SOP's) for alerts and number of instances.

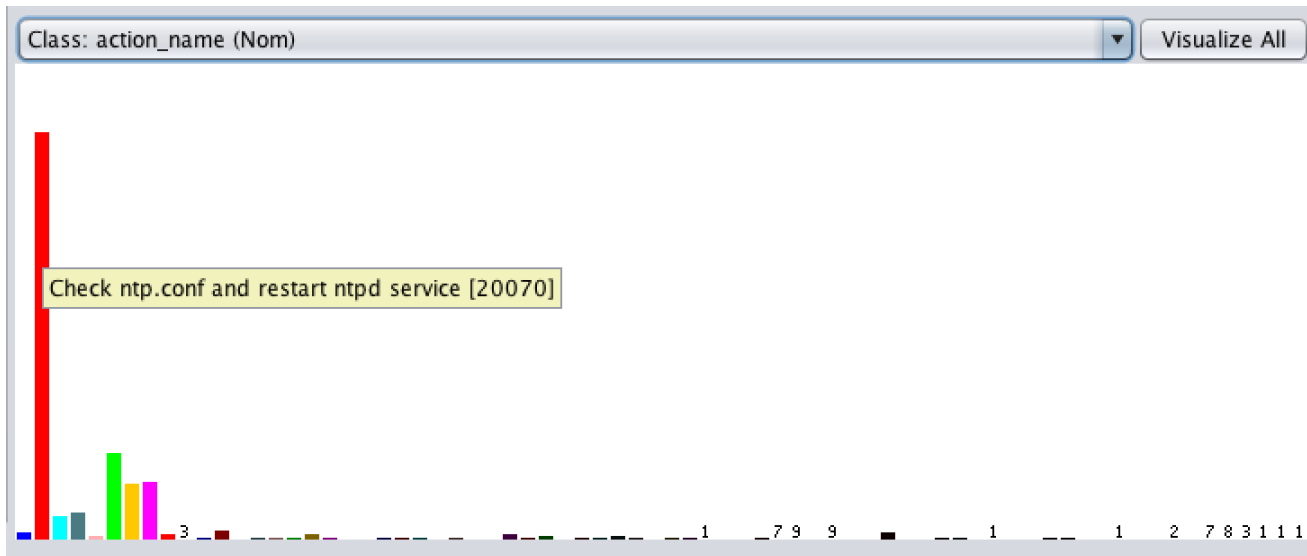


Figure 10. Visualization of action (SOP) and it's instances

In figure 11, we visualize and compared all attributes to get institution about all features of input alert data.

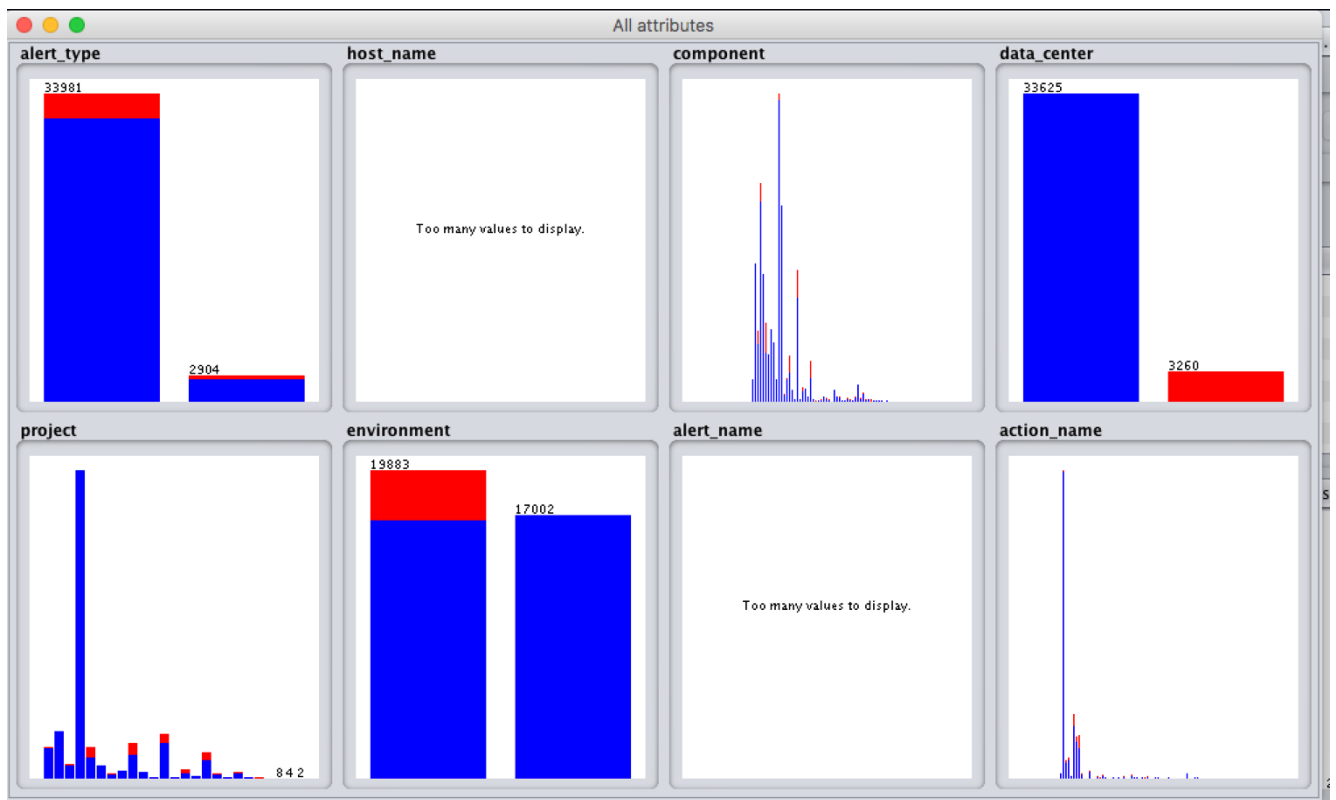


Figure 11. Visualization and comparison of all attributes

VI. Machine Learning Model

Algorithms

ZeroR

The ZeroR algorithm identify and pick up the majority classes in the dataset and uses for predictions. This algorithm can be consider as baseline for the dataset and can be compare to other algorithms. [1][6]

OneR

OneR is very simple association rule algorithm which involves just single attribute in the criteria part. The main idea of the OneR (one-attribute-rule) algorithm is to find the one attribute to use for fewest prediction errors.[1][6]

J48

J48 is a decision tree algorithm which is an implementation of the C4.8 algorithm written in Java language. There are some additional features of J48 which are accounting for tree pruning, missing values, derivation of rules, continuous attribute value ranges etc. In other algorithms the classification is performed in recursive way till every single leaf is pure which means the classification of the data should be as perfect as possible. J48 algorithm generates the rules from which particular identity of that data is generated. The objective of algorithms is progressively generalization of a decision tree until it gets the equilibrium of accuracy and flexibility.

Random Forest

Random Forest is most popular and powerful machine learning algorithms. It is ensemble type of machine learning algorithm called as Bootstrap Aggregation or bagging. Random Forest is an enhancement over the bagged decision trees. Decision trees (e.g. CART) are greedy, that is problem. Decision Trees algorithms selects which variable to split on using a greedy algorithm that reduces errors. Even with Bagging, the decision trees have a lot of structural similarities and high correlation in their predictions. Combining predictions from multiple models in ensembles works better. Random forest changes the algorithm such that the sub-trees are learned so that the resulting predictions from all of the sub trees have less correlation. It is a simple tuning in algorithm. In Classification and Regression Trees (CART, when selecting a split point, the learning algorithm is allowed to look through all variables and all variable values in order to select the most optimal split-point. The random forest

algorithm modify this process so that the learning algorithm is limited to a random sample of features of which to search.[1][6]

K-Nearest Neighbours (KNN)

The k-nearest neighbors algorithm works for both classification and regression. It is also called as kNN for short. It works by storing the entire training dataset and querying to locate the k most similar training patterns when making a predictions. KNN has no model other than storing the entire dataset, so there is no learning required. It is a simple algorithm. KNN makes predictions using the training dataset directly. Predictions are made for a new instance (x) by searching through the entire training set for the K most similar instances (the neighbors) and summarizing the output variable for those K instances. For regression this might be the mean output variable, in classification this might be the mode (or most common) class value. [1][6]

Naïve Bayes

Naive Bayes is a classification algorithm and it is a simple but surprisingly powerful algorithm for predictive modelling. Traditionally it assumes that the input values are nominal, although numerical inputs are also supported by assuming a distribution. Naive Bayes leverages a simple implementation of Bayes Theorem , where the prior probability for each class is calculated from the training data and assumed to be independent of each other. This is an unrealistic assumption because we expect the variables to interact and be dependent, although this assumption makes the probabilities fast and easy to calculate. Even under this unrealistic assumption, Naive Bayes has been shown to be a very effective classification algorithm. Naive Bayes calculates the posterior probability for each class and makes a prediction for the class with the highest probability. Naïve Bayes supports both binary classification and multi-class classification problems.[1][6]

Test Mode

k-Fold Cross Validation

Cross validation is a statistical method used to estimate the skill of machine learning models.

We can select selects Cross Validation test mode, by default it's 10 folds , which means that the dataset is split into 10 parts: the first 9 parts are used to train the algorithm and the last 10th part is used to assess (predict) the algorithm. This process is repeated, allowing each of the 10 parts of the split dataset a chance to be the held-out test set.[1][6]

Percentage split

It randomly splits dataset into a training and a testing partitions each time we evaluate a model. This can give us a very quick estimate of performance and it is preferable, when you have a large dataset.[1][6]

VII. Results and Discussion

This section shows some notations, equations and the comparison of the different Machine Learning algorithms.

Notations:

TP = True positives (The Number of examples predicted positive that are actually positive)

FP = False positives(The Number of examples predicted positive that are actually negative)

TN = True negatives(The Number of examples predicted negative that are actually negative)

FN =False negatives (The Number of examples predicted negative that are actually positive)

Equations:

Recall :

Recall is the TP rate, what fraction of those that are actually positive were predicted positive? i.e. $TP / (actual\ positives)$. It is also called as sensitivity.

Precision :

Precision is, the TP rate ,what fraction of those predicted positive are actually positive? i.e. $TP / (predicted\ Positive)$.It is also called as Positive predictive value.

Accuracy:

Accuracy is also used as a statistical measure of how well a binary classification test correctly identifies or excludes a defined condition on given dataset. Accuracy is the proportion of true results (both TP and TN) and the total number of cases examined.

$$\text{Recall} = \frac{tp}{tp + fn}$$

$$\text{Precision} = \frac{tp}{tp + fp}$$

$$\text{Accuracy} = \frac{tp + tn}{tp + tn + fp + fn}$$

Figure12 shows the comparison of correctly classified instances using various classification schemes on the base of accuracy and error. Based on the below statistics , OneR and J48 gives best and same accuracy using different test modes.

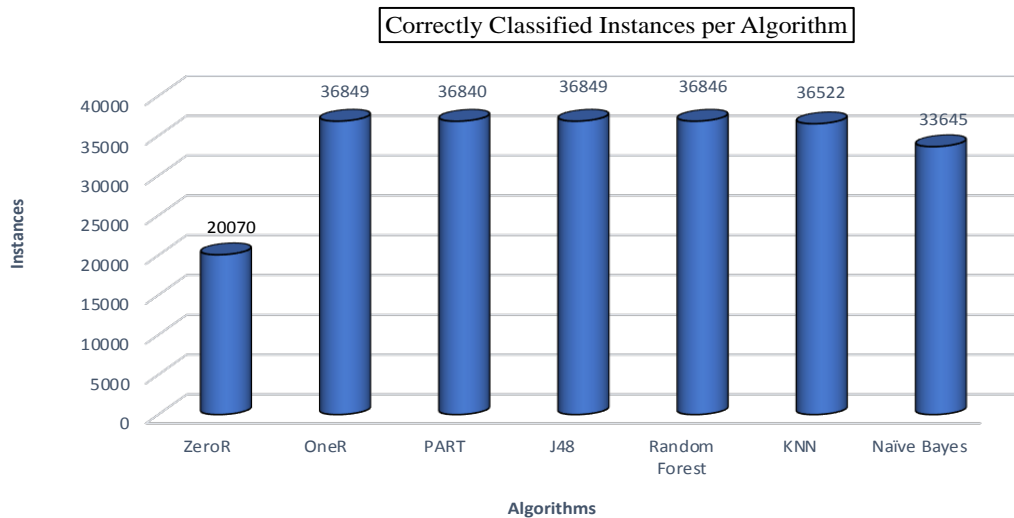


Figure 12. Comparison of correctly classified instances using various classification schemes

Figure13 shows the comparison of incorrectly classified instances using same classification schemes as above. From the below statistics, ZeroR algorithm is showing more instances which is classified incorrectly and OneR and J48 is showing less instances which is incorrectly classified.

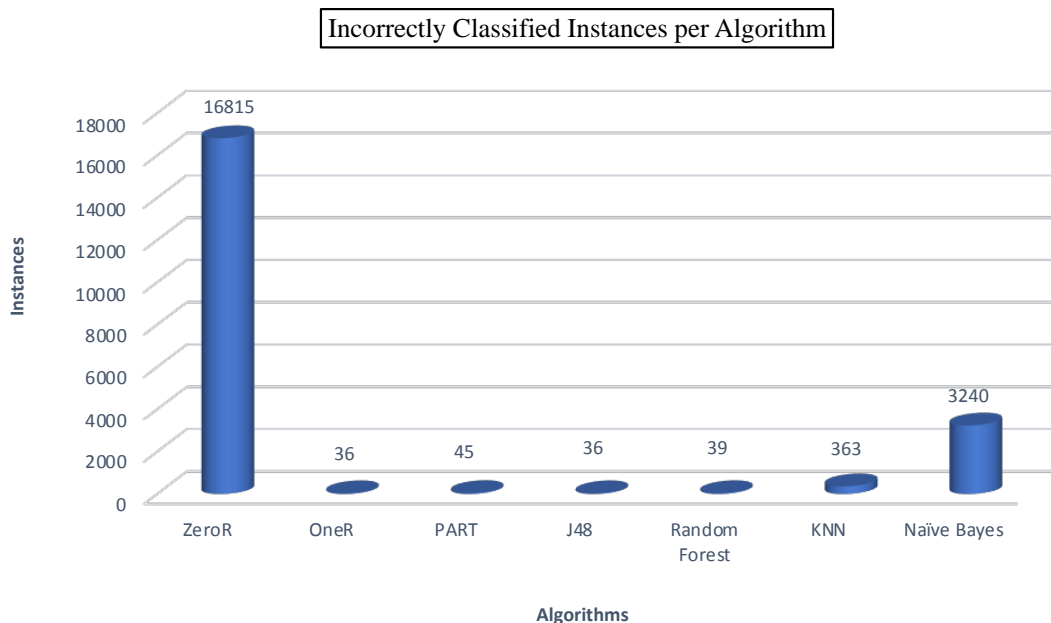


Figure 13. Comparison of incorrectly classified instances using various classification schemes

We also derived observations of TP and FP rate for 10 fold Cross validation and split mode. From below figures 14,16, we can conclude TP rate is not good for ZeroR algorithm for both test modes. OneR and J48 shows consistent TP rate.

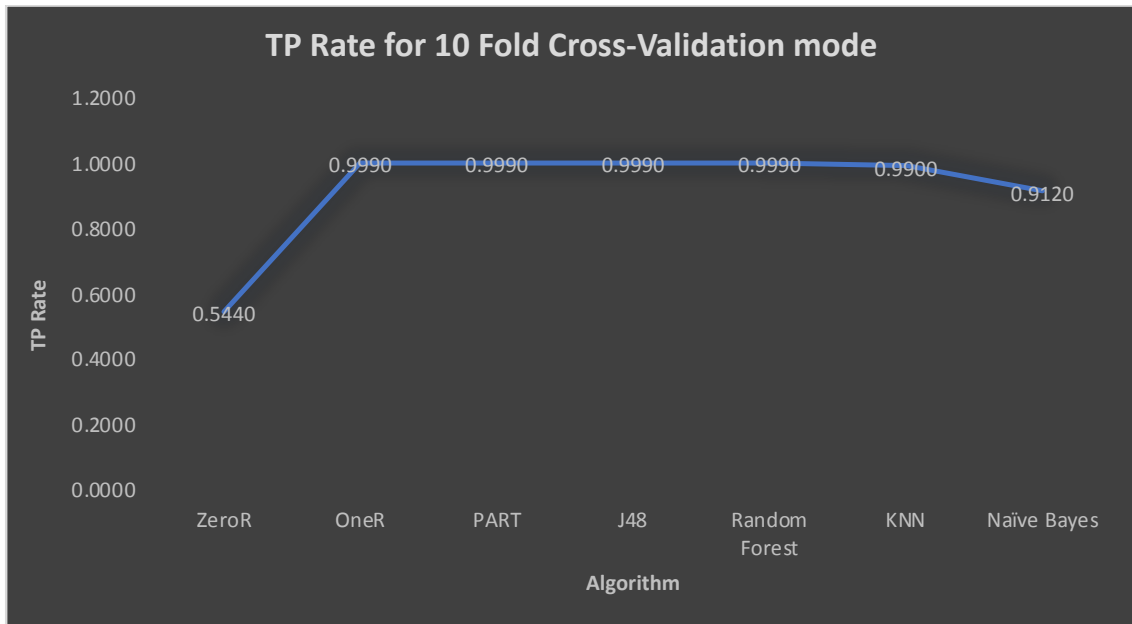


Figure 14. Graph showing TP rate of algorithms in cross validation training / test

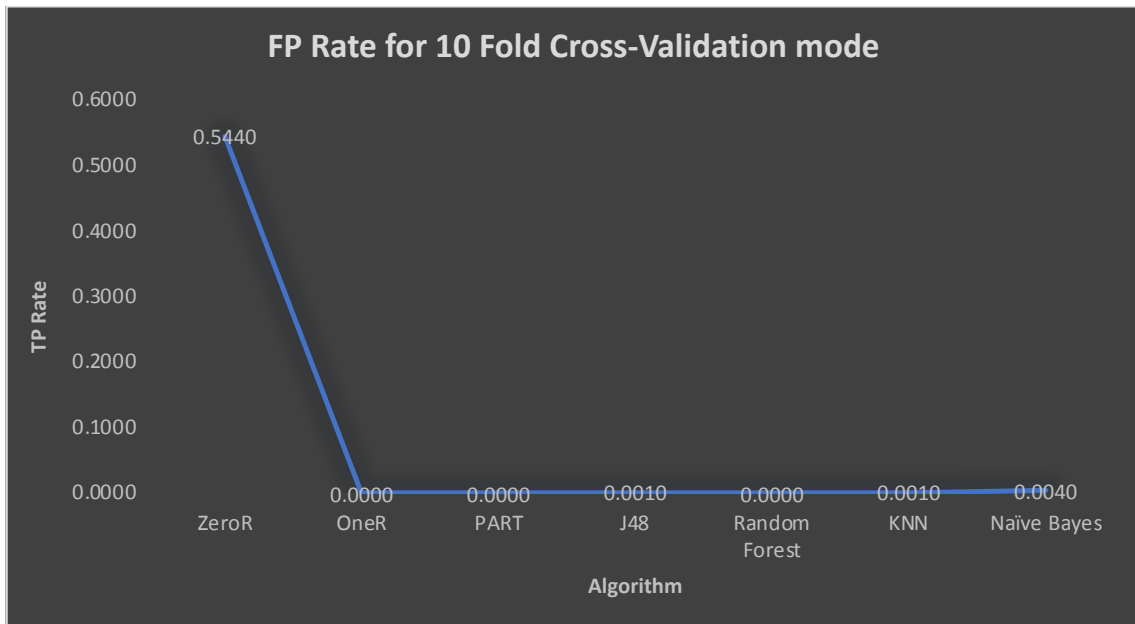


Figure 15. Graph showing FP rate of algorithms in cross validation mode training / test

From figure 15,17 , FP rate ZeroR showing spike which should not be consider as good result.

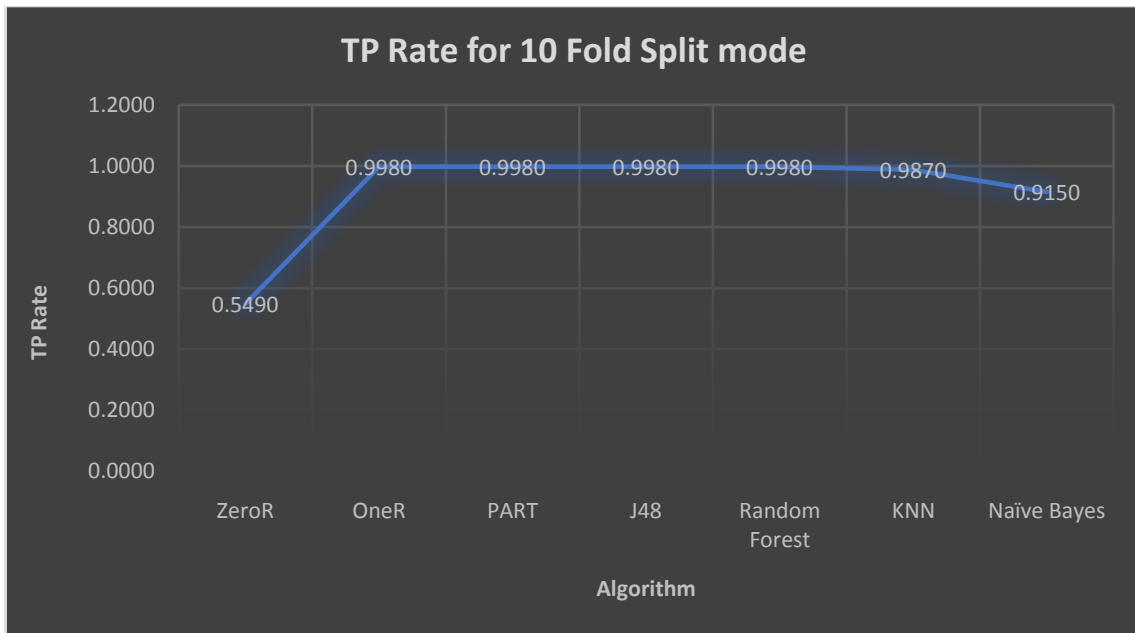


Figure 16. Graph showing TP rate of algorithms in split mode training / test

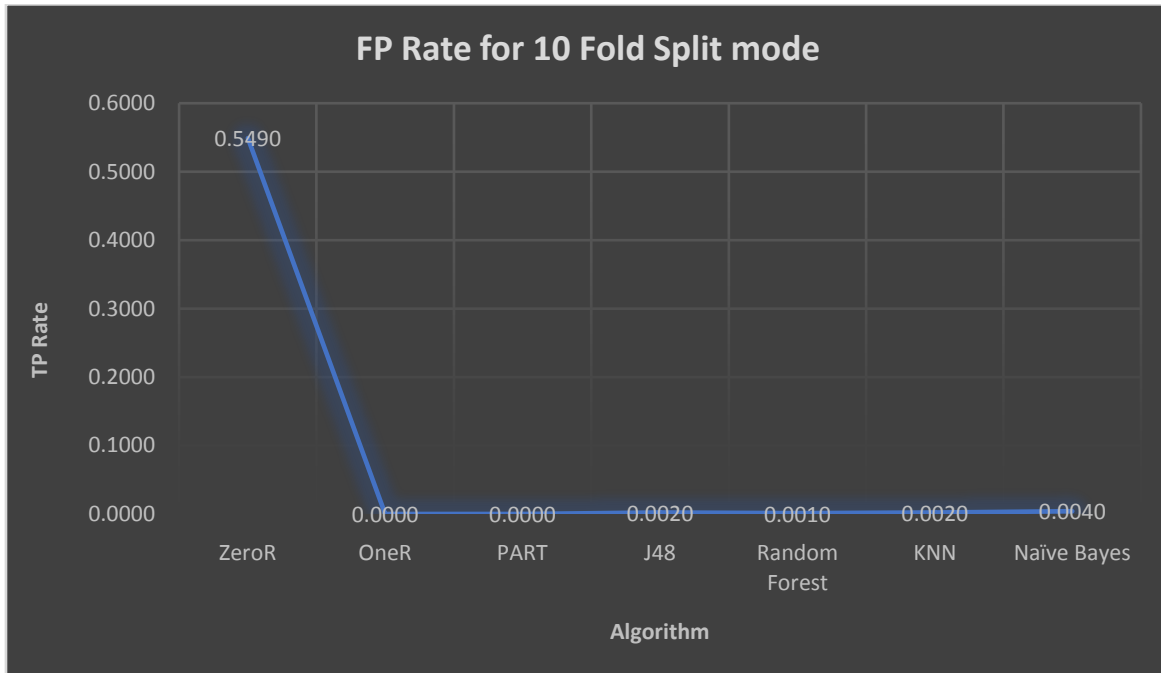


Figure 17. Graph showing FP rate of algorithms in split mode training / test

VIII. Conclusion & Future Work

This research work has proposed a new approach for efficiently predicting the Standard Operating Procedures (SOP) based on different alerts triggered from various system sources. The sample real time data set has been used for experimental purpose. It has come up with the information of alerts and sources. Based on observation numbers , it has been proved that the J48 and OneR algorithms can achieve accuracy up to 99.90%.In future , we plan to automate the execution of predicted SOP's on triggered alerts or servers to remediate the system in real time without any human intervention.

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Impact of Investment Management on Individual Investor: An Empirical Study

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Abstract---Diversified financial sector has provided wide range of opportunities to individual investors. Investor can select any combination of financial instruments for wealth generation. The individual's decision of investment is dependent on the kind of services rendered and the benefits offered in the financial market and every decision-making process has either an opinion or an action. This paper aims to study the investment patterns of individual investors considering the objective of the investment, composition of portfolio, risk bearing capacity, the market knowledge they possess, demographic characteristics, attitude etc. To perform this literature review research papers, journal articles, white papers on behavior of individual investor from various countries are studied. Research papers are analyzed thoroughly in order to present excellent conceptual framework. This study proposes that the perception of an individual investor could be a great help to the financial consultants, fund managers and asset management agencies.

Index Terms---Investment management, Investment decision, Individual investors, Behavioral Pattern, Risk bearing capacity

I. Introduction

Investments in financial sector are specifically important for an individual investor and fund management organizations. As financial market is volatile, investors are more cautious about their investments. Wide ranges of opportunities are to invest in the t in financial market. The objective and investment pattern of investment differs from investor to investor on the basis of the requirements. There are several factors that attract and motivate investors to invest in financial market. Researchers are concentrating on the behavioral patterns and factors affecting individual investor.

Decisions of individual investors was supposed to be based on the Modern Portfolio Theory proposed by Markowitz in 1952. There are three basic measures of modern portfolio theory i.e. Standard deviation, Expected return and correlation. However, it was proved that individual investor possesses very few stocks and are incapable to diversify their portfolio because of lack of knowledge. An individual's risk-taking capacity also plays an important role in financial decision-making process to achieve desired financial goals. To understand the individual investor's behavior factors like objective of the investment, composition of portfolio, risk bearing capacity, the market knowledge, demographic characteristics and attitude need to be considered [1].

Investment Management is the art of managing available funds effectively. Effective fund management helps to grow the money and helps in wealth management. Investment management is done through portfolio management. Investment portfolio is composed of investment instruments such as fixed deposits, recurring deposits, bonds, shares, mutual funds etc. To gain required growth in the investment, portfolio diversification is important [2]. In every investment has some incurred risk. Diversification helps in minimizing the risk associated with investment [3].



Figure 1. Objectives of Portfolio Management

Financial independence is accomplished through effective investment management. Use of investment management for women empowerment is also very important and needed task in the current era.

II. Objective of the Study

Present study focuses on the study is to find the effect of investment management on individual investor. As compared to male investors women are having less inclination towards investment in financial instruments. Hence it is important encourage women to invest in financial market and grow the capital. The objective of the study is to find aspects that affect on individual investors decision about investments. Fig. (2) indicates that investment management is majorly managed by male. Women are less involved in the investments. There is a need to

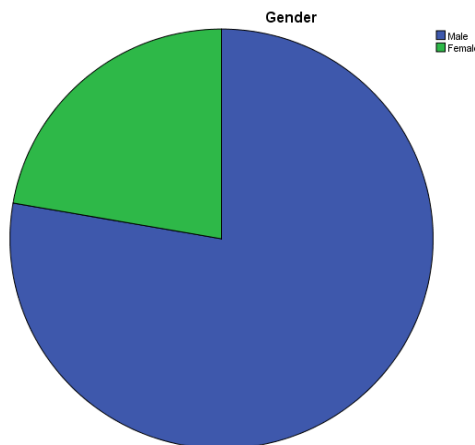


Figure 2. Ratio of Male and female investors

III. Literature Survey

Currently many researchers are exploring the factors affecting individual investor’s investment decision making process in financial market. It is observed that there is a dynamic relationship between behavior of individual investor, stock price fluctuation, trading volume and returns gained. It is also observed that up to certain extent region-wise cultural difference is there in investment patterns. A review of the literature clearly states that individual investor’s behavioral pattern is the most important features in investment management.

As a part of literature survey, researcher considered research papers from different countries concentrating on behavior and factors influencing individual investment decision making process. Some of them are –financial advisor has to analyze the risk tolerance level of their clients. It is quite important parameter while taking the decision related to investment management. Nguyen et. al. (2016), in the research article The influence of financial risk tolerance on investment decision-making in a financial advice context, researcher examined the impact of belief in financial advice service, literacy related to finance and relation length along with service. For the study, data of 538 Australian investors was taken into consideration. Researcher observed that there is a positive association in between investment decision making and investors risk tolerance level. Researcher also observed that there is no positive relation in between literacy related to finance and individual investor’s risk tolerance level [4].

Forecasting of the direction of the stock price is a vital task in financial domain. Even minor improvements in the prediction make a great effect on profit earned from investments. Michel Ballings et. al. (2015) in the article entitled Evaluating multiple classifiers for stock price direction prediction studied random forest, kernel factory, support vector machine, neural networks, k-nearest neighbor and logistic regression for prediction of direction of stock price. Researchers collected data from 5767 companies listed publically from Europe and used AUC as a measure of performance. They observed that random forest is the better performer for stock prediction as compared to all others [5].

S. Lodhi (2014) in the paper entitled Factors influencing individual investor behavior: An empirical study of city Karachi investigated individual investor behavior of Karachi, Pakistan. She observed that there were five independent variables - financial literacy, high experience, use of accounting information, importance of analyzing financial statements and age are the factors that affect on the investor’s decision-making process. She also observed that accounting information and risk aversion are directly related to each other [6].

Tomolael at (2013) in the research paper Factors influencing investment decisions in capital market: A study of individual investors in Nigeria, studied the factors affecting decisions of individual investments and also studied the relation of the socio-economic characteristics of the Nigerian capital market. Data of 297 investors were used for the study. Statistical techniques like independent t-test, post hoc test and ANOVA were used for the data analysis. They found the factors like performance of the fund sponsoring company, expected split of the

stock, probable corporate earnings, dividend policies of the company are more important for the decision making. They also found that socio-economic factors like age, education, gender, marital status significantly affect the decision making about the investments from Nigeria [7].

According to Ebrahim (2012), in the paper entitled An empirical analysis of financial risk tolerance and demographic features of individual investors}, Financial risk tolerance is the level of risk that one is ready to take. Risk tolerance should be measured for investment decision making. Author studied effect of demographic features on portfolio construction, investment decision making and risk tolerance level. Demographic features like age, gender, occupation, marital status, time horizon, income, size of portfolio are taken into consideration. As per the study, there is a variation financial risk tolerance level in accordance to demographic characteristics. Association of these attributes is used to predict risk tolerance level of individual [8].

IV. Research Methodology

The methodology comprises of data, source of data, geographical area of the study. Sample size and framework used for data analysis. The study is based on primary and secondary data. Primary data is generated from 220 individual investors with the help of questionnaire from Pune city, Maharashtra, India. The sources of secondary data are research articles, books, websites and reports. The sample size of 220 respondents is used for analyzing the data. Simple random sampling technique is used for data generation.

V. Analysis of Investment Pattern

Investors attitude towards investment instruments like shares, bonds and mutual funds is studied. Monthly saving pattern, risk bearing capacity of the individual investor is also studied. Investors belonging to different income group, monthly saving pattern are considered for the study.

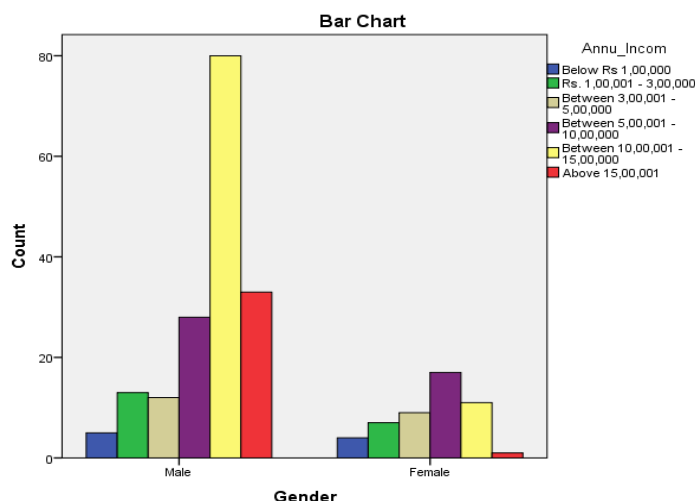


Figure 3. Annual Income of Investors

In the category of annual income up to 10,00,000 around 36% male investors earn more than female investors. And in the higher income category 90% male investors earn more as compared to female investors.

Annual income of the investor has great impact on monthly saving. Table below shows the statistics of gender wise monthly savings. Male investors who are earning better are preferring the investments in financial market.

Table 1. Gender wise Monthly saving

Gender * Monthly Savings Cross tabulation

Count		Monthly Savings					Total
		0%	Between 0 - 10%	Between 10 - 25%	Between 25 - 50%	Over 50%	
Gender	Male	1	71	83	13	3	171
	Female	5	19	19	4	2	49
	Total	6	90	102	17	5	220

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From Table (1) it can be observed that 3% investors are not at all saving anything. 41% investors are saving up to 10% of their annual income. 46% investors are ready to save in between 10-25% of the annual income. 8% investors are saving in between 25-50% and only 2% of the investors are saving above 50% of their annual income.

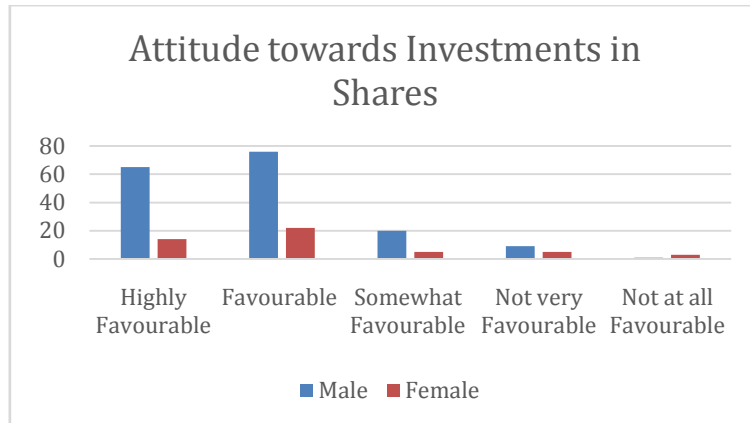


Figure 4. Investors attitude towards investment in Shares

Fig. (4) shows the attitude of investors towards investments in shares. Gender wise there is a significant difference in the attitude. Out of 220 investors 161 male investors are keenly interested in investing in shares whereas only 41 women investors are ready to invest in shares.

Fig. (5) shows the attitude of the investor in bonds. 151 male investors out of 220 are interested in investing in bonds and only 47 female investors are ready to invest in bonds.

Fig. (6) indicates the attitude of investors in mutual funds. 160 male investors are ready to invest in mutual funds. On the other hand, only 47 female investors are interested in mutual fund investments.

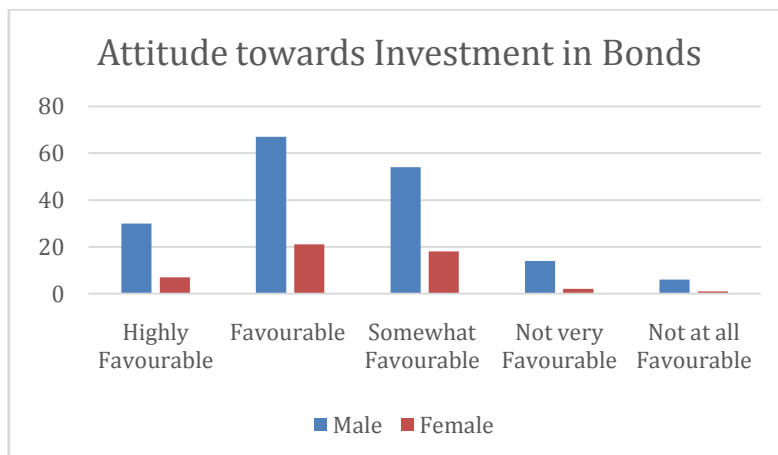


Figure 5. Investors attitude towards investment in Bonds

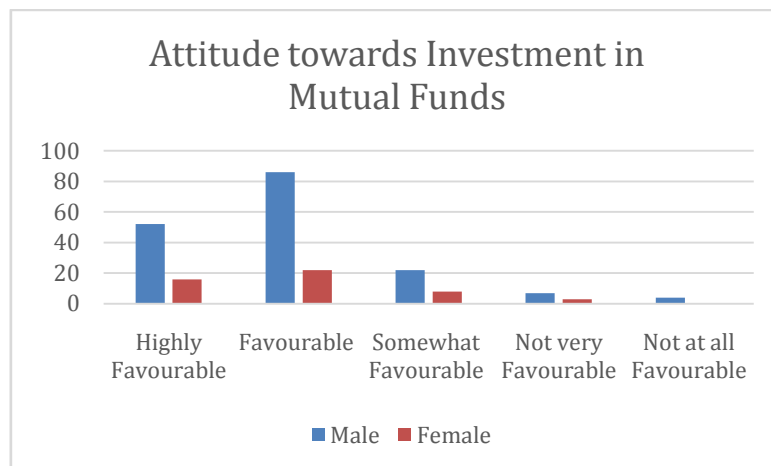


Figure 6. Investors attitude towards investment in Mutual Funds

Table 2. Risk-taking capacity of Individual Investor

Gender * Risk Level Crosstabulation
Count

		Risk Level			Total
		Will Not increase risk at all	Take little more risk with some money	Take little more risk with all money	
Gender	Male	25	133	13	171
	Female	8	36	5	49
Total		33	169	18	220

Table(1) shows gender wise risk-taking capacity of individual investors. From the table it can be seen that 15% of the male investors are ready to take no risk. 78% male investors are ready to take little risk with some money and only 8% male investors are ready to take little more risk with all money.

On a contrary 16% female investors are ready to take no risk. 73% female investors are ready to take risk with some money they are having and 10% female investors can bear more risk with all money they are having.

It shows that men and women investors are having different attitude towards risk incurred in investments.

VI. Conclusion

Diversified financial service sector has given wide range of opportunities to individual investors. The individual’s decision of investment is prejudiced by the kind of services rendered and the benefits offered in the financial market. Financial knowledge and experience have an impact in financial investment decision making process.

The present study focuses on investment pattern of individual investors of Pune city by considering the factors like annual income, monthly savings, attitude towards investment in shares, mutual funds and bonds and risk-taking ability of the investor. This will help to choose the composition of the portfolio. From the data, it can be observed that male investors are more inclined towards any of the investment. 36% male investors earn more than female investors having income up to 10 lakhs and 90% male investors fall in the category of higher income group. Considering the attitude towards investment in shares, bonds and mutual funds male investors are more inclined towards these instruments. Less annual income of women has direct impact on monthly savings. Lack of knowledge refrain women investor to invest in the financial instruments. Also, the risk-taking ability of male investor is more than female investor. Around 93% male investors are ready to take little or more risk with some money they are having. On the other hand, 82% female investors are ready to take some risk with the funds they are having.

Hence there is need to educate women regarding investment avenues. Women can analyze the financial market well and can perform better if given little freedom and confidence. There is a need to create awareness among women investor to increase the involvement of women.

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The Study of Gesture Recognition by using Gesture Algorithm and Image Processing

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Abstract: *The People are using mask and hand gloves for hacking security devices like smart card and information system. The face detection and image recognition by image processing technique are popular for these security threads. So the complete gesture recognition is also important to find hackers, for that hand and eyes recognition is included in this paper. So the eye moves are to recognize particular person among all people. This paper uses new gesture algorithm to solve those security moves on secure devices. The movements produce by the eyes, face and hand of person is important to understand the signing intention of person by proper communication of human computer and natural contacting of machine and human. Some people are send personal data to network this might be easily broken, so complete moves recognition is required. The security alerts are depend upon these gesture recognition.*

Keywords: *Gesture recognition system, Image processing, Gesture Algorithm.*

1. INTRODUCTION

The field gesture recognition is meant to propose method to identify people on the basis of visual information. Basically, visual information is depend on the movements of people. It may include facial expression and the hand movements of people. The many threads are found in security devices such as ATM machine and computer system. In such places the security camera are used to fetch facial expression and moves. The eye movements are also catch for mask hacker. These computer and person communication is able to find stole during processing. For that interactivity is important. The image processing technique is used for face detection. But It is also important to recognize facial expressions of people to prevent scam.

In recent time there are multiple methods and functions to modify networks. The face recognition is firstly important to detect face and the all database is use to find person depend on face image. The network fetch and collect all information about person, these information is necessary to find hackers. The all security users like police and company are used this method for

data security. The police database is available on network, in that database images like faces and moves are capture and stored. Such database is now a days updated to store videos. Those videos have been using for hand recognition. Hand recognition introduce the measures of appearance features and poses, these combination is tested to find hackers psychology. These method is useful to prevent many security attacks and the online threads can be find using gesture recognition process. As the technology increases the need of security grows, so security and people assets safety is important for economic condition of countries.

2. RELATED WORK

The many gesture recognition method are introduce in the recent year. These method are the variation in the feature detection, for two ways of detection such as object detection and general sequence detection. For these two type image processing is required. The object processing is used for captured object. These faces captured and process by gesture algorithm.

In Gesture recognition system, firstly capture images is process by image processing technique

and then face detection algorithm is applied for further object identification. The calculation of face detection is depend upon the simple matrix operations. The face recognition will find the face image from face for matching faces with face database. It uses SUSAN (Smallest Univalve Segment Assimilating Nucleus) algorithm to find different face points. In face recognition face features are automatically found on the basis of expressions and moves. After facial expression detection it is easy to identify person intention depend upon his expression. These gesture of facial expression is recognize in this paper. The parameters is calculated by SUSAN algorithm.

2.1 Gesture Recognition System

The gesture recognition system is introduce to prevent the security attacks on the variable security system like ATM machine, company database and other important data. These gesture recognition consist of facial expression detection and hand moves detection. The facial expression of people is important to identify the intension of people. The below figure shows the facial expression recognition of person by the step by step processing of system.



Fig.1: Face Detection by Image Processing

These expression helps to solve the fetching problem in non-determination places. It goes step by step processing of database. The feature extraction is very much important in the manner of person identification. The facial feature recognition is a process of pixel by pixel value calculation using image processing method and then color matching of face, after that it converts image from black and white to color image, to show the rectangle trace on face. Facial feature recognition is used to identify facial expression of a person to fined intension of that person. These intension of person is needed to prevent the unusual actions from that person and also for the security of people in public as well as private places.

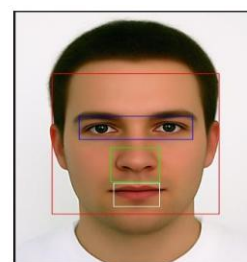


Fig.2: Facial Features in Gesture Recognition

The facial features is detected using the face detection technique and image processing algorithm. The facial feature selection is the process of selecting meaningful features such as forehead, eyes, nose, lips and leave extra features. The process algorithm select input as a face image and provide output as a key features such as eyes, forehead, nose and lips for the person identification. These process images are training images will further match to class in the database. If the face expression is match it is easy to find the hacker. Classification is done on the basis of class and authorization to the person is also given depend upon the class database. If the image is matches to the class database then that person will get permission to go and access person information. These system is used in all company profile for security purpose.

3. PROPOSED SYSTEM

3.1 System Architecture

The security of money and system data is provided by gesture recognition system. The captured image and video is process by using following flow design of system. The flow diagram of system is use to describe the process of gesture recognition with a working of methods, technology and algorithms. These is necessary to have face recognition of person to avoid the suspicious acts by terrorist in the public places as well as in private money sectors. The CCTV camera footage is used to capture moving videos and images, in this paper these footage is used to process the gesture recognition method. The video frames are obtain by from video is process by processing algorithm as a pixel by pixel calculation from RGB to gray and gray to RGB color conversion. The edge detection method is used to detect edges of images. The main edges of image matrix is traces by point to point edge matching and after that matching edges of image is detected and goes further to process. These estimation of the flow is produce a meaningful output as a desired result in the paper for valuable solution to avoid security threads in

the public sector, people must feel safe in all over places while moving.

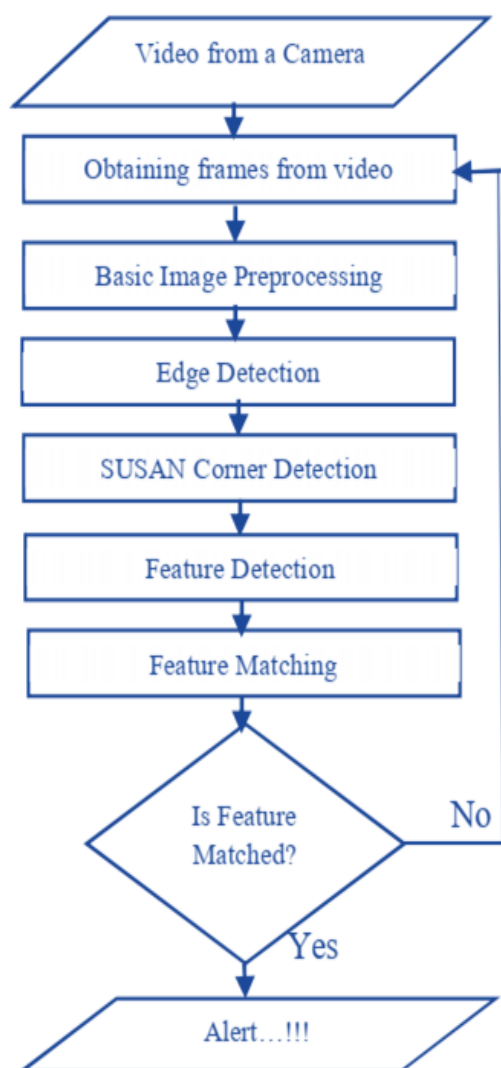


Fig3. Flow of Design

A three dimensional plot of SUSAN area given a small part of a real noisy image, showing edge and corner enhancement. The mathematical calculation is done for image processing. The process shows the proper face detection of person in images as well as from video. These system helps to find hacker by detecting facial expression.

The captured video is firstly taken from camera, then frames are obtain from the video. The basic image processing is done by matrix calculation. The image smoothing is done by these formulation. Then edge gradient detection is done by these calculation. The threshold value is calculated by gradient intensity. The area detection and basic corner detection is done by using SUSAN algorithm. As a result of these face detection the facial recognition process is obtained. Then these facial expression is matches to the class

database, if the face images matches to the database the person identification is done. These security system is automated and can be used to detect various features from video to reduce security issues at crowd places.

3.2 System Algorithm

The Gesture Recognition System is based on various gesture such as face, hands, and eyes. So in this design we have use face recognition by image and video captured. The eye detection is also introduce. For hand recognition these system is use. So complete body recognition can be done ahead. Hand movements and pose are captures to identify. These movements of hand and eye is used for extracting the image and the method mention bellow is processed to extract more features from image for gesture recognition of a anonymous person in work places.

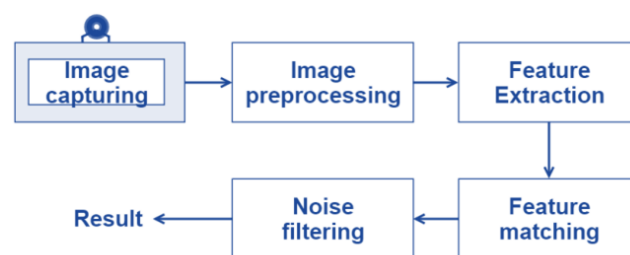


Fig. 4: Vision Based Gesture Recognition System

After Image capturing from CCTV camera the image preprocessing is done by using above image processing algorithm. From that processed image feature of person is extracted. The face detection method detect the face as shown in yellow color rectangle. Then face normalization process carried out on that face. It normalize all image and produce only feature face shown in rectangle. The feature extraction process extract the facial features of person as face, eyes, and nose. If the feature matches to the given database image then the desired output is obtained. After that noise filtering is done, these filter the unwanted pixels of feature images and gives only proper filter image. These process will gives the proper result of facial as well as hand recognition of person.

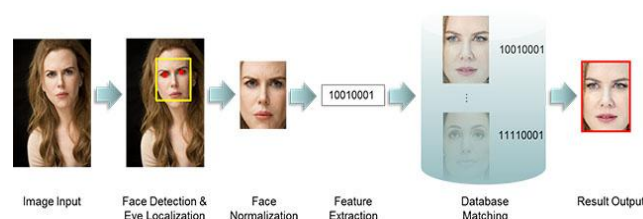


Fig. 5: Gesture Recognition Process

These is complete body gesture recognition system. The neural network can be used for face recognition, these will also produce beneficiary outcome. These figure shows the complete process of algorithm. The input image is given then face detection is done, after face normalization of algorithm, features are extracted. Then database matching process starts if match found then process completed.

4. CONCLUSION

The hacker threads in the security devices and company data as well as personal information is obtain now a days. So to resolve these hacking and security attacks these gesture recognition system is introduced. These method gives the identification of person from captured video and image. The system uses face detection technique and feature extraction and matching process for face matching and face identification. These paper further can be extend for the eye detection to produce complete body gesture recognition.

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A Comparative Study of Project Organisation Structure and Problems Faced during New Product Development by Tier 1 and Tier 2 Suppliers in Indian Automotive Sector

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Abstract: In India, the demands for vehicles have extended dramatically over the past two and a half decades. Numerous vehicle manufacturers around the world and Tier-1 suppliers, have effectively set up offices in India for research, improvement and assembly. The Indian automotive part sector started to update Lean methods to meet these customers' interests. The automobile segment is the main player in the global and Indian economies. The comprehensive motor car sector (four-wheelers) legally contributes 5% to the complete assembly job, 12.9% to the all-out assembly creation esteem and 8.3% to the all-out contemporary undertaking. It also provides \$560 billion to different nations' open income in terms of fuel, flow, deals and enlistment charges. The global automotive industry's annual turnover is around US\$ 5.09 trillion, which is equal to the planet's sixth-largest economy. Likewise, the vehicle business is linked to a few different divisions in the economy, and hence its backhanded commitment is much higher than that. Plastic Interiors Tier 1 and Tier 2 Suppliers This paper aims to identify problems faced by Top 3 Indian and International Automotive Plastic Interiors Tier 1 and Tier 2 Suppliers during the development of new products in addition to examining and categorizing problems in Top 3 Indian and International Automotive Plastic Interiors Tier 1 and Tier 2 Suppliers during the development of new products along with Top 3 Indian and International Automotive Plastic Interiors Tier 1 and Tier 2 Suppliers and Gap Analysis of Project Organization Structure for New Product Advancement in Top 3 Indian and International Plastic Interiors Tier 1 and Tier 2 Suppliers

Keywords: Global value chains, factors affecting participation, automobile industry, organization of production, localization, Innovation Systems, R&D.

1. INTRODUCTION

India needs to evolve as the world's third-largest passenger vehicle market by 2021. It took India about seven years to construct 4,000,000 vehicles out of three million annually. However, the following achievement—5,000,000—is normal in less than five years. Hitting that mark will depend on the current fast-paced currency advancement process, with an expected annual GDP growth rate of 7% by 2020, ongoing urbanization, a prosperous devouring class, and powerful rules and policies. With this growth at the top of the priority list, we set out to produce a point of perspective on the trends forming the Indian market, the motivation for the vehicle company in India, and the objectives for gaining on the market. Currently, the vehicle region adds more than 7% to India's GDP.⁴ The 2016–26 Automotive Mission Plan sets an objective of expanding the commitment to 12%.

Different economic patterns could assist in achieving this goal. Rapid urbanization means that by 2030, the country will have more than 500 million people residing in urban communities— the current U.S. population will have 1.5 occasions.

Increasing wages will also take on a job as around 60 million households could join the expenditure category by 2025 (defined as households with more prominent livelihoods than \$8,000 per year). At the same time, more people are going to enter the workforce. Cooperation could reach 67 per cent by 2020, with more women and youth advertising entering the activity, increasing interest in portability.

Some of them would jump directly into a four-wheeler fragment, while others would move from two to four-wheelers. More than 44 per cent of the expenditure category households will be in 49 development groups— for example, Delhi is dependent on having a comparable GDP for each capita to achieve energy equality as the whole country of Russia in 2025.6 Cities like Delhi are a sweet place for automotive manufacturers to target. Small-scale automobiles and hatchback vehicles were the cornerstones of India's vehicle company, offering around 50 per cent and 6 to 7 per cent growth between 2014 and 2017 budget years. These parts will continue to maintain an overwhelming position, but most of the growth is based on fresh pieces such as minimized SUVs, cars, and extravagant automobiles.

2. LITERATURE REVIEW

The new thing progression (NDP) is a technique in which another thing is started to complete a movement of steps such as organizing, arranging, improving, and displaying (Margaret Rouse, 2018). The NDP operations are carried out through the partnership to carry on with the methodology of enhancement and to update the association's display to rare states (Urban and Hauser, 1993) (Ulrich and Eppinger, 2011). The NDP expects a remarkable activity in the fundamental enhancement of the division of labor, economy, and provides fundamental mechanical degrees of advancement to elevate ways of life. Tata Motors, for instance, dispatches another TAMO vehicle in the vehicle part of the games. The vehicle has gained a manageable market and is giving various games vehicle models such as Audi R8 LMX an extraordinary battle. Likewise, Tata Motors can manufacture its share of the general business and exponentially develop its customer base (KetanThakkar,2017).

In any event, as a consequence of high loss rates of 25% to 45% in the NDP scheme, it is considered to be a risky effort started by the association because different new things are not quickly recognized by the customers (Crawford, 1987) (Cooper, 2001). In order to create new things, the associations place exclusively assets in the inventive job methods so fresh power. Regardless, about 4 factors go into the execution and enhancement phase in every 7 fresh thing musings started by the organizations and only 1 or half come into the last scheme and get driven. Moreover, the speed of achievement of such new things is less, which has an adverse effect on the association that places assets in improving new stuff (Booz, Allen and Hamilton, 1982).

In this way, NDP is seen as the most risky and twisting development executed by the association. Likewise, the production of new things requires a portion of the strategy like organizing, facilitating, allocating resources, and so on which requires assumption at each stage. In any event, in examining or acquiring things that are either dropped or not used in the real age phase, 46 percent of the assets are lost due to powerlessness in the thing progress process. Hereafter, collecting actions such as assessment, testing, taking care of and improving the NDP through social affair material substances about the new thing disclosure is critical so that productive movement of the new thing is achieved on the market (Booz, Allen and Hamilton, 1982).

To construct a central point around the executives accepted, it is a strategy through which the association's advantages are planned, coordinated and dealt with in order to accomplish a specific mission or perform any job (OLIVIA LABARRE, 2019). The undertaking of the board activities is coordinated in order to achieve explicit goals in order to address as necessities the pre-described articles set by the affiliation. Nevertheless, the key test that is anticipated to accomplish the job of loading up locations is the time goals in view of the manner in which numerous supervisory organizations are not ready to accomplish the assignment within the time period prescribed. Quality and expense factors are various issues that the meeting looks at (Joseph Phillips, 2003). In addition, the people (adventure boss, originators, authoritative specialists, and sub-impermanent workers) associated with the project are looking at the budgetary issues such as redesigning the assignment and use of benefits to complete the project. Various undertakings complete the executives' project to express the association's needs and can be associated with any expansion. For example, in the advancement company, adventure board development is completed to produce productive motion of things, such as roads, ranges (Wilmot, Hocker, Arthur, Petty, Martocchio, Cheeseman and Rosania, 2007).

In addition, it redesigns the workers' characteristics and makes them orchestrated and confirmed. The management improvement undertaking is also performed by IT experts to bring things and associations forward, while the board's

biotechnology experience is performed by the Biotechnology masters' Research and Development (R&D). Executives of the project handling different assignments ensure that the work is finished with the quality models pre-picked, contributing arrangement and energy plan (Esselink, 2000). Thus, the project managers use distinct approaches such as Board affirmation Benefits (BRM) to accomplish the doled out effort to attain the set goal. The scheme enables reduce the risk and establishes a match scheme between the errand and the lawful policies (Serra and Kunc, 2015).

Furthermore, the chairmen are using the Critical Chain Adventure Board (CCPM) method to structure and orchestrate the various duties by addressing the faults of errand. For instance, Indian EPC Company is satisfactorily grasping Critical Chain Adventure Administrators (CCPM), which is a bit of the Tata social opportunity to reduce lead times. Using the CCPM permits the advancement association to reduce expenditure, enhance quality, and plan to move more efforts with a relative percentage of benefits. Similarly, within 9 months of the procedure meeting, EPC reported an increase of 75 per cent in the benefit rates (Ehab Shallaby, 2015).

The NPD procedure includes various stages such as perceiving shoppers' needs, setting up conceptualization of items, making a point-by-point statement of items, planning, testing and promoting the item by the Tier 1 and Tier 2 providers' organization for marketing purposes. Each stage of the NPD operation needs to study exercises, progress, motorization, and various processes. Besides, it is also essential that the individuals associated with the Item Advancement Procedure should impart, work together and fill in as a group to achieve the new Item (Kazimierska and Grębosz-Krawczyk, 2017). Each stage of the NPD operation needs to study exercises, progress, motorization, and various processes. Furthermore, it is also essential that the people connected with the Item Advancement Procedure should impart, work together and fill in as a team to achieve the new Item (Kazimierska and Grębosz-Krawczyk, 2017). In this way, the scheme of Stage-Gate's most well-known use NPD procedure is adopted by Tier 1 suppliers, and Tier 2 suppliers are to develop fresh products (Cooper and Kleinschmidt, 1994). Fundamentally, the method includes the vibrant collaboration of all the NPD venture peers with the objective of making important choices by keeping a strategic distance from oversights (Goffin and Micheli, 2010). It also ensures that proper administration practice is established with the objective of properly growing links between the NPD venture people with large authority rehearsals. Furthermore, the conduct of the NPD procedure involves a few stages, so it is essential to handle the entire procedure in a viable manner so that there is no dispute between the different functionaries. The method also includes client requirements and innovation thinking so that the fresh product is produced by the company peers in Tier 1 and Tier 2 suppliers organization with the predefined time period (Barczak and Wilemon, 1989), (Cooper, 2009), (Riek, 2001). It also ensures that reasonable administration practice is established with the goal of properly growing connections between the NPD project individuals with large authority. Furthermore, the conduct of the NPD procedure includes a few phases, so it is important to handle the entire procedure in a viable manner so that there is no dispute between the different functionaries. The method also includes client requirements and innovation thinking so that the fresh product is produced by the company peers in Tier 1 and Tier 2 suppliers organization with the predefined time period (Barczak and Wilemon, 1989), (Cooper, 2009), (Riek, 2001). Over the past few years, the new product enhancement activities have picked up energy, and the innovation-enabled organizations bring countless advances. For example, Naukri, Ola, MakeMyTrip's presentation is a portion of the dispatches made by the IT experts who have been productive and received high recognition from the individuals. It encouraged the speculators to put the funds into the projects of enhancement that energize the professionals and the organization of Tier 1 and Tier 2 suppliers to direct the NPD procedure. According to the research conducted by Venture Intelligence, from 2008-2017, 74 NPD was submitted in the Indian Markets by contributing \$681 million to earn \$4 billion in advantages (ET CONTRIBUTORS, 2018). Nonetheless, while bringing the fresh produce to the market, the Tier 1 and Tier 2 suppliers organization also face marketing difficulties. The buyers' acknowledgement of the fresh products does not take place immediately, and it takes time to collect the new item effectively (Patel, Modha, Patel and Patel, 2014). From now on, it is essential that the start of new products must be achieved by considering the preferences of the customer. In the third phase, the execution method enters into the structure, which mainly includes the execution of the agreement and the management of the objectives that have been achieved up to this point. During this stage, the chores are allocated to the workers and the exercises of lead checking by using the managerial equipment such as the dashboard project. Checking and monitoring are performed in the following phase to break down the job presentation by inspecting the price, risk, and nature of the new Tier 1 and Tier 2 Suppliers Company improvements. In conclusion, by administering the scope of the project, the end of the project is accomplished in the last phase. The people of the enterprise break down whether each part of the undertaking, such as outstanding agreements, administrative work and paperwork, is carried out in a viable manner (William Malsam, 2018). In addition, Tier 1 and Tier 2 suppliers have also adopted appropriate IoT-driven item enhancement practices. The various intrusions looked at by the vehicle company recognized with versatility

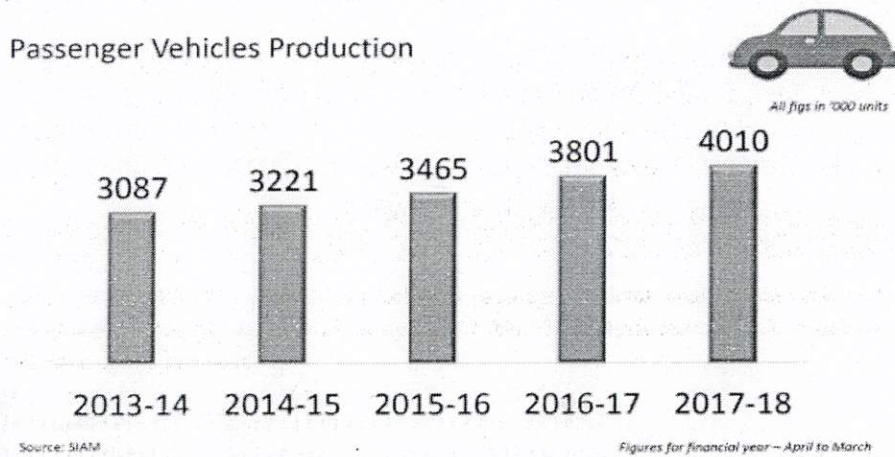
and vehicle-to-vehicle (V2V) interaction are efficiently performed due to the presentation of new developments. It can then be said very well that Tier 1 and Tier 2 suppliers are laying a remarkable task in obtaining the vehicle company new developments (Krishnan and Jha, 2011).

3. NPD PROCESS IN AUTO COMPONENT INDUSTRY AND CURRENT ORGANIZATION STRUCTURE FOR NPD

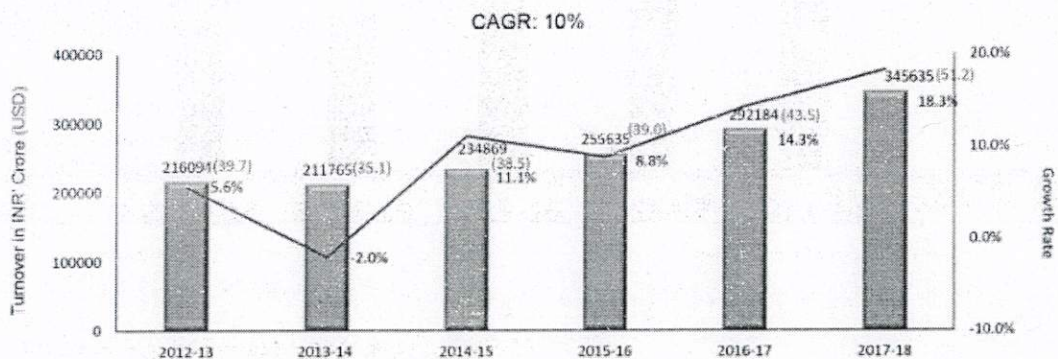
Production

The industry produced a total 30,915,420 vehicles including passenger vehicles, commercial vehicles, three wheelers, two wheelers and quadricycle in April-March 2019 as against 29,094,447 in April-March 2018, registering a growth of 6.26 percent over the same period last year.

Passenger Vehicles Production



Turnover – Auto Component Industry: 2017-18



(Turnover includes supplies to OEMs, aftermarket sales and exports)

4. DOMESTIC SALES

Passenger Vehicle sales rose by 2.70 per cent over the same period last year in April-March 2019. Within passenger vehicles, Passenger Cars, Utility Vehicle & Vans sales increased by 2.05 per cent, 2.08 per cent and 13.10 per cent respectively over the same period last year in April-March 2019.

In April-March 2019, the general section of commercial vehicles recorded an increase of 17.55 per cent compared to the same span last year. Medium & Heavy Commercial Vehicles (M&HCVs) risen 14.66% and Light Commercial Vehicles increased 19.46% over the same period last year in April-March 2019.

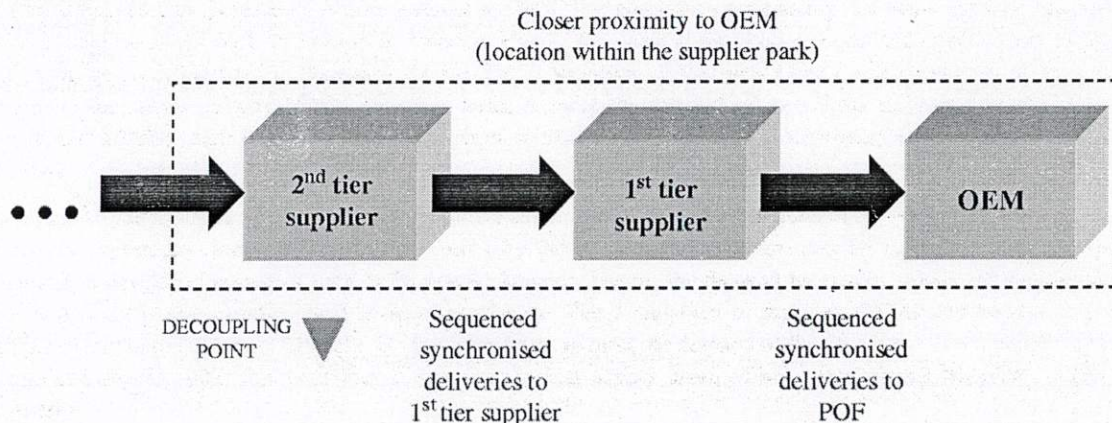
In April-March 2019, two Wheelers sales recorded the development of 4.86 per cent over April-March 2018. Scooters decreased by-) (0.27 per cent in the Two Wheelers segment, while Motorcycles and Mopeds increased by 7.76 per cent and 2.41 per cent in April-March 2019 over April-March 2018, respectively.

5. EXPORTS

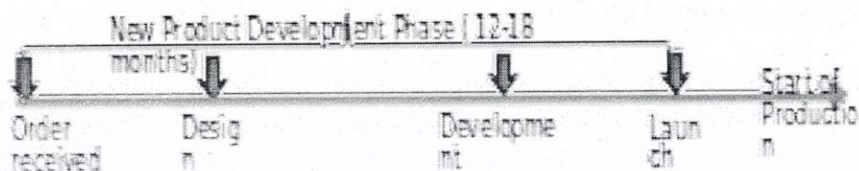
Overall automobile exports rose by 14.50 per cent in April-March 2019. While exports of passenger vehicles decreased by-) (9.64%, Commercial Vehicles, Three Wheelers and Two Wheelers recorded the development of 3.17%, 49.00% and 16.55% respectively over the same period last year in April-March 2019.

The Indian Car Manufacturing industry is also known as Original Equipment Manufacturers (OEM). The manufacturing industry is expected to increase its export volumes by 20%. The companies are making ties and supplying equipment to the developed countries such as Europe & America. Hence, the demand for quality goods and development of the new product in the specified time is necessary for the Tier 1 suppliers so that new OEMs will be able to provide quality services to the clients effectively. On the other hand, to meet the demand of the OEMs the Tier 1 suppliers have to manage and develop their ties with Tier 2 Suppliers so that supply chain of new product and resources will be met adequately.

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Nonetheless, it has been reported that 20 percent of the activities begun by the Indian Automobile OEM do not fulfill the undertakings' prerequisites to complete on timetable. Then again, the operations that have lately begun are also brief on expenditure that expands from the recommended norms. Because of the recent invasion of consumption and extended costs, the OEM is facing difficulties. Similarly, OEMs' strong dependence on Tier 1 and Tier 2 suppliers to complete the exercises identified with New Product Development is extremely responsible for the disappointment in the OEMs' presentation. It also includes the inadequate risk arrangement and proximity of high-risk variables in the New Product Development by Tier 1 and Tier 2 suppliers. It is now essential that the OEMs and the Tier 1 and Tier 2 suppliers in the Indian Automotive industry take suitable action by arranging the acquired asset. In the OEMs, it will assist satisfy customer wishes with reduced expenses. Furthermore, in order to satisfy the growing requirements of the automotive industry, it is vital that the suppliers of Tier 1 and Tier 2 take on more tasks in the development of fresh products and offer fresh products to the company.



The current review will differentiate the difficulties facing Indian Automotive Plastic Interiors Tier 1 and Tier 2 Suppliers when leading the OEM's New Product Development venture. The inquiry will also suggest fresh useful ideas and adequately receive significant upgrades to the Project Management System's work and planning.

The NPD method includes multiple stages such as the recognition of consumer needs, the establishment of product conceptualization, the creation of a comprehensive product proposition, the design, testing and advertising by the Tier 1 and Tier 2 suppliers corporation for marketing purposes. Every phase of the NPD process needs study operations to be conducted, promoted, mechanized, and other procedures. In addition, it is also crucial that the individuals engaged in the phase of product growth should interact, cooperate and work as a team for the fresh product's achievement (Kazimierska & Grębosz-Krawczyk, 2017). The most prevalent use of the Stage-Gate NPD method is therefore the methodology taken by Tier 1 providers and Tier 2 is the development of fresh products (Cooper & Kleinschmidt, 1994). The methodology primarily involves the active involvement of all team members in the NPD project in order to make key decisions by avoiding oversights (Goffin & Micheli, 2010). It also guarantees clear management procedures are established in order to correctly develop excellent leadership habits, interactions between the employees of the NPD project. In addition, conducting the NPD process includes several phases, so it is essential to efficiently handle the entire process so that there is no conflict between the various functionaries. The method also involves consideration of consumer needs and technology so that the project team members in Tier 1 and Tier 2 suppliers corporation develop the fresh item with the defined time frame (Barczak & Wilemon, 1989), (Cooper, 2009), (Riek, 2001). Over the previous three years, new product development activities have acquired momentum and technology-enabled businesses are bringing many innovations. The introduction of Naukri, Ola, MakeMyTrip, for example, are some of the launches made by IT professionals who have been successful and have received high acceptance from people. It urged investors to invest in development initiatives that would encourage experts and vendors from Tier 1 and Tier 2 to perform the NPD process. According to the study undertaken by Venture Intelligence, from 2008-2017, 74 NPD was implemented in Indian Markets by spending \$681 million to earn \$4 billion worth of revenues (ET CONTRIBUTORS, 2018). However, the providers of Tier 1 and Tier 2 also face marketing difficulties while marketing the fresh item. Consumers' adoption of the new products does not take place immediately and it takes time for the fresh item to be successfully received (Patel, Modha, Patel & Patel, 2014). It is therefore essential to implement the launch of fresh products by maintaining customer preferences in mind.

Making the executives procedure center around the assignment; it mostly involves five stages that are beginning, arranging, executing, observing, controlling, and shutting. The start-up procedure is known as the starting approach in which the job estimate is resolved. In this regard, the business case and the study of possibility are carried out in order to know the undertaker's reason and set of objectives. At this stage, all the vital considerations of life resources, expenditure plan, human capital, time period and need are regarded in order to acknowledge the intention of the undertaking in Tier 1 and Tier 2 Suppliers Company by people. In the next phase, the arrangement procedure is updated by amassing the group of undertakings so that the fixed goals are achieved within the required moment. Various components such as degree, definition, tasks, schedule, price, quality, authoritative and parameters of employees are integrated at this point. It also involves connections, risk evaluation, and acquisition with the objective of considering each parameter before proceeding the following procedure. The execution procedure falls into shape in the third organize, which fundamentally involves executing the agreement and administering the policies that have been executed since not long ago. During this point, by using project board apparatuses such as undertaking dashboard, the errands are handed out to the workers and lead checking exercises. By checking the price, danger, and nature of the fresh advances Tier 1 and Tier 2 Suppliers Company, observation and control is performed in the following phase to break down the presentation of the project. In conclusion, the end of the project is completed in the last organize by administering the scope of the assignment. The venture people explore whether each part of the assignment, such as outstanding agreements, administrative work and paperwork, is effectively completed (William Malsam, 2018).

6. ROLE OF TIER 1 AND TIER 2 SUPPLIERS

Providers take on a remarkable task in providing administrations to car companies through their products and supplies that help guide organizations that manage and enhance NPD into organizations. Additionally, the suppliers go to the car company as a critical source of information contributor, advocate, and exchange loan banks. Similarly, the suppliers keep a watch on the advances that take place far and wide and make them viable acquainted with the car company. Also, innovative global progress has restricted organizations and associations around the globe to create new products to meet the evolving needs of buyers. In setting up the car company, many notable changes are taking place in this sector through new item advancement operations to give buyers new products according to their requirements. In this respect, Tier 1 and Tier 2 Suppliers are finishing the innovation range to provide the vehicle with company-new headways like a jolt. The automaker, Tier 1 and Tier 2 suppliers, for example, are conducting exams and discovering the choice for the Li-particle battery used in EVs such as the battery swapping element.

Moreover, new technology has enabled countless new product designers such as Apple and Google, to enter the automotive industry. Administrations such as infotainment products, CarPlay assist the suppliers of Tier 1 and Tier 2 in strengthening the current capabilities with the organization's vision. It enables the suppliers of Tier 1 and Tier 2 to integrate fresh dimensions into the board portfolio product. The car companies are, therefore shifting their assembly approaches step by step from re-appropriating the perfect designs to the manufacturing provisions for the Manufacturing Design Model (DFM). It helps in the reassignment of commitments to the suppliers of Tier 1 and Tier 2 to reduce the overhead costs looked at by the vehicle organizations.

Moreover, the automotive assembly organizations are also establishing cooperation with Tier 1 and Tier 2 suppliers and various OEMs so that the sharing of advances is carried out viable for the economies of scale era. For example, car organizations such as Ford India and Mahindra and Mahindra have established an affiliation with Tier 1 and Tier 2 suppliers and offer vehicle design to procure and use the designation scheme efficiently. Also, organizations such as Nissan and Renault have established alliances with Tier 1 and Tier 2 suppliers to make effective upgrades to their present aggressive rankings. Also, Tier 1 and Tier 2 suppliers have obtained additional IoT-driven Item advancement methods that will be adequately performed. The various intrusions looked at by the vehicle company recognized with versatility and vehicle-to-vehicle (V2V) interaction are efficiently performed due to the presentation of fresh advances. Therefore, it tends to be said that the suppliers of Tier 1 and Tier 2 lay a remarkable task in bringing the automobile company new trends (Krishnan and Jha, 2011). Also, when Tier 1 and Tier 2 suppliers employable in the Indian Automotive Area start the new item development causes authoritative specific tasks or money linked in nature. Level 1 and Tier 2 suppliers also guarantee additional multiplication of advertising and deals at the beginning of the new item advancement exercises in the associations' work.

7. PROBLEM STATEMENT

Providers take on a remarkable task in providing administrations to car companies through their products and supplies that help guide organizations that manage and enhance NPD into organizations. Additionally, the suppliers go to the car company as a critical source of information contributor, advocate, and exchange loan banks. Similarly, the suppliers keep a watch on the advances that take place far and wide and make them viable acquainted with the car company. Also, innovative global progress has restricted organizations and associations around the globe to create new products to meet the evolving needs of buyers. In setting up the car company, many notable changes are taking place in this sector through new item advancement operations to give buyers new products according to their requirements. In this respect, Tier 1 and Tier 2 Suppliers are finishing the innovation range to provide the vehicle with company-new headways like a jolt. The automaker, Tier 1 and Tier 2 suppliers, for example, are conducting exams and discovering the choice for the Li-particle battery used in EVs such as the battery swapping element.

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8. AIMS AND OBJECTIVES

The main aim of the study is to make a comparative study of Project Organisation Structure and Problems Faced during New Product Development by Tier 1 and Tier 2 Suppliers in Indian Automotive Sector. In addition to this, other objectives are as follows:

- Identify Problems Faced by Indian and International Automotive Plastic Interiors Tier 1 and Tier 2 Suppliers during New Product Development.
- Analyze and Categorise the Problems in Indian and International Automotive Plastic Interiors Tier 1 and Tier 2 Suppliers during New Product Development.
- Study the Project Organisation Structure for New Product development in Indian and International Automotive Plastic Interiors Tier 1 and Tier 2 Suppliers.
- Gap Analysis of Project Organisation Structure for New Product development in Indian and International Plastic Interiors Tier 1 and Tier 2 Suppliers.

9. RESEARCH QUESTIONS

- What are the Problems Faced by Indian and International Automotive Plastic Interiors Tier 1 and Tier 2 Suppliers during New Product Development?
- How to Analyse and Categorise the Problems in Indian and International Automotive Plastic Interiors Tier 1 and Tier 2 Suppliers during New Product Development?
- Is there any Gap Analysis of Project Organisation Structure for New Product development in Indian and International Plastic Interiors Tier 1 and Tier 2 Suppliers?

10. RESEARCH HYPOTHESIS

H01: Project Organisation Structure does not help to develop New Products on Time and within Budget in International Automotive Plastic Interiors Tier 1 and Tier 2 Suppliers.

H11: Project Organisation Structure helps to develop New Products on Time and within Budget in International Automotive Plastic Interiors Tier 1 and Tier 2 Suppliers.

H02: Lack of Project Organisation Structure during New Product Development does not lead to Cost overrun in Indian Automotive Tier 1 and Tier 2

H12: Lack of Project Organisation Structure during New Product Development leads to Cost overrun in Indian Automotive Tier 1 and Tier 2

H03: Project Management Skills does not help Project Team to take quick decisions and reduces Problems Faced during New Product Development in Indian and International Plastic Interiors Tier 1 and Tier 2 Suppliers

H13: Project Management Skills helps Project Team to take quick decisions and reduces Problems Faced during New Product Development in Indian and International Plastic Interiors Tier 1 and Tier 2 Suppliers

11. RESEARCH GAPS

The research is essential with the objective of being able to know the different realities identified with the Indian car industry and NDP in a superior way. The Indian Tier 1 and Tier 2 suppliers are trying advertising efforts to create supplies for vehicle companies with the objective of meeting the vehicle company needs and prerequisites properly. It has been found that insufficient available information could provide significant data identified with the suppliers of Automotive Plastic Interiors Tier 1 and Tier 2 and illuminate the organizational adjustments will help the suppliers accommodate OEM's interest as far as fresh product improvements are concerned (Ayers and Odegaard, 2017). Thus, it is essential to direct the current inquiry towards the objective that relevant information identified with the current examination could be recognized in a superior manner.

12. RESEARCH GAPS OF VARIOUS TECHNIQUES

(Brettel et al., 2014) found that although in coming times the intelligent automation along with reorganization of labours may be beneficial for the organisations but the labourers are irreplaceable due to the efficient need of coordination. In shopping places the operators need to be efficient in decision making ensures the operations are carried out without any void. Although the self-sufficient systems can interact with each other, in case of any major problem in them, the decisions may be incorrect. So properly skilled labour should be there to monitor their performance in decision making.

(Brones, Carvalho, & de Senzi Zancul, 2014). Discussed about the gaps existing in their reviewed work where the environmental sustainability in product development is worked upon in particularly scientific papers. Sustainability issues are yet to be assessed in brief. Hence there exists a gap between the project management and environmental sustainability.

(Cooper, 2003) showed the different kinds of research challenges existing in developing a new product. These include the differences in thought existing in the world, inability to prioritize the information required immediately, a vast space of solutions which is yet to be explored, restrictions in time and funds and the huge possibility of failure.

(Kerzner & Kerzner, 2017) discussed the challenge of initiating the analysis considered while managing a project by considering the competency of the company.

(Giannakis & Louis, 2016) discussed that their approach lacks the need of empirical research in the framework. Further the benefits of MAS need to be recognized.

(Olson et al., 2001) did not provide much information about the behaviour content of the cooperation. The proposed work provides no information about the methods with which the managers can motivate the designed patterns existing in the cooperation. No hints are provided how the manager will upgrade the low cooperation levels existing currently.

13. CONCLUSION

The evaluation's basic commitment is to conduct a similar investigation into the structure of the task association in a problem that is examined in the Indian Automotive part during the fresh item enhancement by Tier 1 and Tier 2 suppliers. Moreover, this investigation is also useful in view of the fact that it distinguishes the problems that Top 3 Indian and international automotive plastic providers are looking at in Tier 1 and Tier 2 during new product enhancement. In addition, the study will also examine and order the problem within Tier 1 and Tier 2 supplier in Top 3 Indian and globally Automotive plastic during new product development. Finally, the evaluation will concentrate on the task association structure for the fresh item development in Top 3 Indian and Universal Automotive Plastics inside Tier 1 and Tier 2 providers in order to effectively differentiate the holes in the examination of the company association structure for new item enhancement in the best three Indian and international plastics providers inside Tier 1 and Tier 2.

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The Study of Gesture Recognition by using Gesture Algorithm and Image Processing

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Abstract: *The People are using mask and hand gloves for hacking security devices like smart card and information system. The face detection and image recognition by image processing technique are popular for these security threads. So the complete gesture recognition is also important to find hackers, for that hand and eyes recognition is included in this paper. So the eye moves are to recognize particular person among all people. This paper uses new gesture algorithm to solve those security moves on secure devices. The movements produce by the eyes, face and hand of person is important to understand the signing intention of person by proper communication of human computer and natural contacting of machine and human. Some people are send personal data to network this might be easily broken, so complete moves recognition is required. The security alerts are depend upon these gesture recognition.*

Keywords: *Gesture recognition system, Image processing, Gesture Algorithm.*

1. INTRODUCTION

The field gesture recognition is meant to propose method to identify people on the basis of visual information. Basically, visual information is depend on the movements of people. It may include facial expression and the hand movements of people. The many threads are found in security devices such as ATM machine and computer system. In such places the security camera are used to fetch facial expression and moves. The eye movements are also catch for mask hacker. These computer and person communication is able to find stole during processing. For that interactivity is important. The image processing technique is used for face detection. But It is also important to recognize facial expressions of people to prevent scam.

In recent time there are multiple methods and functions to modify networks. The face recognition is firstly important to detect face and the all database is use to find person depend on face image. The network fetch and collect all information about person, these information is necessary to find hackers. The all security users like police and company are used this method for

data security. The police database is available on network, in that database images like faces and moves are capture and stored. Such database is now a days updated to store videos. Those videos have been using for hand recognition. Hand recognition introduce the measures of appearance features and poses, these combination is tested to find hackers psychology. These method is useful to prevent many security attacks and the online threads can be find using gesture recognition process. As the technology increases the need of security grows, so security and people assets safety is important for economic condition of countries.

2. RELATED WORK

The many gesture recognition method are introduce in the recent year. These method are the variation in the feature detection, for two ways of detection such as object detection and general sequence detection. For these two type image processing is required. The object processing is used for captured object. These faces captured and process by gesture algorithm.

In Gesture recognition system, firstly capture images is process by image processing technique

and then face detection algorithm is applied for further object identification. The calculation of face detection is depend upon the simple matrix operations. The face recognition will find the face image from face for matching faces with face database. It uses SUSAN (Smallest Univalve Segment Assimilating Nucleus) algorithm to find different face points. In face recognition face features are automatically found on the basis of expressions and moves. After facial expression detection it is easy to identify person intention depend upon his expression. These gesture of facial expression is recognize in this paper. The parameters is calculated by SUSAN algorithm.

2.1 Gesture Recognition System

The gesture recognition system is introduce to prevent the security attacks on the variable security system like ATM machine, company database and other important data. These gesture recognition consist of facial expression detection and hand moves detection. The facial expression of people is important to identify the intension of people. The below figure shows the facial expression recognition of person by the step by step processing of system.



Fig.1: Face Detection by Image Processing

These expression helps to solve the fetching problem in non-determination places. It goes step by step processing of database. The feature extraction is very much important in the manner of person identification. The facial feature recognition is a process of pixel by pixel value calculation using image processing method and then color matching of face, after that it converts image from black and white to color image, to show the rectangle trace on face. Facial feature recognition is used to identify facial expression of a person to fined intension of that person. These intension of person is needed to prevent the unusual actions from that person and also for the security of people in public as well as private places.

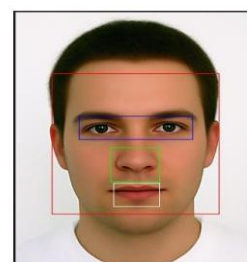


Fig.2: Facial Features in Gesture Recognition

The facial features is detected using the face detection technique and image processing algorithm. The facial feature selection is the process of selecting meaningful features such as forehead, eyes, nose, lips and leave extra features. The process algorithm select input as a face image and provide output as a key features such as eyes, forehead, nose and lips for the person identification. These process images are training images will further match to class in the database. If the face expression is match it is easy to find the hacker. Classification is done on the basis of class and authorization to the person is also given depend upon the class database. If the image is matches to the class database then that person will get permission to go and access person information. These system is used in all company profile for security purpose.

3. PROPOSED SYSTEM

3.1 System Architecture

The security of money and system data is provided by gesture recognition system. The captured image and video is process by using following flow design of system. The flow diagram of system is use to describe the process of gesture recognition with a working of methods, technology and algorithms. These is necessary to have face recognition of person to avoid the suspicious acts by terrorist in the public places as well as in private money sectors. The CCTV camera footage is used to capture moving videos and images, in this paper these footage is used to process the gesture recognition method. The video frames are obtain by from video is process by processing algorithm as a pixel by pixel calculation from RGB to gray and gray to RGB color conversion. The edge detection method is used to detect edges of images. The main edges of image matrix is traces by point to point edge matching and after that matching edges of image is detected and goes further to process. These estimation of the flow is produce a meaningful output as a desired result in the paper for valuable solution to avoid security threads in

the public sector, people must feel safe in all over places while moving.

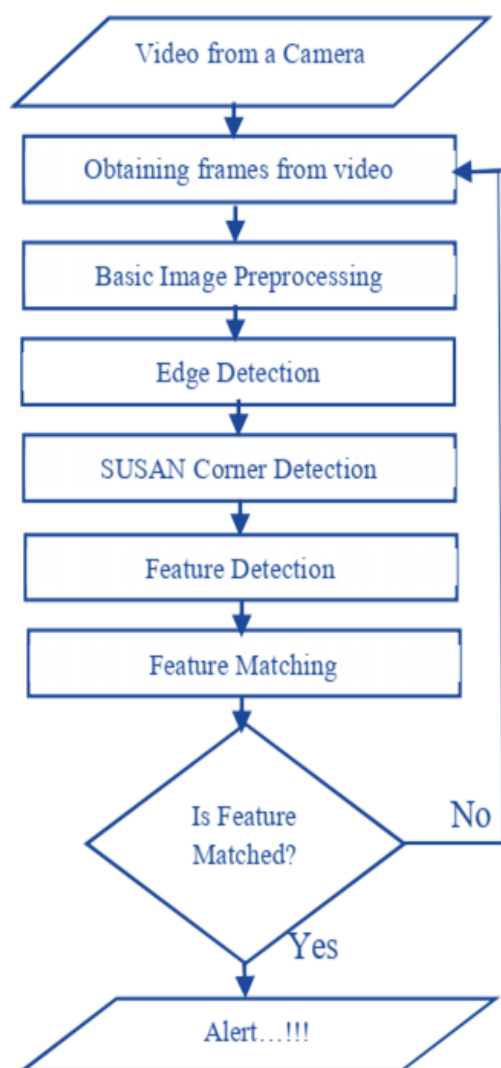


Fig3. Flow of Design

A three dimensional plot of SUSAN area given a small part of a real noisy image, showing edge and corner enhancement. The mathematical calculation is done for image processing. The process shows the proper face detection of person in images as well as from video. These system helps to find hacker by detecting facial expression.

The captured video is firstly taken from camera, then frames are obtain from the video. The basic image processing is done by matrix calculation. The image smoothing is done by these formulation. Then edge gradient detection is done by these calculation. The threshold value is calculated by gradient intensity. The area detection and basic corner detection is done by using SUSAN algorithm. As a result of these face detection the facial recognition process is obtained. Then these facial expression is matches to the class

database, if the face images matches to the database the person identification is done. These security system is automated and can be used to detect various features from video to reduce security issues at crowd places.

3.2 System Algorithm

The Gesture Recognition System is based on various gesture such as face, hands, and eyes. So in this design we have use face recognition by image and video captured. The eye detection is also introduce. For hand recognition these system is use. So complete body recognition can be done ahead. Hand movements and pose are captures to identify. These movements of hand and eye is used for extracting the image and the method mention bellow is processed to extract more features from image for gesture recognition of a anonymous person in work places.

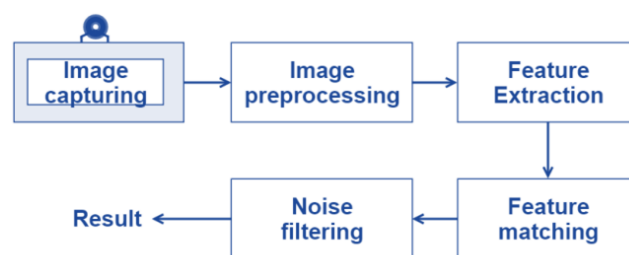


Fig. 4: Vision Based Gesture Recognition System

After Image capturing from CCTV camera the image preprocessing is done by using above image processing algorithm. From that processed image feature of person is extracted. The face detection method detect the face as shown in yellow color rectangle. Then face normalization process carried out on that face. It normalize all image and produce only feature face shown in rectangle. The feature extraction process extract the facial features of person as face, eyes, and nose. If the feature matches to the given database image then the desired output is obtained. After that noise filtering is done, these filter the unwanted pixels of feature images and gives only proper filter image. These process will gives the proper result of facial as well as hand recognition of person.

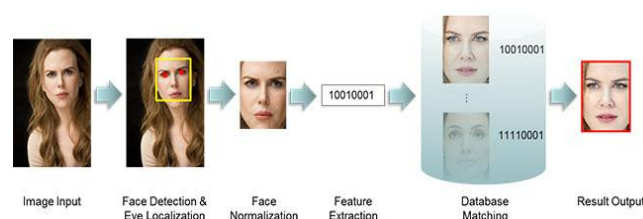


Fig. 5: Gesture Recognition Process

These is complete body gesture recognition system. The neural network can be used for face recognition, these will also produce beneficiary outcome. These figure shows the complete process of algorithm. The input image is given then face detection is done, after face normalization of algorithm, features are extracted. Then database matching process starts if match found then process completed.

4. CONCLUSION

The hacker threads in the security devices and company data as well as personal information is obtain now a days. So to resolve these hacking and security attacks these gesture recognition system is introduced. These method gives the identification of person from captured video and image. The system uses face detection technique and feature extraction and matching process for face matching and face identification. These paper further can be extend for the eye detection to produce complete body gesture recognition.

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A Review of Role of Data Mining Techniques in Portfolio Management

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Abstract---Finance is the process of fund management. It includes allocation of liabilities and assets depending on time. Time value of money is the key component of finance. Features of finance include investment and profitable opportunities, optimal mix of funds, system of internal controls and future decision making. Nowadays several researchers are exploring how data mining techniques can be applied in finance domain. Different avenues for data analysis under finance domain include Portfolio Management, Risk Management, Fraud Detection, Bankruptcy prediction etc. Data mining capabilities such as automated prediction of trends, behaviors and automated discovery of previously unknown patterns help in financial data analysis. This paper reviews several research works that describe application of data mining techniques in financial management from application to technical outlook.

Index Terms---Data Mining, Stock Management, Mutual Funds, Investment Management, Portfolio Management

I. Introduction

This paper reviews application of Data Mining techniques in Finance Domain. Data Mining is a process of discovering correlations or patterns among various fields in huge relational database. Data mining techniques help to reveal hidden patterns, trends for further prediction in financial market. In this era of computer science, data mining techniques like

Association Rule, Decision Tree, Clustering, Classification, Neural Network and Time Series Analysis are very much important for quick decision making.

In finance domain like Stock market, Portfolio Management etc., massive amount of data is generated by organizations which require some techniques for data analysis. With the help of data mining tools, this dynamic and complex data can be tackled easily. Potential benefits of using data mining tools attracted various researchers and commercial market.

Nowadays several researchers are exploring how data mining techniques can be applied to finance domain. Stock market is a market that allows you to buy company share and derivative of company share at a fixed price. Whenever an investor is thinking about investing in stock market, he may come across a large pool of stocks and the very important task is to select the stocks that can earn some profit. It is not necessary that every stock in the market earn profit on the same level. Hence stock selection is a very crucial step in investment management. There is no specific method for price prediction of a company's stock. Research in the field of data mining and its associated technologies discovered improved processes for stock selection and price prediction. Organization of the paper goes like - section two deals with Data Mining and techniques of data mining. Section three deals with Portfolio Management and application of data mining techniques in portfolio management. Section five is composed of Conclusion.

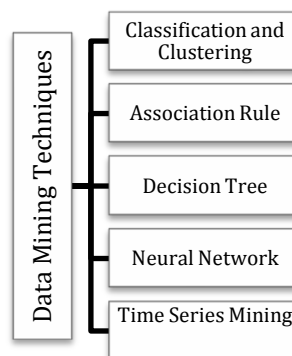


Figure 1. Data Mining Technique

II. Data mining

According to Dunham and Shridhar, Data mining is defined as finding hidden information in a database. It has been also called as exploratory data analysis, deductive learning and data driven discovery. Data mining involves various algorithms to accomplish different tasks. There are three parts of data mining algorithm viz. model, preference and search. Models are categorized as Predictive or Descriptive. A predictive model makes prediction using different data elements whereas descriptive model finds relationships or patterns in data [1]. Depending upon the knowledge which is mined, data mining techniques can be classified into following categories. Figure 1 shows Data Mining Techniques.

A. Clustering

Clustering is a technique in which groups are formed on the basis of data elements and is used to discover particular distribution and patterns of the data. Clustering provides data points on the basis of which data elements are grouped together. Similar type of data elements form a group which is also known as cluster. Clusters do not show the type of relationship between the data elements [2].

In clustering, clusters are not predefined and there is no distinction between dependent and independent variables. Clustering algorithm searches for groups and finds similarities between the data elements. User is allowed to extract the required meaning.

There are various types of clustering algorithms. The K-means algorithm is popular among all. K-means algorithm is simple, easy to understand and can be applied in different scenarios[3].

It is observed that some clustering algorithms generate too many clusters but K-means algorithm can be used to obtain a set of required clusters [4]. The K-means algorithm has been widely used in finance for asset selection and management. As compared to Fuzzy C-means clustering algorithm and Self Organized Map (SOM), K-means reduces the time required for stock selection. It facilitates formation of a group of similar categories into a cluster so that best performing stock can be selected to build a portfolio. Clustering combined with association rule can be used to extract hidden pattern from specified groups [5]. Initially, clustering algorithm is applied on database to form a cluster and then association rule is applied to find particular pattern of a cluster [6].

B. Association Rule (AR)

Association Rule is a mostly used data mining technique for identifying interesting patterns. Association Rules are like If-Then rules where a condition clause triggers a result clause. Association Rules are used for identifying regularities among the products in large transaction data by supermarkets [7]. AR discovers correlation and/or association relationship within data elements of large data-set.

Apriori algorithm is the most commonly used method for association rule mining which uses Large item set property. Association rules are used to find correlation and hence can be applied in finance market and in retail sector. Association rule is used in finance to identify frequent investment patterns of investors. It also assists in building portfolio, analyzing behavioral finance etc.

C. Classification

Classification is the most familiar and popular data mining technique. Classification is the process of determining set of common features and forming their models. It is a two-step process: i] Model construction-where sample is assumed to belong to a predefined class. The model is presented in the form of mathematical formula, decision tree or classification rules. ii] Model usage- Used for classifying unknown objectsbasalto2005clustering. These models are used for future prediction. Estimation and Prediction are the types of classification. Prediction can be considered as the classification of data elements into the possible set of classes. Classification is used to forecast discrete value whereas prediction is used to forecast continuous value. In finance, classification and prediction are mostly used in stock market for stock classification, market value prediction, portfolio construction etc.

D. Decision Tree

A decision tree is a predictive modeling technique used in classification, clustering and prediction. Decision tree uses Divide and conquer technique to reduce sample space into subsets. It assists in analyzing multiple variables. With the help of this technique a tree is constructed and is used for modeling classification process. There are two basic steps of this process constructing a decision tree and applying it on the target data-set. Decision trees are used in finance to explore different investment avenues depending on the requirements of an investor [8].

E. Neural Network

Artificial neural networks are the models that emulate the human pattern recognition function through multiple input structures. It consists of a neuron as a fundamental processing unit which is distributed throughout the model. The main advantage of using neural networks is its ability to learn which is accomplished by adjusting the weights on the basis of learning algorithm. Weights are the important factor that affects the output given by the model. There are two types of learning methods i.e. Supervised and Unsupervised [9]. Neural network model learn through the training data set provided to the model. Neural Network is applicable especially in the field of pattern recognition, classification and association activities. Particularly it handles the areas like financial forecasting, investment management, credit risk assessment etc. [10].

F. Time Series Analysis

Time series is a type of predictive analysis. With the help of Time Series Analysis, value of an attribute is examined over the period of time. The values are usually obtained on the basis of evenly spaced time intervals i.e. hourly, daily, weekly, monthly etc. A time-series plot is used for visualization of the attributes. Time series analysis can be applied on continuous or discrete data elements and is used for finding patterns and for future prediction. Detected patterns may include trends, cycles, seasonal or outliers. Trend chart acts as a guideline for the investors. Past trends, seasonal growth of a stock and variations in the stock price can be analyzed with the help of trend chart [11].

III. Portfolio Management

Group of financial assets like bonds, shares, stocks, debt funds, mutual funds is referred as Portfolio. Portfolio theory is stated by Harry Markowitz. Portfolio management guides the investor to select best available securities that will give expected rate of return for given degree of risk and tries to reduce the risk associated with the portfolio. Portfolio management basically involves three basic activities. i.] Decision making regarding what to buy and when to buy. What to sell and when to sell. ii.] Money management as per the preference of investors. iii.] Minimize risk and maximize returns. Portfolios are directly held by investor and/or managed by financial professionals. Investment process comprises of two tasks viz. Security analysis and Portfolio selection. Investment management or portfolio management is a complex activity which may be broken down into following steps: i] Specification of investment objectives and constraints ii] Choice of the Asset mix iii] Formulation of Portfolio strategy iv] Selection of securities v] Portfolio Execution vi] Portfolio Revision vii] Performance Evaluation. For the effective management of portfolios, data mining techniques like decision tree, association rule, clustering, neural networks, time series analysis and classification are utilized.

IV. Application of Data Mining

To extract knowledge is quite similar to create wealth and hence strategic planning is required. Large amount of data is generated by financial market which is to be analyzed to get valuable information. Nowadays several researchers are exploring how data mining techniques can be applied to finance domain. Time series data mining is recognized as one of the major challenging problems in data mining [10] which focuses on trend analysis, similarity search, classification, clustering, segmentation etc. It is easy to uncover dynamic and nonlinear relationship of financial data with the help of data mining. Following section emphasizes on various categories in which data mining is applied in portfolio management.

A. Portfolio Management using Clustering

There are number of studies in the literature that illustrates the application of various clustering methods which can be used for the problems of classification and results are compared. Chiu et al.(2009) [12] applied K-means algorithm for intelligent market segmentation. Many variations of K-means are also used in many fields. Kim et al. (2008) [13] applied GA form of k-means clustering algorithm for developing an recommender system for online shopping market. Linter and Sharpe (1965, 1967, 1970) developed Capital Asset Pricing Model (CAPM) and Equilibrium Market Model. Ballestro et al. (1996) illustrated a Compromise Programming Model for Portfolio selection. Parra, Uria et al. (2001) [14] applied fuzzy goal programming method for portfolio selection.

Basalto et al. in 2005 [15] applied a pairwise clustering method for the analysis of Dow Jones index companies for the identification of analogous temporal behavior of the price of the stock. The basic aim is to understand the underlying dynamics which rule the company's stock price. The cluster identification of companies of a given stock market index can be exploited in the portfolio optimization strategies. Shaun et al. in 1993 [16]

proposed stock market forecasting based on ANN. System was trained using 500 composite indexes of last 20 years. The system produced the forecast and adjusted itself by comparing actual results with forecasted result.

Vladimir et al. in 2006 [17] studied different characteristics of the market graph and evolution over the period of time and some interesting conclusions are drawn based on the analysis. It is observed that power law structure of the market graph is reasonably stable for the considered time intervals. So it can be stated that self-organized networks are applicable in finance. Another main finding is that edge density of the market graph and maximum clique size is increasing steadily from last few years. Also suggested the way in which financial instruments can be brought into clusters.

B. Portfolio Management using Association Rule

According to Agrawal et al. in 1993, identification of association rules is challenging data mining problem and extensive research is going on the use of association rules for handling data mining problems. Association rule algorithms are used to find relationships among the variables and hence can be applied for portfolio management.

Ting et al. in 2006 [18] studied application of sequential and non-sequential association rule mining for stock analysis. They studied two formulations i.e. inter stock pattern and intra-stock pattern mining. Three association classification methods i.e. best confidence, majority voting and maximum window size are applied for selection of suitable association rule or rules for prediction of stock price.

Shu-Hsien et al. in 2008 [19] examined investments in Taiwan stock market. They adopted two phase data mining method namely association rule and clustering. Apriori algorithm was implemented to find association of stock category and possible investments in specified stock category and later implemented k-means clustering algorithm for finding out possible investment avenues for portfolio management in Taiwan stock market.

Paranjape et al. in 2011 [20] proposed recommender system using association rule mining for stock markets. They implemented association rule mining, fuzzy association rule mining, weighted fuzzy association rule mining with time intervals which are used to predict relationships between various stocks and are used for recommendations of mutual funds for portfolio management.

C. Portfolio Management using classification

Leung et al. in 2000 [21] focused on returns on stockmarket index. On the basis of investment returns and forecast performance, he compared two models using time series comparison method. The classification models are used to predict the direction of stock market which is based on probability and include probabilistic neural network, linear discriminant analysis, probit and logit. For effective trading, set of threshold rules are offered which are driven by the classification models and are proved best for analyzing stock market to maximize the returns from trading.

David Moreno et al. in 2004 [22] applied some nonlinear techniques like k-means neighbors, COM and K-means algorithm for evaluation of Spanish mutual funds. With these methods, it is possible to find mutual funds that are misclassified on the basis of historical performances. It is concluded that approximately 40 percent and above mutual funds could be misclassified. After that alternative classification method was applied. This was based on double step methodology and obtained comparatively lower rate of misclassifications.

Francesco Pattarin in 2004 [23] proposed a classification algorithm for style analysis of mutual funds. In this different statistical methods are combined and utilizes at low cost. Different classification methods give reliable information to the fund managers and investors who wish to compare different financial products. This paper implemented a classification method which comprises of three steps i] Dimensionality reduction on the basis of principal component analysis ii]Clustering iii] Style identification.

D. Portfolio Management Using Decision Tree

In the stock market, it is quite important to buy right stock at right time which is of great interest to investor. To accomplish the objective, decision tree is the most widely used data mining technique. In this section some papers are reviewed which focus on application of decision tree for portfolio management. Lin in 2004 proposed a technique for modification of filter rule by including three decision variables allied with fundamental analysis. In this paper only past information was used for clustering and not the future information and later with the help of decision tree technique stock selection and prediction is done.

Muh-Cherng in 2006 [24] presented a stock trading method by linking decision tree and filter rule. Filter rules are used for generation of candidate trading points. These points are clustered using the application of decision tree which include future information. Taiwan and NASDAQ stock markets are used for justification of the proposed method.

Hui et al. in 2008 [25] presented a data mining method by combining decision tree, information gain and attribute oriented induction. It is used for preprocessing financial data and a decision tree model is constructed for prediction of financial distress. Depending on the one class attributes and financial ratios attributes, data mining model for financial distress prediction is designed.

Jar-Long in 2006 [26] proposed the use of two-layer bias decision tree which include technical indicators for generation of decision rule which guides investors by giving recommendations in stock market. This method facilitates purchasing accuracy. As compared to random purchase technical indicators perform better in terms of stock forecasting and improved returns on investments.

E. Portfolio Management using neural network

In this section literature regarding use of Neural Network for portfolio management is reviewed. According to the paper reviewed, the standard neural networks have the capacity to learn existing relationships between the data elements. Multilayer perceptron is the most popular neural network which uses back-propagation algorithm networks. Such type of neural network is best for classification and prediction and is widely used in finance domain.

Defu et al. in 2004 [27] considered application of multilayer back-propagation neural network in finance. A transformed neural network model is developed for forecasting and an intelligent mining system is developed. The system is developed for stock forecasting i.e. buying and selling options are predicted as per the future trends. This helps investors indecision making process.

Hadavandi et al. in 2010 [28] developed an expert system using artificial neural network and genetic fuzzy system for stock forecasting. Initially, Stepwise Regression Analysis is used to find factors affecting stock price. In the next step, data is divided in k-clusters using Self Organizing Map neural network. Later, clusters are fed to Genetic Fuzzy System model by using data base tuning and rule base extraction. It is concluded that the proposed method is best for stock price forecasting.

Kara et a. in 2010 [29] presented application of ANN and Support Vector Machine for prediction of stock price index movement direction for Istanbul Stock Exchange. In this, two models are developed and compared for prediction of stock price index movement direction on daily basis for IstanbulStock Exchange. Models are developed using ANN and SVM and concluded that ANN performs considerably better than SVM.

Mohamed Mostafa in 2010 [30] forecasted the Kuwait Stock Exchange. In this, two neural network architectures - Generalized

Regression neural network and Multilayer perceptron neural network are used for prediction of Kuwait Stock Exchanges closing price movements. He concluded that neuro computational models are most useful tools for forecasting stock exchange movements.

Chiang et al. [31] applied ANN for forecasting end of year NAV of mutual funds. For this Back-propagation, neural network is implemented. NAV of mutual fund is predicted on the basis of historical data that is present in the data base.

F. Portfolio Management using Time Series Forecasting

According to OECD Glossary of Statistical terms, time series is defined as- A time series is a set of regular time-ordered observations of a quantitative characteristics of an individual or collective phenomenon taken at successive, equidistant, periods/points of time This technique is most frequently used in portfolio management for forecasting. In past few years many researchers focused on fuzzy time series for handling forecasting problems.

Chan et al. performed analysis of daily trade data of Shanghai Stock Exchange with the help of neural network. In this two weight initialization and two learning algorithms are compared. He concluded that neural networks can model time series in better manner. The proposed model i.e. MLR weight initialization with conjugate gradient algorithm needless computation cost and learns much better than random initialization with steepest decent.

Tae HyupRoh in 2007 [56] proposed hybrid models using time series and neural network for forecasting stock price volatility on the basis of direction and deviation. He also demonstrated the application of hybrid model for forecasting market volatility. HyupRoh concluded that neural network along with time series analysis is applicable for financial forecasting.

Chi-Jie Lu et al. in 2011 [57] applied Support Vector Regression along with time series for forecasting financial data. He developed a model of financial time series with the help of SVR in which major problem was identification and removal of noise. To overcome this, two stage modeling was used i.e.Support Vector Regression and

independent Component Analysis. Experimental analysis concluded that proposed model performs significantly better than SVR.

Table 1. Data mining Techniques for Portfolio Management

Application	Clustering and Classification	Association Rule	Decision Tree	Neural Network	Time Series Mining
Stock Market Prediction and Analysis	[32],[33], [34], [28]	[35], [36], [37]	[38], [39], [40]	[41], [42], [43] [44]	[45], [46]
Mutual Funds	[47], [48], [49], [50]	[1], [51], [52]	[40]	[31], [53]	[54], [23], [55]

IV. Conclusion

In the growing economic globalization and advancement of information technology, financial data is generated and accumulated rapidly. Hence need some tools and techniques to manage and analyze the data effectively. This will facilitate individual investors and companies for planning their strategies and for decision making. Data mining finds patterns and correlations which can be used to predict future trends in finance. Advantages of using data mining in finance are low cost, revenue generation, awareness and responsiveness. This paper reviews several research works that describe application of data mining techniques in financial management from application to technical outlook. Research papers from last few years are identified which focused on data mining application in portfolio management. In this paper we considered investments in stocks and mutual funds as a part of portfolio and application wise categorization is presented. It is observed that data mining techniques are effective for handling finance data.

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ENABLING ICT FOR VOLUNTARY ORGANIZATIONS

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Abstract : As the roles and functions of voluntary organizations have significantly expanded in recent years, there is a growing concern over the need to transform the operation and structure of these organizations. ICT support in voluntary organizations is an interesting emergent field of research. The purpose of this study is to study the implementation of Information and Communication Technology (ICT) in voluntary organizations. The study was conducted in and around Pune. The objectives of the study were to study the usage and impact of ICT in voluntary organizations, to determine the issues and challenges they are facing. Pilot Study was conducted. Questionnaires were administered to various voluntary organizations and the results of this are analyzed.

Keywords: Information and Communication Technology, Voluntary Organization

I. INTRODUCTION

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3.1 Population and Sample

KSE-100 index is an index of 100 companies selected from 580 companies on the basis of sector leading and market capitalization. It represents almost 80% weight of the total market capitalization of KSE. It reflects different sector company's performance and productivity. It is the performance indicator or benchmark of all listed companies of KSE. So it can be regarded as universe of the study. Non-financial firms listed at KSE-100 Index (74 companies according to the page of KSE visited on 20.5.2015) are treated as universe of the study and the study have selected sample from these companies.

The study comprised of non-financial companies listed at KSE-100 Index and 30 actively traded companies are selected on the bases of market capitalization. And 2015 is taken as base year for KSE-100 index.

3.2 Data and Sources of Data

For this study secondary data has been collected. From the website of KSE the monthly stock prices for the sample firms are obtained from Jan 2010 to Dec 2014. And from the website of SBP the data for the macroeconomic variables are collected for the period of five years. The time series monthly data is collected on stock prices for sample firms and relative macroeconomic variables for the period of 5 years. The data collection period is ranging from January 2010 to Dec 2014. Monthly prices of KSE -100 Index is taken from yahoo finance.

3.3 Theoretical framework

Variables of the study contains dependent and independent variable. The study used pre-specified method for the selection of variables. The study used the Stock returns are as dependent variable. From the share price of the firm the Stock returns are calculated. Rate of a stock salable at stock market is known as stock price.

Systematic risk is the only independent variable for the CAPM and inflation, interest rate, oil prices and exchange rate are the independent variables for APT model.

Consumer Price Index (CPI) is used as a proxy in this study for inflation rate. CPI is a wide basic measure to compute usual variation in prices of goods and services throughout a particular time period. It is assumed that rise in inflation is inversely associated to security prices because Inflation is at last turned into nominal interest rate and change in nominal interest rates caused change in discount rate so discount rate increase due to increase in inflation rate and increase in discount rate leads to decrease the cash flow's present value (Jecheche, 2010). The purchasing power of money decreased due to inflation, and due to which the investors demand high rate of return, and the prices decreased with increase in required rate of return (Iqbal et al, 2010).

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I. RESEARCH METHODOLOGY

The methodology section outline the plan and method that how the study is conducted. This includes Universe of the study, sample of the study, Data and Sources of Data, study's variables and analytical framework. The details are as follows;

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Exchange rate is a rate at which one currency exchanged with another currency. Nominal effective exchange rate (Pak Rupee/U.S.D) is taken in this study. This is assumed that decrease in the home currency is inversely associated to share prices (Jecheche, 2010). Pan et al. (2007) studied exchange rate and its dynamic relationship with share prices in seven East Asian Countries and concluded that relationship of exchange rate and share prices varies across economies of different countries. So there may be both possibility of either exchange rate directly or inversely related with stock prices. Oil prices are positively related with share prices if oil prices increase stock prices also increase (Iqbal et al, 2012). Ataullah (2001) suggested that oil prices cause positive change in the movement of stock prices. The oil price has no significant effect on stock prices (Dash & Rishika, 2011). Six month T-bills rate is used as proxy of interest rate. As investors are very sensitive about profit and where the signals turn into red they definitely sell the shares. And this sensitivity of the investors towards profit effects the relationship of the stock prices and interest rate, so the more volatility will be there in the market if the behaviors of the investors are more sensitive. Plethora (2002) has tested interest rate sensitivity to stock market returns, and concluded an inverse relationship between interest rate and stock returns. Nguyen (2010) studies Thailand market and found that Interest rate has an inverse relationship with stock prices.

KSE-100 index is used as proxy of market risk. KSE-100 index contains top 100 firms which are selected on the bases of their market capitalization. Beta is the measure of systematic risk and has a linear relationship with return (Horn, 1993). High risk is associated with high return (Basu, 1977, Reiganum, 1981 and Gibbons, 1982). Fama and MacBeth (1973) suggested the existence of a significant linear positive relation between realized return and systematic risk as measured by β . But on the other side some empirical results showed that high risk is not associated with high return (Michailidis et al. 2006, Hanif, 2009). Mollah and Jamil (2003) suggested that risk-return relationship is nonlinear perhaps due to high volatility.

3.4 Statistical tools and econometric models

This section elaborates the proper statistical/econometric/financial models which are being used to forward the study from data towards inferences. The detail of methodology is given as follows.

3.4.1 Descriptive Statistics

Descriptive Statics has been used to find the maximum, minimum, standard deviation, mean and normally distribution of the data of all the variables of the study. Normal distribution of data shows the sensitivity of the variables towards the periodic changes and speculation. When the data is not normally distributed it means that the data is sensitive towards periodic changes and speculations which create the chances of arbitrage and the investors have the chance to earn above the normal profit. But the assumption of the APT is that there should not be arbitrage in the market and the investors can earn only normal profit. Jarque bera test is used to test the normality of data.

3.4.2 Fama-McBeth two pass regression

After the test statistics the methodology is following the next step in order to test the asset pricing models. When testing asset pricing models related to risk premium on asset to their betas, the primary question of interest is whether the beta risk of particular factor is priced. Fama and McBeth(1973)develop a two pass methodology in which the beta of each asset with respect to a factor is estimated in a first pass time series regression and estimated betas are then used in second pass cross sectional regression to estimate the risk premium of the factor. According to Blum (1968) testing two-parameter models immediately presents an unavoidable errors-in-the variables problem.It is important to note that portfolios (rather than individual assets) are used for the reason of making the analysis statistically feasible.Fama McBeth regression is used to attenuate the problem of errors-in-variables (EIV) for two parameter models (Campbell, Lo and MacKinlay, 1997).If the errors are in the β (beta)of individual security are not perfectly positively correlated, the β of portfolios can be much more precise estimates of the true β (Blum, 1968).

The study follow Fama and McBeth two pass regression to test these asset pricing models.The Durbin Watson is used to check serial correlation and measures the linear association between adjacent residuals from a regression model. If there is no serial correlation, the DW statistic will be around 2. The DW statistic will fall if there is positive serial correlation (in worst case, it will be near zero). If there is a negative correlation, the statistic will lie somewhere between 2 and 4. Usually the limit for non-serial correlation is considered to be DW is from 1.8 to 2.2. A very strong positive serial correlation is considered at DW lower than 1.5 (Richardson and smith, 1993).

According to Richardson and smith(1993) to make the model more effective and efficient the selection criteria for the shares in the period are: Shares with no missing values in the period, Shares with adjusted $R^2 < 0$ or F significant (p-value) > 0.05 of the first pass regression of the excess returns on the market risk premium are excluded. And Shares are grouped by alphabetic order into group of 30 individual securities (Roll and Ross, 1980).

3.4.2.1 Model for CAPM

In first pass the linear regression is used to estimate beta which is the systematic risk.

$$R_i - R_f = (R_m - R_f)\beta \quad (3.1)$$

Where R_i is Monthly return of thesecurity, R_f is Monthly risk free rate, R_m is Monthly return of market and β is systematic risk (market risk).

The excess returns $R_i - R_f$ of each security is estimated from a time series share prices of KSE-100 index listed shares for each period under consideration. And for the same period the market Premium $R_m - R_f$ also estimated. After that regress the excess returns $R_i - R_f$ on the market premium $R_m - R_f$ to find the beta coefficient (systematic risk).

Then a cross sectional regression or second pass regression is used on average excess returns of the shares and estimated betas.

$$\hat{R}_i = \gamma_0 + \gamma_1\beta_i + \epsilon \quad (3.2)$$

Where λ_0 = intercept, \hat{R}_i is average excess returns of security i , β_i is estimated be coefficient of security i and ϵ is error term.

3.4.2.2 Model for APT

In first pass the betas coefficients are computed by using regression.

$$R_i - R_f = \beta_{i1}f_1 + \beta_{i2}f_2 + \beta_{i3}f_3 + \beta_{i4}f_4 + \epsilon \quad (3.3)$$

Where R_i is the monthly return of stock i , R_f is risk free rate, β_i is the sensitivity of stock i with factors and ϵ is the error term.

Then a cross sectional regression or second pass regression is used on average excess returns of the shares on the factor scores.

$$\hat{R} = \gamma_0 + \gamma_1\beta_1 + \gamma_2\beta_2 + \gamma_3\beta_3 + \gamma_4\beta_4 + \epsilon_i \quad (3.4)$$

Where \hat{R} is average monthly excess return of stock i , λ = risk premium, β_1 to β_4 are the factors scores and ϵ_i is the error term.

3.4.3 Comparison of the Models

The next step of the study is to compare these competing models to evaluate that which one of these models is more supported by data. This study follows the methods used by Chen (1983), the Davidson and Mackinnon equation (1981) and the posterior odds ratio (Zellner, 1979) for comparison of these Models.

3.4.3.1 Davidson and MacKinnon Equation

CAPM is considered the particular or strictly case of APT. These two models are non-nested because by imposing a set of linear restrictions on the parameters the APT cannot be reduced to CAPM. In other words the models do not have any common variable. Davidson and MacKinnon (1981) suggested the method to compare non-nested models. The study used the Davidson and MacKinnon equation (1981) to compare CAPM and APT.

This equation is as follows;

$$R_i = \alpha R_{APT} + (1 - \alpha)R_{CAPM} + e_i \quad (3.5)$$

Where R_i = the average monthly excess returns of the stock i , R_{APT} = expected excess returns estimated by APT, R_{CAPM} = expected excess returns estimated by CAPM and α measure the effectiveness of the models. The APT is the accurate model to forecast the returns of the stocks as compare to CAPM if α is close to 1.

3.4.3.2 Posterior Odds Ratio

A standard assumption in theoretical and empirical research in finance is that relevant variables (e.g stock returns) have multivariate normal distributions (Richardson and smith, 1993). Given the assumption that the residuals of the cross-sectional regression of the CAPM and the APT satisfy the IID (Independently and identically distribution) multivariate normal assumption

(Campbell, Lo and MacKinlay, 1997), it is possible to calculate the posterior odds ratio between the two models. In general the posterior odds ratio is a more formal technique as compare to DM equation and has sounder theoretical grounds (Aggelidis and Maditinos, 2006).

The second comparison is done using posterior odd radio. The formula for posterior odds is given by Zellner (1979) in favor of model 0 over model 1.

The formula has the following form;

$$R = \left[\frac{ESS_0}{ESS_1} \right]^{N/2} N^{K_0 - K_1/2} \quad (3.6)$$

Where ESS_0 is error sum of squares of APT, ESS_1 is error sum of squares of CAPM, N is number of observations, K_0 is number of independent variables of the APT and K_1 is number of independent variables of the CAPM. As according to the ratio when;

$R > 1$ means CAPM is more strongly supported by data under consideration than APT.

$R < 1$ means APT is more strongly supported by data under consideration than CAPM.

IV. RESULTS AND DISCUSSION

4.1 Results of Descriptive Statics of Study Variables

Variable	Minimum	Maximum	Mean	Std. Deviation	Jarque-Bera test	Sig
KSE-100 Index	-0.11	0.14	0.020	0.047	5.558	0.062
Inflation	-0.01	0.02	0.007	0.008	1.345	0.510
Exchange rate	-0.07	0.04	0.003	0.013	1.517	0.467
Oil Prices	-0.24	0.11	0.041	0.060	2.474	0.290
Interest rate	-0.13	0.05	0.047	0.029	1.745	0.418

Table 4.1: Descriptive Statics

Table 4.1 displayed mean, standard deviation, maximum minimum and jarque-bera test and its p value of the macroeconomic variables of the study. The descriptive statistics indicated that the mean values of variables (index, INF, EX, OilP and INT) were 0.020, 0.007, 0.003, 0.041 and 0.047 respectively. The maximum values of the variables between the study periods were 0.14, 0.02, 0.04, 0.41, 0.11 and 0.05 for the KSE- 100 Index, inflation, exchange rate, oil prices and interest rate.

The standard deviations for each variable indicated that data were widely spread around their respective means.

Column 6 in table 4.1 shows jarque bera test which is used to check the normality of data. The hypotheses of the normal distribution are given;

H_0 : The data is normally distributed.

H_1 : The data is not normally distributed.

Table 4.1 shows that at 5 % level of confidence, the null hypothesis of normality cannot be rejected. KSE-100 index and macroeconomic variables inflation, exchange rate, oil prices and interest rate are normally distributed.

The descriptive statistics from Table 4.1 showed that the values were normally distributed about their mean and variance. This indicated that aggregate stock prices on the KSE and the macroeconomic factors, inflation rate, oil prices, exchange rate, and interest rate are all not too much sensitive to periodic changes and speculation. To interpret, this study found that an individual investor could not earn higher rate of profit from the KSE. Additionally, individual investors and corporations could not earn higher profits and interest rates from the economy and foreign companies could not earn considerably higher returns in terms of exchange rate. The investor could only earn a normal profit from KSE.

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Evolutions in CRM: Use of Technology in Strengthening Customer Relationship

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Abstract---Aim of studying analytical CRM is to depict impact of various techniques used in banks for increasing customer satisfaction and customer loyalty. Customer satisfaction is important in increasing customer loyalty and developing more business with customers. This paper mainly focuses on what are different methods used by banks for delighting customers. We also study customer's awareness about facilities provided by their bank.

Keywords---Customer Relationship Management, Customer Satisfaction, Customer Analytics

I. Introduction

Technology and Relationship Marketing are important phenomenon becomes the focal point to emerging practices and policies of Indian banking. Core Banking Solution (CBS) is first step towards use of technology for relationship marketing. All the banks have overcome the teething troubles of CBS and it has become the axis of bank's growth and performance. Most of the Banks move one step ahead by investing in technology enabled Customer Relationship Management Software. CBS generated customer information is utilized for enhancing business opportunities. Thus, CRM is logical Progression of CBS for banks. [1]

CRM, or customer relationship management, refers to the processes and techniques used to analyze the interactions between a customer and a company. The main goals of CRM are to help improve the services provided to the customer and to increase the probability that the customer will return to the company. The multiple stages that a customer goes through while considering, purchasing, evaluating and becoming a loyal follower is known as the life cycle of the customer. CRM seeks to analyze the data from the different stages of a customer life cycle with a view to improve customer oriented sales and marketing.

Analytical CRM is a subset of CRM in which data is collected by a company about their customer interactions, with the goal of increasing customer satisfaction and their customer retention rate. Analytical CRM is a behind-the-scenes process; the customer is not aware that his or her actions and interactions with the company are being captured and analyzed. Based on the information gathered about customer practices, interactions and the end results of these interactions, companies can predict customer trends and suggest products towards which the customer is most likely to gravitate

II. Literature Review

For designing research instrument and methodology, the secondary data is used. Various research papers, research articles and thesis are reviewed.

Interaction through touch points

Customer interaction is required for identifying their needs and getting feedback from them regarding services provided by Bank.

According to the Brown and Gulycz (2002), if an organization willing to make a stable relationship with its customers, there are different ways to have an interaction with them including interaction along touch points and distribution channels. The main purpose is to find out how and when the customers would like to interact with the organization (Pralhad and Ramaswamy, 2001). [1]

The interaction activities should be well customized and organized through the available touch points. The touch points provide in relation to the customers' profiles developed by data gathered from the former records of the customers.

According to Peppers and Rogers (1997) the touch points must be used for distribution of different products, services and communication with the customers. [3]

Customer Service

Customer service is more important to attract more leads in bank. Now days customers have more choices for creating account at bank. CRM programs can be designed for reactive services and Proactive services. Reactive service is where the customer has a problem (product failure, question about a bill, product return) and contacts the company to solve it.

Proactive service is a different matter; this is a situation where the manager has decided not to wait for customers to contact the firm but to rather be aggressive in establishing a dialogue with customers prior to complaining or other behaviour sparking a reactive solution. [2]

Customization

All customers are interacting with bank through different perspectives. CRM program should allow customization in categorizing customer data. Customization is termed “versioning.” [2]

Customer Delight

According to Uppal (2011) delighters include friendliness, courtesy, consideration, problem solving and personalization, which are considered as most essential elements of service quality. Courtesy can be shown through employee politeness, respect, friendliness and consideration. Prompt customer-oriented recovery management, personalization, going beyond the call of duty or out the way helps provision and customization also delight customers.

Verma (2003) emphasized that customer delight results in long-term profitability and loyalty among customers. Delighting the customers by taking the extra mile leaves a memorable impression on them, which the customer talks about from time to time by becoming profitable customers.

It is very important to understand customer’s expectation properly and deliver actual performance beyond their expectation. This will make them delighted customer.

Objectives

After reviewing literature, researcher identified that study of analytical CRM is necessary with respect to customer interaction, with the goal of increasing customer satisfaction.

Objective of this study are-

1. To study types of analytics performed in analytical CRM
2. To study impact of CRM on business development

Hypothesis

H1: Customer satisfaction rating is dependent on usage of effective CRM

III. Research Methodology

Data Set

The present study is an attempt to understand what different dimensions are analyzed through customer analytics of CRM. Customer awareness about facilities provided by their bank to them is also studied.

Study sample

The population for the present study comprises of the Private, Nationalized and Cooperative banks from Pune region. Customers of above mentioned banks from all age groups, income levels, and occupation are considered. The study comprise of data from 16 different banks and 60 customers. This study is pilot study of future research.

Data collection method

A survey method is used to collect data. A structured questionnaire is prepared and shared with concerned person in bank. The responses are collected. Random data sample of appropriate size is collected to ensure that sufficient data for all condition is obtained.

Researcher designs two questionnaire viz banker questionnaire and customer questionnaire.

- I. Banker questionnaire has following parts –
 1. Basic information of respondent
 2. CRM basics

3. Customer analytics
 4. Service analytics
 5. Effectiveness of CRM implementation
 6. Business development
- II. Customer questionnaire has following parts-
1. Personal information
 2. Bank information
 3. Services and facilities

IV. Data Analysis

Reliability of data:

For checking reliability, Cronbach’s alpha test was used. Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability.

The Cronbach’s Alpha was calculated for the both the questionnaire by using SPSS.

For Banker Questionnaire:

Reliability Statistics

Cronbach's Alpha	N of Items
.944	69

For Customer Questionnaire

Reliability Statistics

Cronbach's Alpha	N of Items
.906	47

Above table shows that Cronbach’s Alpha for banker questionnaire and customer questionnaire are 0.944 and 0.906 respectively which is greater than .5, it indicates internal consistency of both type of questionnaire. Hence it can be stated that, the research instrument used for the study is reliable.

Findings from Analysis

- More than 70% banks use CRM for Marketing and Service Desk facility
- More than 50% respondent give excellent rating to user interface of CRM packages
- Bankers are highly satisfied with CRM package as Integration with core banking solutions/ legacy systems is very smooth.
- Large volume of data storage in CRM package is also rated by all bankers.
- 56% respondent strongly agreed on CRM helps for assessing customer satisfaction levels of their performance
- 50% respondent strongly agreed that CRM sends information of products/services to customers regularly
- More than 80% banker agree on the fact that analytical CRM added value to their business growth

From the following graph it is observed that Maturity of CRM in bank is more than 5 years

*Corresponding Author: Jayashree S. Pati

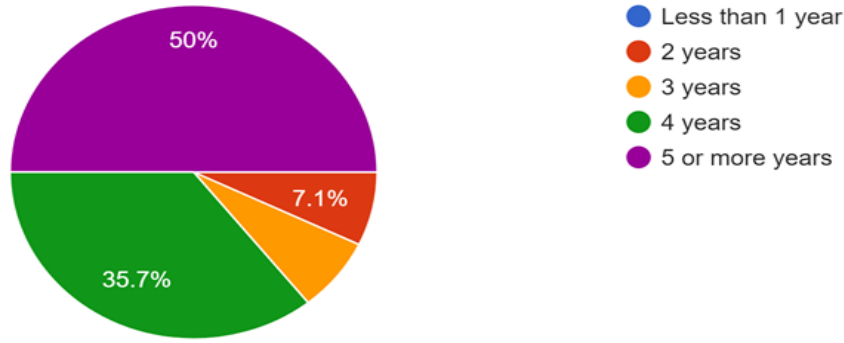


Figure 1. Maturity of CRM

Analytical CRM requires customer data for performing analysis. Various channels are used for collecting customer data. ATM, Website, mobile applications are widely used channels. Following graph describes contribution of each channel for collecting customer data.

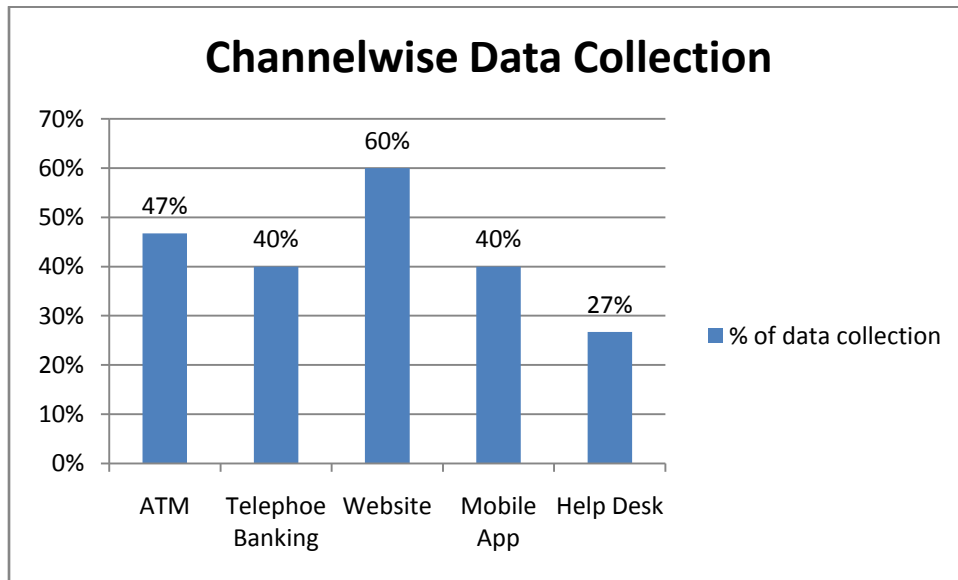


Figure 2. Channel wise data collection (source- data collected through questionnaire)

Analytical CRM performs various analytics like customer analytics, service analytics, channel analytics, etc. level of satisfaction of usefulness of such analysis is mentioned below

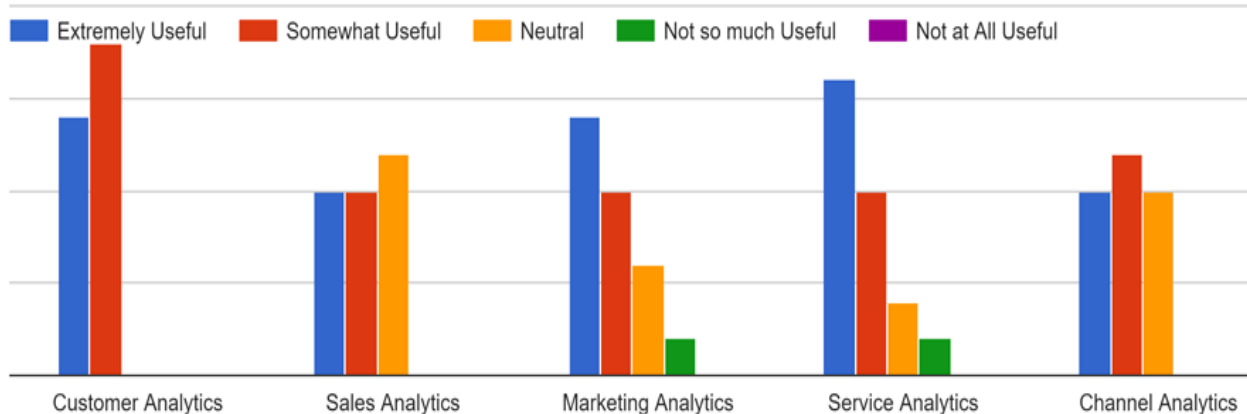


Figure 3. Types of analytics (source- data collected through questionnaire)

Various functionalities are analyzed in customer analytics for understanding customer and his behavior.

Following graph depicts different dimension of customer analytics

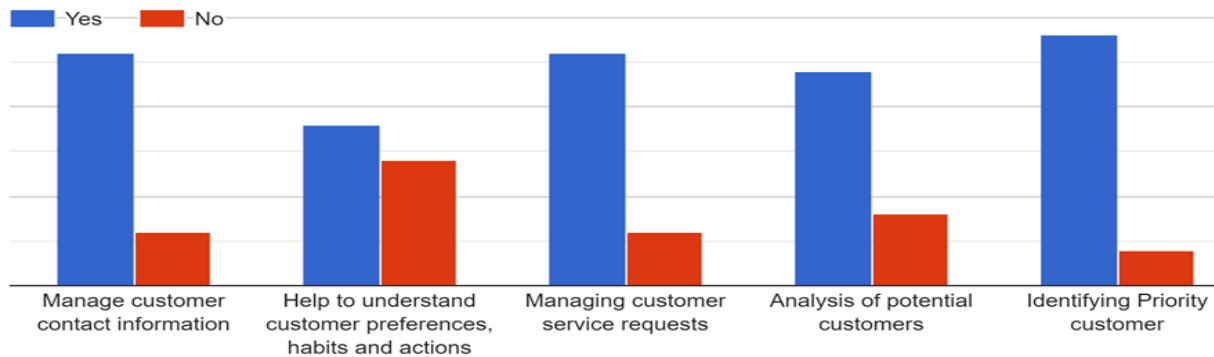


Figure 4. Functionalities addressed by Customer Analytics of CRM(Source- data collected through questionnaire)

Delighting customers is important for improving relationship with customer. Study shows that Nationalized banks are more concern about delighting customers Private Banks are focusing more on following steps are taken for most of the banks.

Table 1. Efforts for delighting customers (Source of data: Questionnaire Data)

Sr. No	Description	Private Bank	Nationalized Bank	Cooperative Bank
1	Provide Single Window service	100%	100%	80%
2	Reward loyalty of customers	100%	100%	60%
3	Offer related or complementary product	100%	87%	80%
4	Keep your customer informed about everything	80%	100%	100%
5	Taking frequent meeting with your staffs for implementing new ideas	80%	100%	100%
6	Calling customers on their special occasion/ festivals	100%	88%	100%
7	Greeting the customer and thanking him after and every transaction with the bank	60%	100%	100%

Hypothesis testing

t-Test: Paired Two Sample for Means		
	Variable 1	Variable 2
Mean	1.112444	0.707354
Variance	0.11559	0.418807
Observations	25	25
Pearson Correlation	-0.18876	
Hypothesized Mean Difference	0	
df	24	
t Stat	2.577615	
P(T<=t) one-tail	0.008259	
t Critical one-tail	1.710882	
P(T<=t) two-tail	0.016518	
t Critical two-tail	2.063899	

Customer satisfaction rating is dependent on usage of effective CRM this hypothesis is tested using paired two sample t test for means. P value obtained after performing this test is 0.0165 which is less than 0.05 hence this hypothesis is accepted

V. Conclusion

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This paper is attempted to throw light on various analytics performed in customer relationship management of banks. Customer analytics is widely used for identifying customer's requirements, their level of satisfaction and identifying different techniques for delighting customers. Further Research is required for identifying ways for retaining customer's loyalty.

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A Review of Role of Data Mining Techniques in Portfolio Management

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Abstract---Finance is the process of fund management. It includes allocation of liabilities and assets depending on time. Time value of money is the key component of finance. Features of finance include investment and profitable opportunities, optimal mix of funds, system of internal controls and future decision making. Nowadays several researchers are exploring how data mining techniques can be applied in finance domain. Different avenues for data analysis under finance domain include Portfolio Management, Risk Management, Fraud Detection, Bankruptcy prediction etc. Data mining capabilities such as automated prediction of trends, behaviors and automated discovery of previously unknown patterns help in financial data analysis. This paper reviews several research works that describe application of data mining techniques in financial management from application to technical outlook.

Index Terms---Data Mining, Stock Management, Mutual Funds, Investment Management, Portfolio Management

I. Introduction

This paper reviews application of Data Mining techniques in Finance Domain. Data Mining is a process of discovering correlations or patterns among various fields in huge relational database. Data mining techniques help to reveal hidden patterns, trends for further prediction in financial market. In this era of computer science, data mining techniques like

Association Rule, Decision Tree, Clustering, Classification, Neural Network and Time Series Analysis are very much important for quick decision making.

In finance domain like Stock market, Portfolio Management etc., massive amount of data is generated by organizations which require some techniques for data analysis. With the help of data mining tools, this dynamic and complex data can be tackled easily. Potential benefits of using data mining tools attracted various researchers and commercial market.

Nowadays several researchers are exploring how data mining techniques can be applied to finance domain. Stock market is a market that allows you to buy company share and derivative of company share at a fixed price. Whenever an investor is thinking about investing in stock market, he may come across a large pool of stocks and the very important task is to select the stocks that can earn some profit. It is not necessary that every stock in the market earn profit on the same level. Hence stock selection is a very crucial step in investment management. There is no specific method for price prediction of a company's stock. Research in the field of data mining and its associated technologies discovered improved processes for stock selection and price prediction. Organization of the paper goes like - section two deals with Data Mining and techniques of data mining. Section three deals with Portfolio Management and application of data mining techniques in portfolio management. Section five is composed of Conclusion.

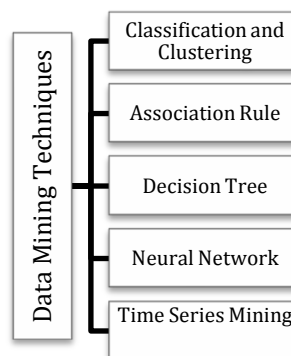


Figure 1. Data Mining Technique

II. Data mining

According to Dunham and Shridhar, Data mining is defined as finding hidden information in a database. It has been also called as exploratory data analysis, deductive learning and data driven discovery. Data mining involves various algorithms to accomplish different tasks. There are three parts of data mining algorithm viz. model, preference and search. Models are categorized as Predictive or Descriptive. A predictive model makes prediction using different data elements whereas descriptive model finds relationships or patterns in data [1]. Depending upon the knowledge which is mined, data mining techniques can be classified into following categories. Figure 1 shows Data Mining Techniques.

A. Clustering

Clustering is a technique in which groups are formed on the basis of data elements and is used to discover particular distribution and patterns of the data. Clustering provides data points on the basis of which data elements are grouped together. Similar type of data elements form a group which is also known as cluster. Clusters do not show the type of relationship between the data elements [2].

In clustering, clusters are not predefined and there is no distinction between dependent and independent variables. Clustering algorithm searches for groups and finds similarities between the data elements. User is allowed to extract the required meaning.

There are various types of clustering algorithms. The K-means algorithm is popular among all. K-means algorithm is simple, easy to understand and can be applied in different scenarios[3].

It is observed that some clustering algorithms generate too many clusters but K-means algorithm can be used to obtain a set of required clusters [4]. The K-means algorithm has been widely used in finance for asset selection and management. As compared to Fuzzy C-means clustering algorithm and Self Organized Map (SOM), K-means reduces the time required for stock selection. It facilitates formation of a group of similar categories into a cluster so that best performing stock can be selected to build a portfolio. Clustering combined with association rule can be used to extract hidden pattern from specified groups [5]. Initially, clustering algorithm is applied on database to form a cluster and then association rule is applied to find particular pattern of a cluster [6].

B. Association Rule (AR)

Association Rule is a mostly used data mining technique for identifying interesting patterns. Association Rules are like If-Then rules where a condition clause triggers a result clause. Association Rules are used for identifying regularities among the products in large transaction data by supermarkets [7]. AR discovers correlation and/or association relationship within data elements of large data-set.

Apriori algorithm is the most commonly used method for association rule mining which uses Large item set property. Association rules are used to find correlation and hence can be applied in finance market and in retail sector. Association rule is used in finance to identify frequent investment patterns of investors. It also assists in building portfolio, analyzing behavioral finance etc.

C. Classification

Classification is the most familiar and popular data mining technique. Classification is the process of determining set of common features and forming their models. It is a two-step process: i] Model construction-where sample is assumed to belong to a predefined class. The model is presented in the form of mathematical formula, decision tree or classification rules. ii] Model usage- Used for classifying unknown objectsbasalto2005clustering. These models are used for future prediction. Estimation and Prediction are the types of classification. Prediction can be considered as the classification of data elements into the possible set of classes. Classification is used to forecast discrete value whereas prediction is used to forecast continuous value. In finance, classification and prediction are mostly used in stock market for stock classification, market value prediction, portfolio construction etc.

D. Decision Tree

A decision tree is a predictive modeling technique used in classification, clustering and prediction. Decision tree uses Divide and conquer technique to reduce sample space into subsets. It assists in analyzing multiple variables. With the help of this technique a tree is constructed and is used for modeling classification process. There are two basic steps of this process constructing a decision tree and applying it on the target data-set. Decision trees are used in finance to explore different investment avenues depending on the requirements of an investor [8].

E. Neural Network

Artificial neural networks are the models that emulate the human pattern recognition function through multiple input structures. It consists of a neuron as a fundamental processing unit which is distributed throughout the model. The main advantage of using neural networks is its ability to learn which is accomplished by adjusting the weights on the basis of learning algorithm. Weights are the important factor that affects the output given by the model. There are two types of learning methods i.e. Supervised and Unsupervised [9]. Neural network model learn through the training data set provided to the model. Neural Network is applicable especially in the field of pattern recognition, classification and association activities. Particularly it handles the areas like financial forecasting, investment management, credit risk assessment etc. [10].

F. Time Series Analysis

Time series is a type of predictive analysis. With the help of Time Series Analysis, value of an attribute is examined over the period of time. The values are usually obtained on the basis of evenly spaced time intervals i.e. hourly, daily, weekly, monthly etc. A time-series plot is used for visualization of the attributes. Time series analysis can be applied on continuous or discrete data elements and is used for finding patterns and for future prediction. Detected patterns may include trends, cycles, seasonal or outliers. Trend chart acts as a guideline for the investors. Past trends, seasonal growth of a stock and variations in the stock price can be analyzed with the help of trend chart [11].

III. Portfolio Management

Group of financial assets like bonds, shares, stocks, debt funds, mutual funds is referred as Portfolio. Portfolio theory is stated by Harry Markowitz. Portfolio management guides the investor to select best available securities that will give expected rate of return for given degree of risk and tries to reduce the risk associated with the portfolio. Portfolio management basically involves three basic activities. i.] Decision making regarding what to buy and when to buy. What to sell and when to sell. ii.] Money management as per the preference of investors. iii.] Minimize risk and maximize returns. Portfolios are directly held by investor and/or managed by financial professionals. Investment process comprises of two tasks viz. Security analysis and Portfolio selection. Investment management or portfolio management is a complex activity which may be broken down into following steps: i] Specification of investment objectives and constraints ii] Choice of the Asset mix iii] Formulation of Portfolio strategy iv] Selection of securities v] Portfolio Execution vi] Portfolio Revision vii] Performance Evaluation. For the effective management of portfolios, data mining techniques like decision tree, association rule, clustering, neural networks, time series analysis and classification are utilized.

IV. Application of Data Mining

To extract knowledge is quite similar to create wealth and hence strategic planning is required. Large amount of data is generated by financial market which is to be analyzed to get valuable information. Nowadays several researchers are exploring how data mining techniques can be applied to finance domain. Time series data mining is recognized as one of the major challenging problems in data mining [10] which focuses on trend analysis, similarity search, classification, clustering, segmentation etc. It is easy to uncover dynamic and nonlinear relationship of financial data with the help of data mining. Following section emphasizes on various categories in which data mining is applied in portfolio management.

A. Portfolio Management using Clustering

There are number of studies in the literature that illustrates the application of various clustering methods which can be used for the problems of classification and results are compared. Chiu et al.(2009) [12] applied K-means algorithm for intelligent market segmentation. Many variations of K-means are also used in many fields. Kim et al. (2008) [13] applied GA form of k-means clustering algorithm for developing an recommender system for online shopping market. Linter and Sharpe (1965, 1967, 1970) developed Capital Asset Pricing Model (CAPM) and Equilibrium Market Model. Ballestro et al. (1996) illustrated a Compromise Programming Model for Portfolio selection. Parra, Uria et al. (2001) [14] applied fuzzy goal programming method for portfolio selection.

Basalto et al. in 2005 [15] applied a pairwise clustering method for the analysis of Dow Jones index companies for the identification of analogous temporal behavior of the price of the stock. The basic aim is to understand the underlying dynamics which rule the company's stock price. The cluster identification of companies of a given stock market index can be exploited in the portfolio optimization strategies. Shaun et al. in 1993 [16]

proposed stock market forecasting based on ANN. System was trained using 500 composite indexes of last 20 years. The system produced the forecast and adjusted itself by comparing actual results with forecasted result.

Vladimir et al. in 2006 [17] studied different characteristics of the market graph and evolution over the period of time and some interesting conclusions are drawn based on the analysis. It is observed that power law structure of the market graph is reasonably stable for the considered time intervals. So it can be stated that self-organized networks are applicable in finance. Another main finding is that edge density of the market graph and maximum clique size is increasing steadily from last few years. Also suggested the way in which financial instruments can be brought into clusters.

B. Portfolio Management using Association Rule

According to Agrawal et al. in 1993, identification of association rules is challenging data mining problem and extensive research is going on the use of association rules for handling data mining problems. Association rule algorithms are used to find relationships among the variables and hence can be applied for portfolio management.

Ting et al. in 2006 [18] studied application of sequential and non-sequential association rule mining for stock analysis. They studied two formulations i.e. inter stock pattern and intra-stock pattern mining. Three association classification methods i.e. best confidence, majority voting and maximum window size are applied for selection of suitable association rule or rules for prediction of stock price.

Shu-Hsien et al. in 2008 [19] examined investments in Taiwan stock market. They adopted two phase data mining method namely association rule and clustering. Apriori algorithm was implemented to find association of stock category and possible investments in specified stock category and later implemented k-means clustering algorithm for finding out possible investment avenues for portfolio management in Taiwan stock market.

Paranjape et al. in 2011 [20] proposed recommender system using association rule mining for stock markets. They implemented association rule mining, fuzzy association rule mining, weighted fuzzy association rule mining with time intervals which are used to predict relationships between various stocks and are used for recommendations of mutual funds for portfolio management.

C. Portfolio Management using classification

Leung et al. in 2000 [21] focused on returns on stockmarket index. On the basis of investment returns and forecast performance, he compared two models using time series comparison method. The classification models are used to predict the direction of stock market which is based on probability and include probabilistic neural network, linear discriminant analysis, probit and logit. For effective trading, set of threshold rules are offered which are driven by the classification models and are proved best for analyzing stock market to maximize the returns from trading.

David Moreno et al. in 2004 [22] applied some nonlinear techniques like k-means neighbors, COM and K-means algorithm for evaluation of Spanish mutual funds. With these methods, it is possible to find mutual funds that are misclassified on the basis of historical performances. It is concluded that approximately 40 percent and above mutual funds could be misclassified. After that alternative classification method was applied. This was based on double step methodology and obtained comparatively lower rate of misclassifications.

Francesco Pattarin in 2004 [23] proposed a classification algorithm for style analysis of mutual funds. In this different statistical methods are combined and utilizes at low cost. Different classification methods give reliable information to the fund managers and investors who wish to compare different financial products. This paper implemented a classification method which comprises of three steps i] Dimensionality reduction on the basis of principal component analysis ii]Clustering iii] Style identification.

D. Portfolio Management Using Decision Tree

In the stock market, it is quite important to buy right stock at right time which is of great interest to investor. To accomplish the objective, decision tree is the most widely used data mining technique. In this section some papers are reviewed which focus on application of decision tree for portfolio management. Lin in 2004 proposed a technique for modification of filter rule by including three decision variables allied with fundamental analysis. In this paper only past information was used for clustering and not the future information and later with the help of decision tree technique stock selection and prediction is done.

Muh-Cherng in 2006 [24] presented a stock trading method by linking decision tree and filter rule. Filter rules are used for generation of candidate trading points. These points are clustered using the application of decision tree which include future information. Taiwan and NASDAQ stock markets are used for justification of the proposed method.

Hui et al. in 2008 [25] presented a data mining method by combining decision tree, information gain and attribute oriented induction. It is used for preprocessing financial data and a decision tree model is constructed for prediction of financial distress. Depending on the one class attributes and financial ratios attributes, data mining model for financial distress prediction is designed.

Jar-Long in 2006 [26] proposed the use of two-layer bias decision tree which include technical indicators for generation of decision rule which guides investors by giving recommendations in stock market. This method facilitates purchasing accuracy. As compared to random purchase technical indicators perform better in terms of stock forecasting and improved returns on investments.

E. Portfolio Management using neural network

In this section literature regarding use of Neural Network for portfolio management is reviewed. According to the paper reviewed, the standard neural networks have the capacity to learn existing relationships between the data elements. Multilayer perceptron is the most popular neural network which uses back-propagation algorithm networks. Such type of neural network is best for classification and prediction and is widely used in finance domain.

Defu et al. in 2004 [27] considered application of multilayer back-propagation neural network in finance. A transformed neural network model is developed for forecasting and an intelligent mining system is developed. The system is developed for stock forecasting i.e. buying and selling options are predicted as per the future trends. This helps investors indecision making process.

Hadavandi et al. in 2010 [28] developed an expert system using artificial neural network and genetic fuzzy system for stock forecasting. Initially, Stepwise Regression Analysis is used to find factors affecting stock price. In the next step, data is divided in k-clusters using Self Organizing Map neural network. Later, clusters are fed to Genetic Fuzzy System model by using data base tuning and rule base extraction. It is concluded that the proposed method is best for stock price forecasting.

Kara et al. in 2010 [29] presented application of ANN and Support Vector Machine for prediction of stock price index movement direction for Istanbul Stock Exchange. In this, two models are developed and compared for prediction of stock price index movement direction on daily basis for Istanbul Stock Exchange. Models are developed using ANN and SVM and concluded that ANN performs considerably better than SVM.

Mohamed Mostafa in 2010 [30] forecasted the Kuwait Stock Exchange. In this, two neural network architectures - Generalized

Regression neural network and Multilayer perceptron neural network are used for prediction of Kuwait Stock Exchanges closing price movements. He concluded that neuro computational models are most useful tools for forecasting stock exchange movements.

Chiang et al. [31] applied ANN for forecasting end of year NAV of mutual funds. For this Back-propagation, neural network is implemented. NAV of mutual fund is predicted on the basis of historical data that is present in the data base.

F. Portfolio Management using Time Series Forecasting

According to OECD Glossary of Statistical terms, time series is defined as- A time series is a set of regular time-ordered observations of a quantitative characteristics of an individual or collective phenomenon taken at successive, equidistant, periods/points of time This technique is most frequently used in portfolio management for forecasting. In past few years many researchers focused on fuzzy time series for handling forecasting problems.

Chan et al. performed analysis of daily trade data of Shanghai Stock Exchange with the help of neural network. In this two weight initialization and two learning algorithms are compared. He concluded that neural networks can model time series in better manner. The proposed model i.e. MLR weight initialization with conjugate gradient algorithm needless computation cost and learns much better than random initialization with steepest decent.

Tae HyupRoh in 2007 [56] proposed hybrid models using time series and neural network for forecasting stock price volatility on the basis of direction and deviation. He also demonstrated the application of hybrid model for forecasting market volatility. HyupRoh concluded that neural network along with time series analysis is applicable for financial forecasting.

Chi-Jie Lu et al. in 2011 [57] applied Support Vector Regression along with time series for forecasting financial data. He developed a model of financial time series with the help of SVR in which major problem was identification and removal of noise. To overcome this, two stage modeling was used i.e. Support Vector Regression and

independent Component Analysis. Experimental analysis concluded that proposed model performs significantly better than SVR.

Table 1. Data mining Techniques for Portfolio Management

Application	Clustering and Classification	Association Rule	Decision Tree	Neural Network	Time Series Mining
Stock Market Prediction and Analysis	[32],[33], [34], [28]	[35], [36], [37]	[38], [39], [40]	[41], [42], [43] [44]	[45], [46]
Mutual Funds	[47], [48], [49], [50]	[1], [51], [52]	[40]	[31], [53]	[54], [23], [55]

IV. Conclusion

In the growing economic globalization and advancement of information technology, financial data is generated and accumulated rapidly. Hence need some tools and techniques to manage and analyze the data effectively. This will facilitate individual investors and companies for planning their strategies and for decision making. Data mining finds patterns and correlations which can be used to predict future trends in finance. Advantages of using data mining in finance are low cost, revenue generation, awareness and responsiveness. This paper reviews several research works that describe application of data mining techniques in financial management from application to technical outlook. Research papers from last few years are identified which focused on data mining application in portfolio management. In this paper we considered investments in stocks and mutual funds as a part of portfolio and application wise categorization is presented. It is observed that data mining techniques are effective for handling finance data.

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Impact of Investment Management on Individual Investor: An Empirical Study

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Abstract---Diversified financial sector has provided wide range of opportunities to individual investors. Investor can select any combination of financial instruments for wealth generation. The individual's decision of investment is dependent on the kind of services rendered and the benefits offered in the financial market and every decision-making process has either an opinion or an action. This paper aims to study the investment patterns of individual investors considering the objective of the investment, composition of portfolio, risk bearing capacity, the market knowledge they possess, demographic characteristics, attitude etc. To perform this literature review research papers, journal articles, white papers on behavior of individual investor from various countries are studied. Research papers are analyzed thoroughly in order to present excellent conceptual framework. This study proposes that the perception of an individual investor could be a great help to the financial consultants, fund managers and asset management agencies.

Index Terms---Investment management, Investment decision, Individual investors, Behavioral Pattern, Risk bearing capacity

I. Introduction

Investments in financial sector are specifically important for an individual investor and fund management organizations. As financial market is volatile, investors are more cautious about their investments. Wide ranges of opportunities are to invest in the t in financial market. The objective and investment pattern of investment differs from investor to investor on the basis of the requirements. There are several factors that attract and motivate investors to invest in financial market. Researchers are concentrating on the behavioral patterns and factors affecting individual investor.

Decisions of individual investors was supposed to be based on the Modern Portfolio Theory proposed by Markowitz in 1952. There are three basic measures of modern portfolio theory i.e. Standard deviation, Expected return and correlation. However, it was proved that individual investor possesses very few stocks and are incapable to diversify their portfolio because of lack of knowledge. An individual's risk-taking capacity also plays an important role in financial decision-making process to achieve desired financial goals. To understand the individual investor's behavior factors like objective of the investment, composition of portfolio, risk bearing capacity, the market knowledge, demographic characteristics and attitude need to be considered [1].

Investment Management is the art of managing available funds effectively. Effective fund management helps to grow the money and helps in wealth management. Investment management is done through portfolio management. Investment portfolio is composed of investment instruments such as fixed deposits, recurring deposits, bonds, shares, mutual funds etc. To gain required growth in the investment, portfolio diversification is important [2]. In every investment has some incurred risk. Diversification helps in minimizing the risk associated with investment [3].



Figure 1. Objectives of Portfolio Management

Financial independence is accomplished through effective investment management. Use of investment management for women empowerment is also very important and needed task in the current era.

II. Objective of the Study

Present study focuses on the study is to find the effect of investment management on individual investor. As compared to male investors women are having less inclination towards investment in financial instruments. Hence it is important encourage women to invest in financial market and grow the capital. The objective of the study is to find aspects that affect on individual investors decision about investments. Fig. (2) indicates that investment management is majorly managed by male. Women are less involved in the investments. There is a need to

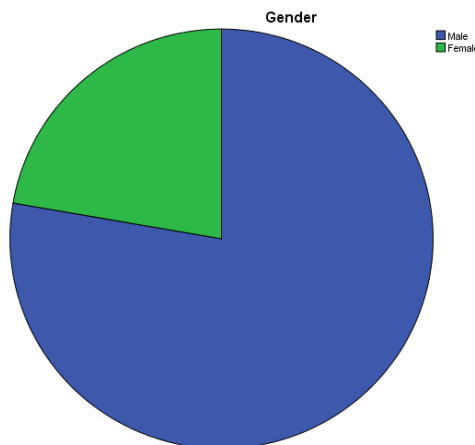


Figure 2. Ratio of Male and female investors

III. Literature Survey

Currently many researchers are exploring the factors affecting individual investor’s investment decision making process in financial market. It is observed that there is a dynamic relationship between behavior of individual investor, stock price fluctuation, trading volume and returns gained. It is also observed that up to certain extent region-wise cultural difference is there in investment patterns. A review of the literature clearly states that individual investor’s behavioral pattern is the most important features in investment management.

As a part of literature survey, researcher considered research papers from different countries concentrating on behavior and factors influencing individual investment decision making process. Some of them are –financial advisor has to analyze the risk tolerance level of their clients. It is quite important parameter while taking the decision related to investment management. Nguyen et. al. (2016), in the research article The influence of financial risk tolerance on investment decision-making in a financial advice context, researcher examined the impact of belief in financial advice service, literacy related to finance and relation length along with service. For the study, data of 538 Australian investors was taken into consideration. Researcher observed that there is a positive association in between investment decision making and investors risk tolerance level. Researcher also observed that there is no positive relation in between literacy related to finance and individual investor’s risk tolerance level [4].

Forecasting of the direction of the stock price is a vital task in financial domain. Even minor improvements in the prediction make a great effect on profit earned from investments. Michel Ballings et. al. (2015) in the article entitled Evaluating multiple classifiers for stock price direction prediction studied random forest, kernel factory, support vector machine, neural networks, k-nearest neighbor and logistic regression for prediction of direction of stock price. Researchers collected data from 5767 companies listed publically from Europe and used AUC as a measure of performance. They observed that random forest is the better performer for stock prediction as compared to all others [5].

S. Lodhi (2014) in the paper entitled Factors influencing individual investor behavior: An empirical study of city Karachi investigated individual investor behavior of Karachi, Pakistan. She observed that there were five independent variables - financial literacy, high experience, use of accounting information, importance of analyzing financial statements and age are the factors that affect on the investor’s decision-making process. She also observed that accounting information and risk aversion are directly related to each other [6].

Tomolael at (2013) in the research paper Factors influencing investment decisions in capital market: A study of individual investors in Nigeria, studied the factors affecting decisions of individual investments and also studied the relation of the socio-economic characteristics of the Nigerian capital market. Data of 297 investors were used for the study. Statistical techniques like independent t-test, post hoc test and ANOVA were used for the data analysis. They found the factors like performance of the fund sponsoring company, expected split of the

stock, probable corporate earnings, dividend policies of the company are more important for the decision making. They also found that socio-economic factors like age, education, gender, marital status significantly affect the decision making about the investments from Nigeria [7].

According to Ebrahim (2012), in the paper entitled An empirical analysis of financial risk tolerance and demographic features of individual investors}, Financial risk tolerance is the level of risk that one is ready to take. Risk tolerance should be measured for investment decision making. Author studied effect of demographic features on portfolio construction, investment decision making and risk tolerance level. Demographic features like age, gender, occupation, marital status, time horizon, income, size of portfolio are taken into consideration. As per the study, there is a variation financial risk tolerance level in accordance to demographic characteristics. Association of these attributes is used to predict risk tolerance level of individual [8].

IV. Research Methodology

The methodology comprises of data, source of data, geographical area of the study. Sample size and framework used for data analysis. The study is based on primary and secondary data. Primary data is generated from 220 individual investors with the help of questionnaire from Pune city, Maharashtra, India. The sources of secondary data are research articles, books, websites and reports. The sample size of 220 respondents is used for analyzing the data. Simple random sampling technique is used for data generation.

V. Analysis of Investment Pattern

Investors attitude towards investment instruments like shares, bonds and mutual funds is studied. Monthly saving pattern, risk bearing capacity of the individual investor is also studied. Investors belonging to different income group, monthly saving pattern are considered for the study.

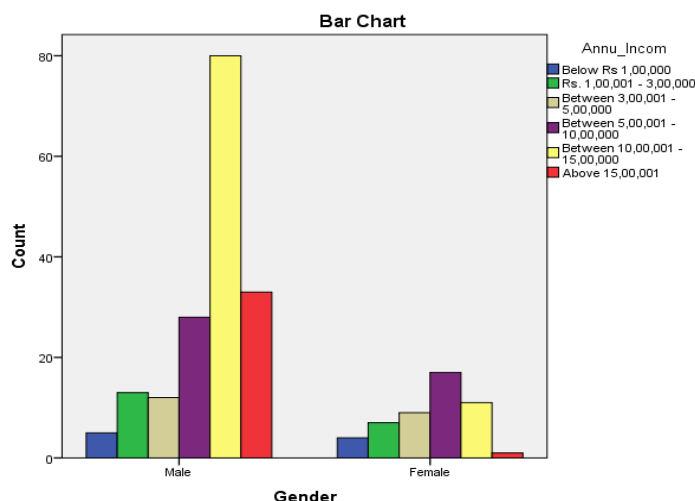


Figure 3. Annual Income of Investors

In the category of annual income up to 10,00,000 around 36% male investors earn more than female investors. And in the higher income category 90% male investors earn more as compared to female investors.

Annual income of the investor has great impact on monthly saving. Table below shows the statistics of gender wise monthly savings. Male investors who are earning better are preferring the investments in financial market.

Table 1. Gender wise Monthly saving

Gender * Monthly Savings Cross tabulation

Count		Monthly Savings					Total
		0%	Between 0 - 10%	Between 10 - 25%	Between 25 - 50%	Over 50%	
Gender	Male	1	71	83	13	3	171
	Female	5	19	19	4	2	49
	Total	6	90	102	17	5	220

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From Table (1) it can be observed that 3% investors are not at all saving anything. 41% investors are saving up to 10% of their annual income. 46% investors are ready to save in between 10-25% of the annual income. 8% investors are saving in between 25-50% and only 2% of the investors are saving above 50% of their annual income.

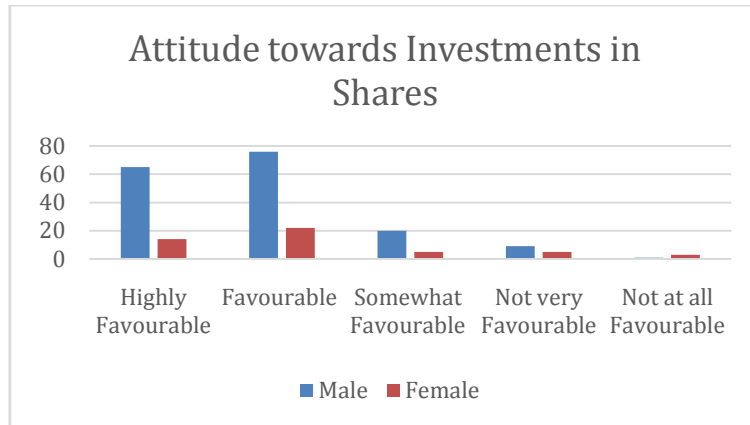


Figure 4. Investors attitude towards investment in Shares

Fig. (4) shows the attitude of investors towards investments in shares. Gender wise there is a significant difference in the attitude. Out of 220 investors 161 male investors are keenly interested in investing in shares whereas only 41 women investors are ready to invest in shares.

Fig. (5) shows the attitude of the investor in bonds. 151 male investors out of 220 are interested in investing in bonds and only 47 female investors are ready to invest in bonds.

Fig. (6) indicates the attitude of investors in mutual funds. 160 male investors are ready to invest in mutual funds. On the other hand, only 47 female investors are interested in mutual fund investments.

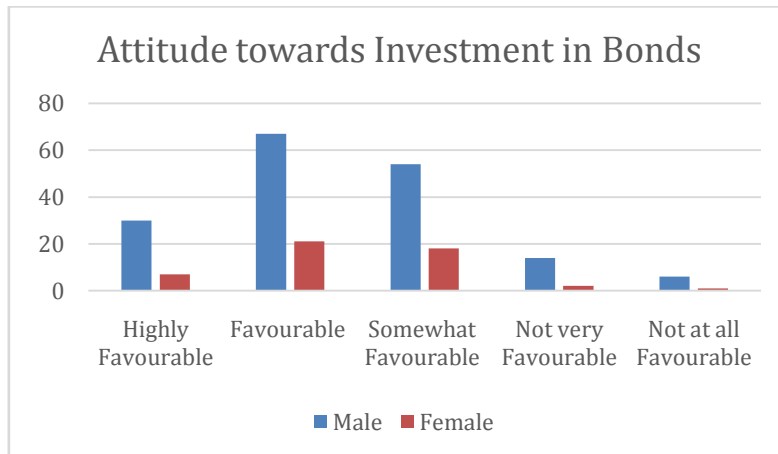


Figure 5. Investors attitude towards investment in Bonds

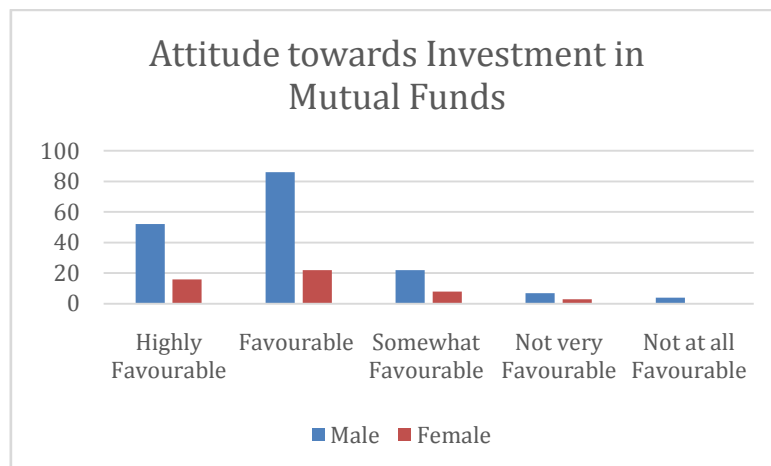


Figure 6. Investors attitude towards investment in Mutual Funds

Table 2. Risk-taking capacity of Individual Investor

Gender * Risk Level Crosstabulation
Count

		Risk Level			Total
		Will Not increase risk at all	Take little more risk with some money	Take little more risk with all money	
Gender	Male	25	133	13	171
	Female	8	36	5	49
Total		33	169	18	220

Table(1) shows gender wise risk-taking capacity of individual investors. From the table it can be seen that 15% of the male investors are ready to take no risk. 78% male investors are ready to take little risk with some money and only 8% male investors are ready to take little more risk with all money.

On a contrary 16% female investors are ready to take no risk. 73% female investors are ready to take risk with some money they are having and 10% female investors can bear more risk with all money they are having.

It shows that men and women investors are having different attitude towards risk incurred in investments.

VI. Conclusion

Diversified financial service sector has given wide range of opportunities to individual investors. The individual’s decision of investment is prejudiced by the kind of services rendered and the benefits offered in the financial market. Financial knowledge and experience have an impact in financial investment decision making process.

The present study focuses on investment pattern of individual investors of Pune city by considering the factors like annual income, monthly savings, attitude towards investment in shares, mutual funds and bonds and risk-taking ability of the investor. This will help to choose the composition of the portfolio. From the data, it can be observed that male investors are more inclined towards any of the investment. 36% male investors earn more than female investors having income up to 10 lakhs and 90% male investors fall in the category of higher income group. Considering the attitude towards investment in shares, bonds and mutual funds male investors are more inclined towards these instruments. Less annual income of women has direct impact on monthly savings. Lack of knowledge refrain women investor to invest in the financial instruments. Also, the risk-taking ability of male investor is more than female investor. Around 93% male investors are ready to take little or more risk with some money they are having. On the other hand, 82% female investors are ready to take some risk with the funds they are having.

Hence there is need to educate women regarding investment avenues. Women can analyze the financial market well and can perform better if given little freedom and confidence. There is a need to create awareness among women investor to increase the involvement of women.

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Study of Traits of Individual Investors to Determine their Investment Pattern

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Abstract—In modern economics, bulk of research has been built on views of individual investors who attempt to maximize their wealth by minimizing the risk. Factors such as financial market situations, performance of the fund sponsoring companies, fund related qualities are majorly affecting on the investment decisions. Investors belonging to different age groups, gender, qualification, occupations, income group, communities, and risk tolerance level from Pune city is collected and used for the study. Form the experimental analysis using correlation and regression, knowledge and monthly saving are negatively correlated with correlation -0.276 . Education and monthly saving are positively correlated with correlation 0.411 . Annual income and monthly savings are positively correlated. There is a correlation in between Withdrawal plan and Annual Income. Investors from 5-10 lack income group are ready to hold their investments for the period of 3 to 5 years showing their conservative nature.

Index Terms—Individual investors, Investment decision, Risk bearing capacity, Behavioral Finance

I. Introduction

In modern economics, bulk of research has been built on views of individual investors who attempt to maximize their wealth by minimizing the risk. These investors keenly assess the risk and return on investment options to select the composition of the portfolio as per their risk bearing capacity. Models based on these conventions have powerful insight of how market works. For ex. CAPM (Capital Asset-Pricing Model) is a model that determines the relation between systematic risk and expected return on investments. Grossman-Stiglitz model is a canonical rational expectations model used for financial markets. This model focuses on managing the risk. Risk averse informed traders use this model for anticipation of the risk associated with their investment portfolio. Kyle studies the behaviour of a risk-neutral single informed trader. Strategic behaviour of informed trader is focused by managing and observing the price impact [1]. Investors manage their funds in variety of ways. Individual investors demographic, personal, psychological characteristics affect upon the investment decision making process.

The present study focuses on how investors investment is affected by the knowledge of the various investment avenues, knowledge of risk and return on investment, knowledge about the fund sponsoring company's performance, portfolio composition and portfolio managements techniques. Till date, researcher can find very little work on impact of knowledge, risk bearing capacity, market trends, accounting information, government policies on individual investors decision making process. The present study aims to examine the impact of these factors on individual investors decision making process through pragmatic research of the investors from the Pune city.

The primary objective of any investment is to gain some good return on investment. According to the risk bearing capacity, individual investors can be broadly classified as Conservative, Balanced or Aggressive. Time horizon of the investment is also an important aspect while taking the decision about the investment. Short term investments are quite risky than long term investments. Equity funds and investments in real estate are found popular among the investors. As per the current trend of the investors 60% investors fall into Conservative, 20% into Balanced and 20% into aggressive category as shown in Fig. (1) below.

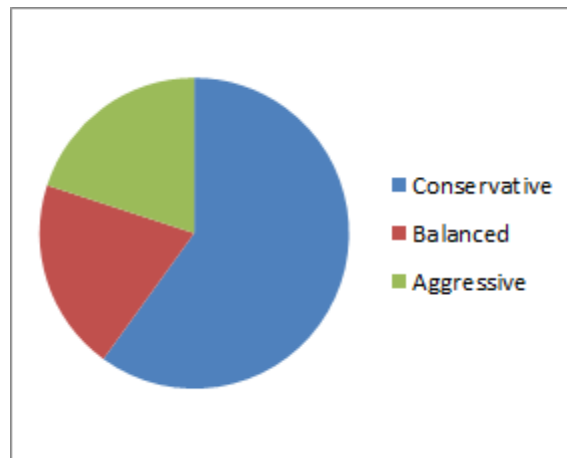


Figure 1. Individual Investor's Category

A. Scope of the Study

As of now, not much text is available on the behavior of the investors in Pune city. Factors such as financial market situations, performance of the fund sponsoring companies, fund related qualities are majorly affecting on the investment decisions. The present work will provide the data about the investor's investment decision making process from different income slabs, age groups, community, educational level, gender and many more along with their preferences of investments and risk bearing capacity.

B. Objective of the study

The objective of the present study is -

- i] To determine the influence of knowledge on individual investors decision making process.
- ii] To analyse the influence of accounting information on investors decision making process.
- iii] To study the impact of knowledge on risk bearing capacity of the investors.

The organization of the paper goes like - Section-II indicated the literature survey, Section - III deals with experimental analysis, and Section - IV comprises of conclusion.

II. Literature survey

As a part of literature survey, researcher studied many research papers focusing the behaviour of individual investors, factors influencing investment decision making process. Some of them are -

Hoffmann et al (2015) worked on understanding the investors' perceptions and risk taking behaviour. They used the data of investors from Netherlands. They combined monthly survey data with matching brokerage records to show the change in individual investors perception drive the trading process and decision of risk. They concluded that investors with higher levels and upward revisions are actively involved in trading and getting higher benefits. Also, the risk tolerance level is observed as high [2].

Tomolael at (2013) studied the factors affecting decisions of individual investments and studied the relation of the socio-economic characteristics of the Nigerian capital market. Data of 297 investors were used for the study. Statistical techniques like independent t-test, post hoc test and ANOVA were used for the data analysis. They found the factors like performance of the fund sponsoring company, expected split of the stock, probable corporate earnings, dividend policies of the company are more important for the decision making. They also found that socio-economic factors like age, education, gender, marital status significantly affect the decision making about the investments from Nigeria [3].

Kartasova et al (2013) studied the investment patterns of investors from Lithuania stock market. Through questionnaire data is collected from the investors. He observed that women are overconfident than men. Investors with required knowledge are found good or even very good investors. Level of confidence depends on experience and knowledge. Kartasova also observed that investors from age group 30 - 45 and beginners are opting most risky investments. Also married take less risk as compared to single. He concluded that individual investors decision making depends on some personal characteristics like age, gender, profession and experience [4].

Hoffmann et al (2013) examined change in individual investors perception and risk bearing capacity during financial crisis. They observed that individual investors' perceptions vacillate majorly during the financial crisis.

Throughout the worst months of the financial crisis, expectations on return on investment and risk tolerance level get decreased whereas risk perception gets increased. They concluded that even in the situation of financial crises individual investors actively participate in trading process and can also ready to take little risk during the financial crisis [5].

As per Manhot et al(2012) markets are moving from static to dynamic there by changing the level of risk. As risk is increased, additional amount is at stake. They explored the relationship between risk level and demographic characteristics from Rajasthan state. They observed that based on the capacity to handle risk, investment avenues get changed like mutual funds, bonds, shares, gold, real estate etc. They concluded that there is negative correlation between Gender, Marital status, Age, Occupation and Education and there is positive correlation between Income level, Cities and Knowledge [6].

Anna et al (2004) studied the economic factors that are affecting individual investors behavior from Greek Stock Exchange. The analysis is done on the data collected from Athens Stock Exchange (ASE) and observed that the knowledgeable and experienced investors are more adaptive to the financial situations. Also observed that there is some correlation between the factors of behavioral finance theory and individual investors behavioral pattern [7].

III. Experimental Analysis

For the purpose of experimental analysis primary data of individual investors is generated through questionnaire consisting questions on personal information, time horizon, portfolio composition, factors influencing individual investments, level of satisfaction, knowledge and risk tolerance. Data of 90 investors belonging to different age groups, gender, qualification, occupations, income group, communities, and risk tolerance level from Pune city of Maharashtra state from India is collected and is used for the study.

A. Research Hypothesis

Researcher tried to check if there exist any association in between the attributes such as education, knowledge of investment, annual income and monthly savings of the investor. Following hypothesis are stated and verified.

1. H0: There is no correlation in between Knowledge and Monthly saving.
H1: There is a correlation in between Knowledge and Monthly saving.
2. H0: There is no correlation in between Education and Monthly savings.
H1: There is a correlation in between Education and Monthly savings.
3. H0: There is a correlation in between Annual income and Monthly saving.
H1: There is no correlation in between Annual income and Monthly saving.
4. H0: There is no correlation in between Withdrawal plan and Annual income.
H1: There is a correlation in between Withdrawal plan and Annual income.
5. H0: There is no correlation in between Knowledge and Scheme's portfolio of investments.
H1: There is a correlation in between Knowledge and Scheme's portfolio of investments.

SPSS i.e. Statistical Package for Social Science is used for the data analysis. Statistical techniques such as correlation, regression is used to find the association between the variables. Correlation technique helps to identify whether there exist any relation in between the variables or attributes. Regression helps to identify the degree of association between the variables or attributes.

B. Hypothesis Testing

Hypothesis 1:

- H0: There is no correlation in between Knowledge and Monthly saving.
H1: There is a correlation in between Knowledge and Monthly saving.

Correlations

		Knowledge	Month_Savng
Knowledge	Pearson Correlation	1	-.276**
	Sig. (1-tailed)		.004
	N	90	90
Month_Savng	Pearson Correlation	-.276**	1
	Sig. (1-tailed)	.004	
	N	90	90

** . Correlation is significant at the 0.01 level (1-tailed).

Figure 2. Correlation between Knowledge and Monthly Saving

Correlation -0.276 proves that Knowledge and Monthly savings have negative correlation. As significance value 0.004 is less than 0.05, hence we reject the Null Hypothesis there by accepting the alternative hypothesis. We can conclude that there is a negative correlation in between knowledge and Monthly saving.

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.746	.209		13.166	.000
	Month_Savng	-.197	.073	-.276	-2.694	.008

a. Dependent Variable: Knowledge

Figure 3. Regression of Knowledge and Monthly Saving

The Regression equation is –

$$Y = 2.746 - 0.197X \tag{1}$$

Where Y= Monthly Saving and X= Knowledge.

Hypothesis 2:

H0: There is no correlation in between Education and Monthly savings.

H1: There is a correlation in between Education and Monthly savings.

Correlations

		Education	Month_Savng
Education	Pearson Correlation	1	.411**
	Sig. (1-tailed)		.000
	N	90	90
Month_Savng	Pearson Correlation	.411**	1
	Sig. (1-tailed)	.000	
	N	90	90

** . Correlation is significant at the 0.01 level (1-tailed).

Figure 4. Correlation between Education and Monthly Saving

From the result we can observe that there is a positive correlation 0.411 in between Education and Monthly saving. We found that Post-graduate investors are saving 10-25% of their annual income. Hence, we reject the Null hypothesis that there is no correlation in between Education and Monthly saving.

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.628	.228		7.152	.000
	Month_Savng	.338	.080	.411	4.231	.000

a. Dependent Variable: Education

Figure 5. Regression of Education and Monthly Saving

The regression equation is

$$Y = 1.628 + 0.338X \tag{2}$$

Where Y = Monthly Saving and X = Education.

Hypothesis 3:

H0: There is a correlation in between Annual income and Monthly saving.

H1: There is no correlation in between Annual income and Monthly saving.

Correlations

		Annu_Incom	Month_Savng
Annu_Incom	Pearson Correlation	1	.259**
	Sig. (1-tailed)		.007
	N	90	90
Month_Savng	Pearson Correlation	.259**	1
	Sig. (1-tailed)	.007	
	N	90	90

** . Correlation is significant at the 0.01 level (1-tailed).

Figure 6. Correlation between Annual Income and Monthly Saving.

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.623	.449		5.837	.000
	Month_Savng	.397	.158	.259	2.517	.014

a. Dependent Variable: Annu_Incom

Figure 7. Regression of Annual Income and Monthly Saving

Correlation 0.259 indicates that there is positive correlation in between Annual income and Monthly savings. Significance value 0.07 is greater than 0.05 hence we accept the Null Hypothesis and reject the alternative hypothesis. We can observe that investors from income group 5 to 10 lacks are monthly saving up to 10%. Regression equation is as below-

$$Y = 2.623 + 0.397X \tag{3}$$

Where Y = Monthly Saving and X = Annual Income.

Hypothesis 4:

H0: There is no correlation in between Withdrawal plan and Annual income.

H1: There is a correlation in between Withdrawal plan and Annual income.

Correlations

		Withdraw_Plan	Annu_Incom
Withdraw_Plan	Pearson Correlation	1	.347**
	Sig. (1-tailed)		.000
	N	90	90
Annu_Incom	Pearson Correlation	.347**	1
	Sig. (1-tailed)	.000	
	N	90	90

** . Correlation is significant at the 0.01 level (1-tailed).

Figure 8. Correlation of Withdrawal Plan and Annual Income

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.569	.285		5.504	.000
	Annu_Incom	.252	.072	.347	3.475	.001

a. Dependent Variable: Withdraw_Plan

Figure 9. Regression of Withdrawal Plan and Annual Income

From the correlation coefficient $p=0.347$ we can observe that there is a positive correlation in between withdrawal plan and Annual Income. As significant value is less than 0.05, we Reject the Null Hypothesis and we Accept the Alternative Hypothesis that There is a correlation in between Withdrawal plan and Annual Income. 28% investors fall in to 5-10 lack Income group out of which 12% investors are ready to hold their investments for the period of 3 to 5 years. It shows that the investors are somewhat in conservative nature. Most of the investors are not ready to hold their investments more than 5 years. Some factors like financial market situations, performance of the fund sponsoring companies, fund related qualities are majorly affecting on the investment decisions. The Regression equation is -

$$Y = 1.569 + 0.252X \tag{4}$$

Where Y = Withdrawal Plan and X = Annual Income.

Hypothesis 5:

H0: There is no correlation in between Knowledge and Scheme's portfolio of investments.

H1: There is a correlation in between Knowledge and Scheme's portfolio of investments.

Correlations

		Knowledge	Fund_Rel_Quality_D
Knowledge	Pearson Correlation	1	.273**
	Sig. (1-tailed)		.005
	N	90	90
Fund_Rel_Quality_D	Pearson Correlation	.273**	1
	Sig. (1-tailed)	.005	
	N	90	90

** . Correlation is significant at the 0.01 level (1-tailed).

Figure 10. Correlation of Withdrawal Plan and Scheme's Portfolio of Investment

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.774	.176		10.069	.000
	Fund_Rel_Quality_D	.227	.085	.273	2.664	.009

a. Dependent Variable: Knowledge

Figure 11. Regression of Withdrawal Plan and Scheme’s Portfolio of Investment

Correlation coefficient 0.273 indicates that there is a positive correlation in between Knowledge and Scheme's portfolio of investment. As significant value is less than 0.05, we Reject the Null Hypothesis and we Accept the Alternative Hypothesis that There is a correlation in between Knowledge and Scheme's portfolio of investment. The Regression equation is –

$$Y = 1.774 + 0.227X \tag{5}$$

IV. Conclusion

Individual investors investment decisions are prejudiced or impacted by some factors. Factors such as financial market situations, performance of the fund sponsoring companies, fund related qualities are majorly affecting on the investment decisions. These investors keenly assess the risk and return on investment options to select the composition of the portfolio as per their risk bearing capacity. If we study the current trend of the investors then we can observe that 60% investors fall into Conservative , 20% into Balanced and 20% into aggressive category. The objective of the research is to identify the impact of knowledge and accounting information on individual investors decision making process. Risk bearing capacity of the investors is also studied.

For the experimental analysis primary data of individual investors is generated through questionnaire. Data of 90 investors belonging to different age groups, gender, qualification, occupations, income group, communities, and risk tolerance level from Pune city is collected and used for the study.

To identify the traits of the investors related to their investment patterns, we implemented statistical techniques viz. Correlation and Regression. Using correlation, we attempted to identify the impact and kind of association in between the factors like education, annual income, monthly saving, knowledge and some fund related qualities. Form the experimental analysis knowledge and monthly saving are negatively correlated with correlation -0.276. Education and monthly saving are positively correlated with correlation 0.411. There is a correlation in between Withdrawal plan and Annual Income. 28% investors fall in to 5-10 lack Income group. Out of which 12% investors are ready to hold their investments for the period of 3 to 5 years. It shows that the investors are somewhat conservative in nature.

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Designing of Digits Recognition Technique Using Neural Network

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Abstract—Handwriting Digit Recognition (HDR) has been research widely and there are many associated work in pattern recognition. Different commercial software’s are also available in the Market. The major focus is on the improvements in the accuracy levels. In this paper, we have investigated different HDR systems and their implementation for digits in English. Lastly we have experimented digit recognition through artificial neural network using supervised deep learning.

Index Terms—Handwriting Digit Recognition, Image processing, Neural Network, MNIST

I. Introduction

In Handwritten Digit Recognition, the digits written are initially converted into machine readable format. Then observation, segmentation and classification methods are applied through different pattern recognition algorithms. Broadly, there are online and offline recognition types. [1]. In offline recognition, handwritten digits are converted into image and then to codes which are the inputs for different recognition applications. In this paper we are focusing on offline digit recognition only. The major challenge in offline digit recognition are different shapes, variations in symbol drawing, inclinations, different styles of writing. [2]

In handwritten digit recognition system, the major task is to identify the digit from differentiating it using features and extracting. For this process of locating different regions many sampling methods are used. [3]. Due to this exact feature extraction is focused more for higher performance of HDR. It has wide range of application use towards automatic identification of postal codes, bank cheques and license plates etc.

In his paper we have an investigated some digit identification with respect to digit classification and recognition systems from existing databases. A standard process of handwriting digit recognition is depicted in the following figure.

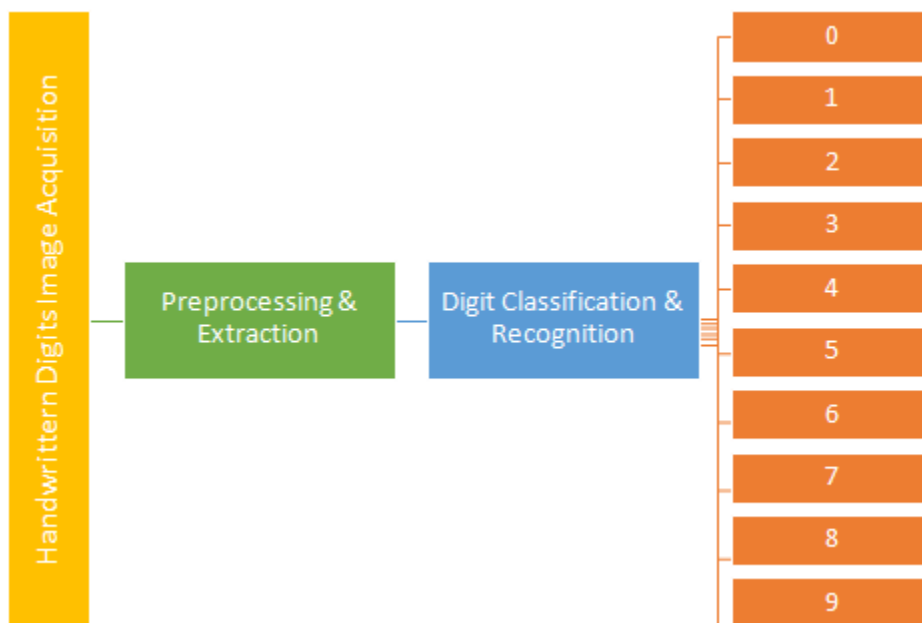


Figure 1. Handwritten Digit Recognition Process

II. Handwriting Digit Recognition (HDR)

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Handwriting digit recognition was very difficult problem due to variation in different size, height, width and angle. In these cases, Artificial neural network is extremely useful for the process of classification of the digits. Classification is categorized into:

1. Learning through Supervised: In this process, initially machine learns different tasks which we can associate with from an input to output through pairs [8]. We also consider association from training set for learning with some data [9] For this type of learning there is one single correlated association from an input to expected output. This algorithm different associated mapping with unlearn examples and create required optimal results from unlearn model or data. [10]
2. Learning through Unsupervised: In this type of learning. Machine tries to study the given sample data which may not be labeled or classified but tries to categories it. Unsupervised learning learns different common factors from data and try to learn new object with similar piece of information from it. Sometimes reinforcement can also be used for this association [11]

Some Machine Learning Techniques used for HDR are as follows:

1. Multilayer Perceptron MLP – This is feed forward ANN. It consists of minimum 3 layers. But for input node it uses non-linear activation function. MLP utilizes a supervised learning technique called back propagation for training. [4]. MLP can differentiate between multi layers and non-linear activation. [5]
2. Support-vector machine – SVM analyzes the data using supervised learning models. In SVM the classification as well as analysis from regression is carried out. It can be used with two models, first one is non-probabilistic model. In this model binary linear classifier is used. The second is statistical probabilistic based. In this model, all the examples are shown using different examples likes dots in plane which can be mapped. These mapped points can be divided as separable for differentiation. We keep on adding another examples to this mapping and try to predict the category for new set of data for the same into previous mapping [6]

III. Experimental Results

We have used the MNIST database. This database is subset of NIST database. In this sample, 784 (28*28) pixel gray-scale images are used. Total dataset of 70K images are separated into set of 42k for training and of 28k for testing as well as validation. We have used MNIST dataset for this experiment.

We have initially created neural network for training the dataset of 42k samples. Then we have used test dataset of 28k for performance, validation and accuracy. The preprocess dataset image of 28*28 pixels saved loaded into the model. The network architecture was tuned with 250 hidden neurons for the best results.

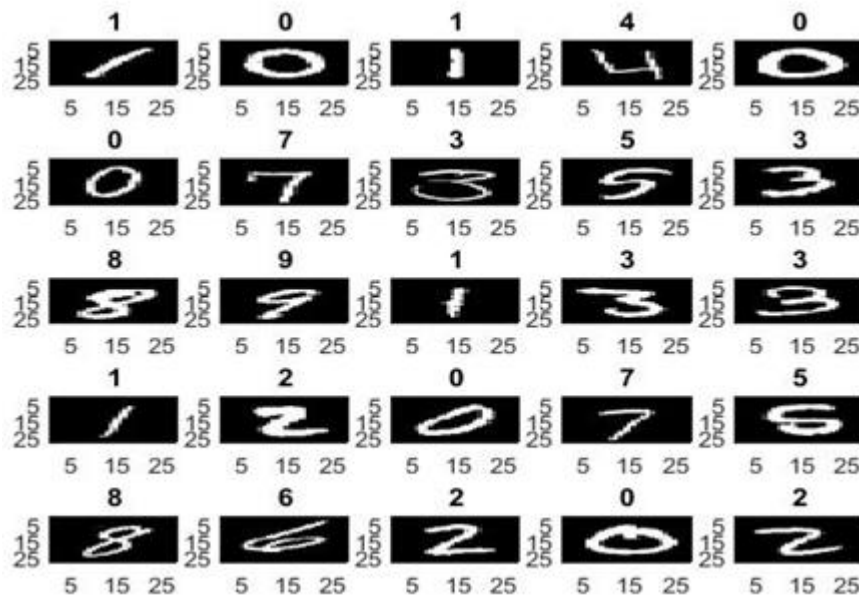


Figure 2. A Sample of Handwritten Digit Recognition

In the below figure, as the number of hidden neurons increases accuracy increase accordingly. Initially there is high increase in accuracy from 0 to 50 hidden neurons. After increase in 50 neurons to 100 moderate accuracy increases. From 150 neurons to 250 there is continuous increase in accuracy. At 250 neurons we were able to

achieve 96% (approximately) accuracy. After 250 neurons again accuracy decreases slightly. Hence, 250 neurons are considering optimum result with said accuracy.

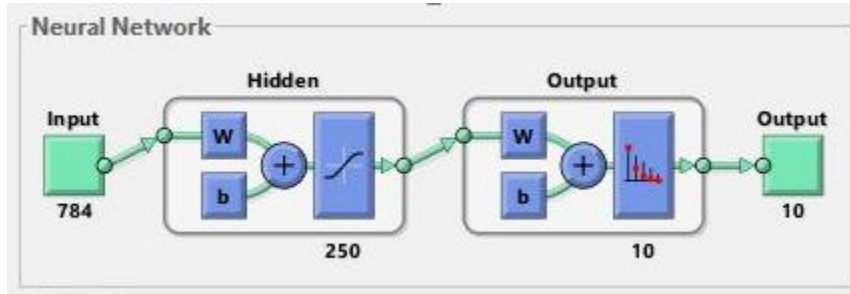


Figure 3. A Neural Network for Handwritten Digit Recognition

In the below figure, as the number of hidden neurons increases accuracy increase accordingly. Initially there is high increase in accuracy from 0 to 50 hidden neurons. After increase in 50 neurons to 100 moderate accuracy increases. From 150 neurons to 250 there is continuous increase in accuracy. At 250 neurons we were able to achieve 96% (approximately) accuracy. After 250 neurons again accuracy decreases slightly. Hence, 250 neurons are considering optimum result with said accuracy.

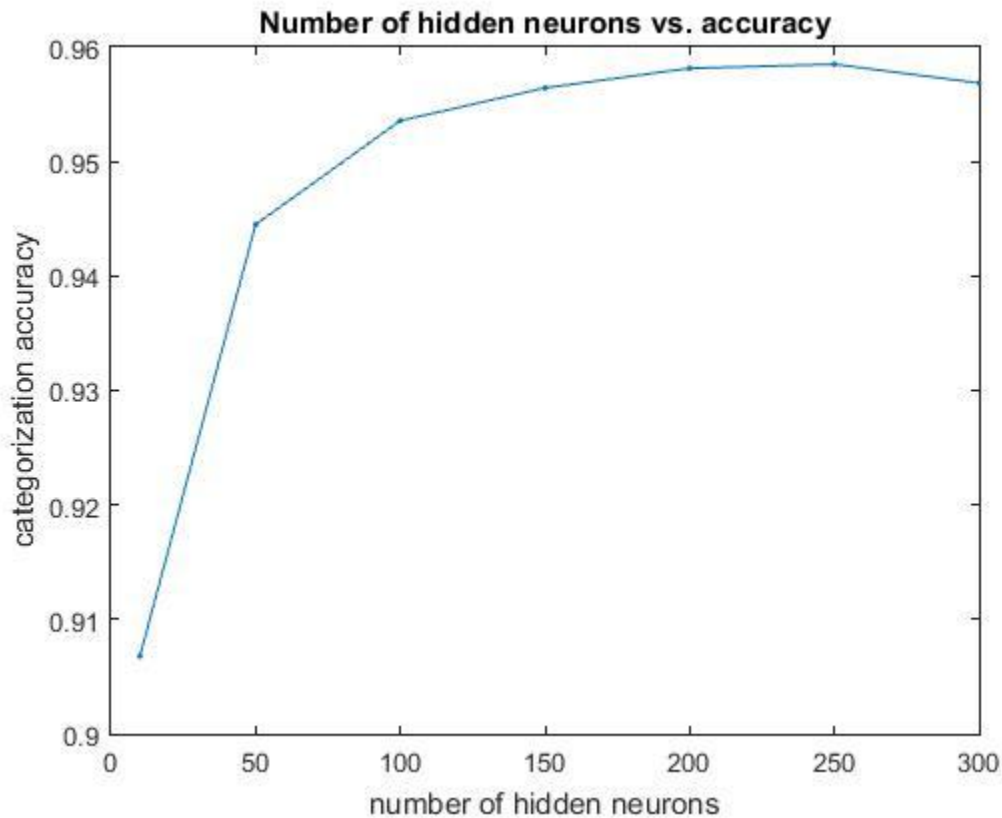


Figure 4. Result Graph: Number of hidden neurons Vs. Accuracy

IV. Conclusion

Handwritten digit recognition is important part of pattern recognition. The HDR is challenging because of different writing styles and forms. Some of the different methods like supervise and unsupervised learning are discussed. Also, few technologies like SVM and MLP were introduced. We have performed experiment using NN and experimental details are shared. Using our Neural network with supervised learning we were able to achieve good accuracy of 96%.

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Comparative Study of Fog, Cloud and Edge Computing

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Abstract---We can say that Fog Computing can be a simplification of the MEC paradigm, as a result of it spreads the Cloud toward the network edge, dispensing resources and services anyplace on the Cloud-to-Things time, in topological proximity to the top devices requiring them. Therefore, the foremost distinction is that the Fog perceives the possibility to possess a hierarchy of Fog nodes which can probably span from the top devices, to the sting, through the core, and up to the Cloud. The general service/application is additionally then decomposed and deployed in elements at intervals such a hierarchy. Each node at intervals the hierarchy will play its role, and this primarily depends on its position/layer at intervals this pyramid-like organization

Keywords---Cloud Computing, Fog Computing, Edge Computing, Internet of Things (IoT)

I. Introduction

The world of information technology is one wherever grandiose sounding names usually mask simply however straightforward the underlying technologies actually are. As Moore's Law created computing costs drop exponentially over time, we tend to entered the age of decentralized computing wherever everyone had a computer (or because it was referred to as, a workstation) that would do small-medium sized tasks. These workstations used a local-area-network (LAN) to attach to mini-mainframes referred to as servers that may do the work. Then came the age of ecommerce and that we captive on to putting together large server farms referred to as information centers. From there we tend to determined that the approach forward was to create ginormous information centers and begin vocation them "the cloud". We tend to then determined that everything has to "talk to the cloud" as a result of that's what the Internet of Things (IoT) is about. IoT suggests that everything talks to the cloud and every one that huge information we tend to accumulate makes society additional economical than ever. One downside that we tend to suddenly met therewith set up was an absence of information measure.

Solving the information measure drawback that we're encountering with "the cloud" is remarkably simple. we tend to merely produce one thing called "fog computing" and insert it between "the cloud" and every one our "IoT devices" as shown if fig.1. "Fog computing" is just moving a number of the computing power nearer to the devices in order that "the cloud" doesn't should be consulted for each very little minor detail. several smaller time-sensitive process selections is created by associate negotiator device that then aggregates all the information it learns and sends that up to the cloud. It's quite like redistributed computing everywhere once more. During this case but, we're pertaining to the devices placed in "the fog"

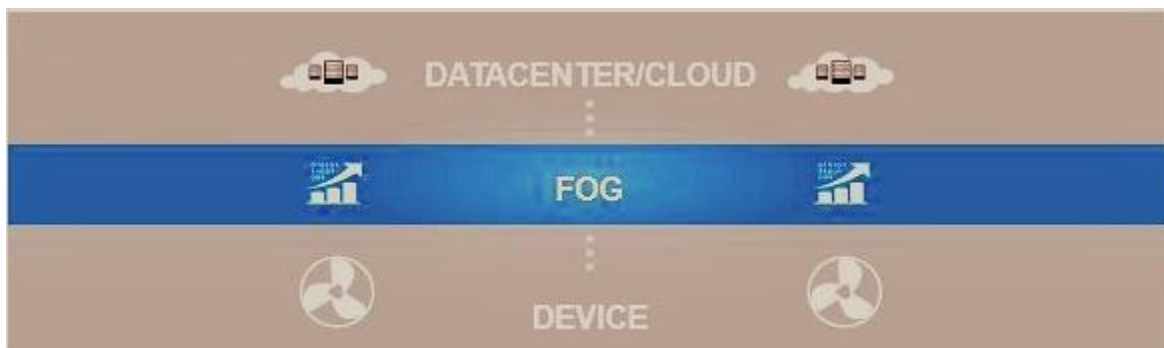


Figure 1. Fog Computing

Edge computing is computing that's done at or near the source of the data, instead of relying on the cloud at one of a dozen data centers to do all the work. It doesn't mean the cloud will disappear. It means the cloud is coming to you.

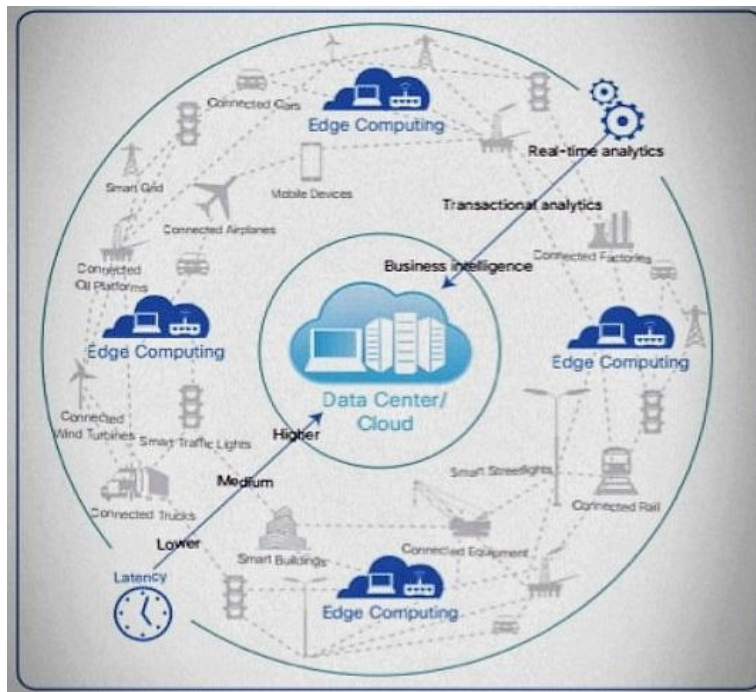


Figure 2. Edge Computing

“The cloud” in the middle and then put all the IoT devices on the “edge of the circle”. The computers that bond all these devices to the cloud are referred to as either “edge computing”

Organizations that rely heavily on information are more and more seemingly to use cloud, fog, and edge computing infrastructures. These architectures enable organizations to require advantage of a variety of computing and information storage resources, together with the Industrial Internet of Things (IIoT). Cloud, fog and edge computing might seem similar, however they're totally different layers of the IIoT. Edge computing for the IIoT permits process to be performed domestically at multiple call points for the aim of reducing network traffic. WinSystems’ expertise in industrial embedded computer systems will leverage the facility of the IIoT to alter the successful style of high-performing industrial applications.

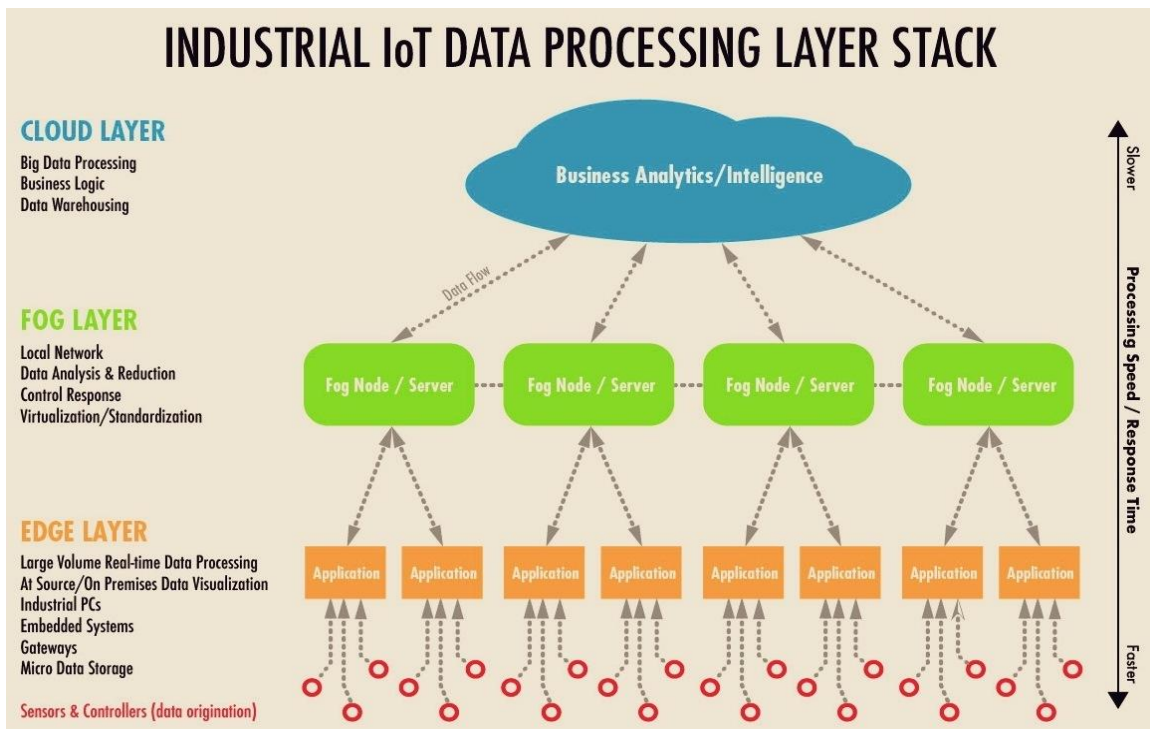


Figure 3. Industrial IoT Data Processing Layer Stack

II. Cloud Computing

During the past few years, the IT world witnessed the birth and growth of a new paradigm, commonly called Cloud Computing, although it has also been named as Dynamic Computing [1]. It is difficult to assign a precise date for its genesis, since the term “cloud” has already been used in several contexts, describing large ATM networks in the 1990s for instance [2], and is also based upon some already existing technologies like distributed computing, virtualization or utility computing which have been around for several years [3]. However, some [4] claim that the true birth of Cloud Computing happened when IBM and Google announced a partnership in this domain [5], leading to a hype around the subject and lots of popularity.

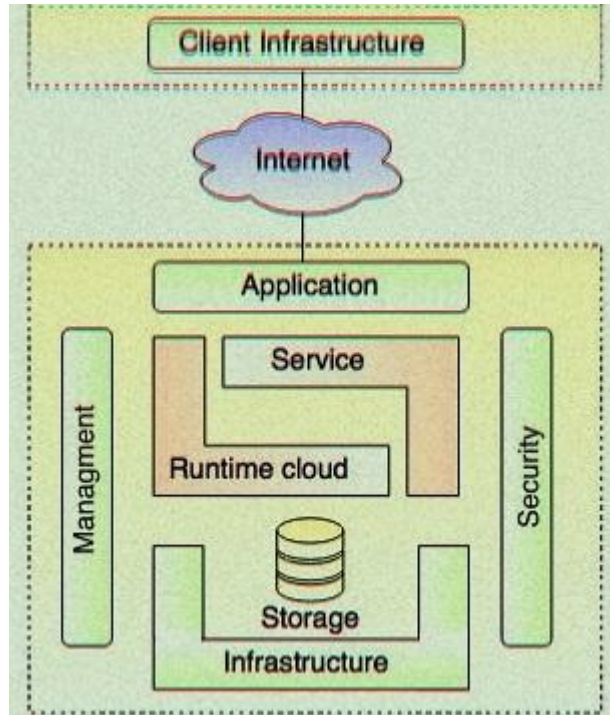


Figure 4. Industrial IoT Data Processing Layer Stack

Advantages of Cloud for IoT

Since attached devices have restricted storage capability and process power, the mixing with cloud computing involves assistance:

- **Improved Performance:** The communication between IoT sensors and processing systems is quicker.
- **Storage Capacities:** extremely scalable and unlimited space for storing is able to integrate mixture and share the big quantity of data.
- **Process Capabilities:** Remote knowledge centers give unlimited virtual process capabilities on-demand.
- **Reduced Costs:** license fees are not up to the value of the on-premise instrumentality and its continuous maintenance.

Disadvantages of Cloud for IoT

Unfortunately, there's nothing perfect, and cloud technology has some shortcomings, particularly for the Internet of Things services.

- **High Latency:** Additional IoT apps need terribly low latency, however cloud can't guarantee it due to the gap between shopper devices and processing centers.
- **Time Period:** Technical problems and interruptions in networks might occur for any reason in any Internet-based system and build customers suffer from an outage; several firms use multiple connection channels with machine-controlled failover to avoid issues.

- **Security and Privacy:** Your non-public data is moved through globally connected channels aboard thousands of gigabytes of different users information, no surprise that the system is vulnerable to cyber-attacks or knowledge loss; the matter is partly solved with the assistance of hybrid or non-public clouds.

III. Fog Computing Versus Edge Computing

Data produced from IoT devices is processed at three locations: cloud, network, or device itself. As mentioned higher than, if information is processed within the cloud, it'll take lots of your time to induce analyzed. So, it's better to method it either on the network or within the device.

Both the technologies bring intelligence and information to analytics platforms set near the supply of information generation, like speakers, motors, screens, sensors, etc. The aim of those technologies is to cut back latency problems, whereas betting on the cloud to investigate information and build faster data-driven choices.

The fundamental objective of the Internet of Things (IoT) is to get and analyze information from assets that were antecedently disconnected from most processing tools.

This information is generated by physical assets or things deployed at the terribly fringe of the network like motors, lightweight bulbs, generators, pumps, and relays that perform specific tasks to support a business method. The Internet of Things is regarding connecting these unconnected devices (things) and causing their information to the cloud or web to be analyzed.

In traditional IoT cloud design, all information from physical assets or things is transported to the cloud for storage and advanced analysis. Once within the cloud, the info is employed for psychological feature prognostics (that is, prophetic maintenance, rhetorical failure analysis and method optimization).

Fog and edge computing in industrial and automation applications are network and system architectures that try to collect, analyze, and process data from these assets additional expeditiously than ancient cloud architecture. These architectures share similar objectives:

- To decrease the amount of data sent to the cloud
- To lower the network and Internet latency
- To enhance the system response time in isolated mission-critical applications.

However, there's a key distinction between the two concepts. Each fog computing and edge computing involve pushing intelligence and process capabilities down nearer to wherever the data originates at the network edge. The key distinction between the two architectures is strictly wherever that intelligence and computing power is placed.

- **Fog computing** impulses intelligence right down to the local area network (LAN) level of specification, process information in a very fog node or IoT entrance.

- **Edge computing** pushes the intelligence, process power and communication abilities of a footing entrance or appliance directly into devices like PACs (programmable automation controllers).

In each architectures information is generated from the identical supply physical assets like pumps, motors, relays, sensors, and so on. These devices perform a task within the physical world like pumping water, switch electrical circuits, or sensing the globe around them. These are the "things" that create the Internet of Things.

Fog computing

In fog computing, moving data from things to the cloud consist of many steps.

1. Initially all the electrical signals from things are conventionally bound to the I/O points of an automation controller. The automation controller executes an impression program to change the things.
2. In step 2, the information from the system program is distributed to associate OPC server or protocol entrance that converts the information into a protocol internet systems perceive, like MQTT or HTTP.
3. Then the data is distributed to a distinct system, sort of a fog node or IoT entrance on the computer network that collects the data and performs higher-level process and analysis. This methodology filters, analyzes, processes, and can even store the information for transmission to the cloud or WAN at a later date.

So fog computing involves several layers of quality and data conversion. Its design depends on several links during a communication chain to maneuver data from the physical world of our assets into the digital world of data technology. During a fog computing architecture, every link within the communication chain could be a potential purpose of failure.

Edge computing

Edge computing make simpler this communication chain and decreases potential points of failure. In edge computing, physical assets like pumps, motors, and generators are yet again physically wired into a sway system where the committee automates them by executing an aboard program. Intelligent PACs with edge computing capabilities collect analyze, and technique info from the physical assets they're connected to the identical time they're running the program.

PACs then use edge computing capabilities to work out what knowledge should be keep regionally or sent to the cloud for plenty of analysis. In edge computing, intelligence is simply regarding pushed to the network edge, wherever our physical assets or things are initial connected on and wherever IoT data originates.

Edge computing saves time and value by streamlining IoT communication, reducing system and verbal description quality, and decreasing the number of potential failure points in an IoT application. Reducing system vogue quality is crucial to the success of IoT applications.

Advantages of edge computing and fog computing

- **Real-Time Data Analysis:** Since, the information is processed at the supply of data generation; it may be analyzed in real-time or close to real-time.
- **Less Costs:** These technologies lesser the costs as firms would like less data bandwidth management solutions for native devices, as compared to the cloud or information center.
- **Lower Bandwidth Consumption:** companies wouldn't need high information measure to handle information, as a result of process can happen at the edge itself.
- **Lesser Latency Levels:** this is often the most advantage of edge computing and fog computing. They lower the latency compared to a faraway cloud or information center by eliminating the time concerned in causation information back and forth.

IV. Applications of Edge & Fog Computing

• Oil And Gas Industry

Edge computing holds a key role within the oil and gas trade. many IoT devices are deployed to observe temperature, humidity, pressure, moisture and lots of different factors. the information generated from these devices provides insights regarding the health of the systems. Analyzing and process the information in real-time facilitate the trade to stop many incidents.

• Intelligent Transportation and Traffic Management

IoT technology is obtaining used to effectively manage traffic and transportation. Since, the traffic data is gathered exploitation sensors and cameras, it should be acted upon in real-time, and otherwise it will be of no use. Edge computing processes immense amounts of data on the traffic hardware itself, whereas reducing operational and storage costs.

• Self-Driving Vehicles

Although, the self-driving vehicles haven't become the norm, however edge computing is also a necessary technology for them. It'll be insufferable for such vehicles to work, while not analyzing information in real-time. Driverless vehicles host artificial intelligence and IoT applications at the sting, therefore latency levels between data generated and accustomed run vehicle is extremely low.

Applications of Fog Computing

• Smart Cities

There are lots of challenges for giant cities, like public safety, holdup, high energy usage, municipal services, etc. Fog computing will facilitate in addressing these challenges by deploying a network of fog nodes, forming one IoT network. Several cities are failing to rework into good ones, due to broadband information measure and property problems. Deployment of fog nodes will optimize the bandwidth, whereas providing native storage and process.

• Smart Buildings

To make massive buildings smarter, thousands of sensors are needed for scheming many parameters like identity card readers, temperature, occupancy of parking lot, etc. Fog computing are often applied in such buildings for independent operations. The sensible buildings can have fog nodes on every floor to observe the tasks, management lights and alternative electrical appliances, etc. it'll additionally give calculate and storage arrangement to enhance talents of mobile devices.

For example, a sensing element can generate knowledge once it senses smoke, so method it to fog nodes in period for additional actions.

- **Visual security**

For security tenacities, cameras are fitted all over publically places like parking lots, shopping malls, restaurants, etc. the data from these cameras would like high storage and information measure to hold it to the cloud. Also, it can't be analyzed in period. By applying a fog computing coming up with, the video process for sensitive police work systems may be divided between fog nodes. This may alter period following and detection of incongruities or the other such activities.

V. Conclusion

Fog computing mentions to the collection and processing of select IoT data within an IoT gateway or other sensor data gathering point. This is most typically done for automatic higher cognitive process, dominant devices, acting analytics, streaming to regulate applications, or preprocessing knowledge before promoting or streaming the foremost necessary knowledge to the cloud for extra process or archive. This approach is most applicable in industrial and industrial applications like factories, distribution centers, process plants, automotive, malls, and also the like. the most goals of this approach is to modify further efficiencies in automation, value savings, operations, performance, and in some cases to extend knowledge security.

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Statistical Analysis to Compare RSA and AES128 Algorithms for PIN type Message Transactions

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Abstract---The internet is the fundamental part of our lives. Many customers use the online banking and ATM transactions in their day to day life, for shopping, bill payments, reservations, fund transfer etc. for secure transaction. Majority of people supposed to manage their bank account from anywhere at any time is continuously increasing; this requirement of safe and secure transactions are of at most important. This paper focus on consistent public cryptographic analysis algorithms like RSA and AES128 method of encryption and decryption process and their performances is compared for the secure data transfer through network communication via. Internet. The paper also includes the comparative results and graphical representation of RSA and AES128 algorithm for PIN type message by using statistical analysis tool t-test.

Keywords---Online banking, PIN type message, RSA and AES algorithm, Cryptography.

I. Introduction

Cryptography is the strength for the security systems. The main challenge in use of the Cryptosystems is maintaining the confidentiality of the cryptographic key. A Cryptosystem uses the symmetric and asymmetric key algorithms to accomplish the encryption and decryption process. It improves the security of the data and overcomes the problems of key management and key confidentiality. [1].As enhancement of technology in communication and internet the financial firm, e-commerce firm, banks, etc. are suffering from frauds that are being incurred while using these services daily.[2]The ATM and online banking transactions performed by card and provide the security through PIN. For the execution of such type of e-banking system where money is transferred through an exchange of electronic signals between financial bases. Cryptographic techniques are being increasingly used to protect information by ensuring Confidentiality, Integrity and Authenticity over and done with RSA and AES algorithm. The cryptographic keys cannot be remembered because these are large in size and are random. Therefore usually the cryptographic keys are stored in highly secure location with password or personal identification number (PIN) based authentication. Using PIN or password as a safety measure for securing the cryptographic key is not a safe approach as they can be easily extracted or guessed by heuristic (rule based) attack, dictionary attack, brute force attack etc. To overcome the difficulties of securing the cryptographic keys, RSA and AES algorithms can be used with various parameters such as time, energy, attack defended; send received bytes etc. to provide network security while online banking and ATM transactions.

II. Method and Performance Evaluation of RSA And AES Algorithm

The Rivest-Shamir-Adleman (RSA) Asymmetric key algorithm is one of the most popular and secure public key encryption methods. RSA is the algorithm capitalizes on the fact that there is no efficient way to factor very large (100-200 digit) numbers. RSA is an internet encryption and authentication system that uses an algorithm developed in 1977 by Ron Rivest, Adi Shamir, and Leonard Adleman. The RSA algorithm is the most commonly used encryption and authentication algorithm and is included as part of the web browsers from Microsoft and Netscape. The encryption system is own by RSA security. The technologies are part of existing or proposed Web, Internet and computing standards. [3][4].

The National Institute of Standards and Technology (NIST) had created AES, which was a new Federal Information Processing Standard (FIPS) publication that describes an encryption method. AES was a privacy transform for IPsec and Internet Key Exchange (IKE) and developed to replace the Data Encryption Standard (DES). AES has a variable key length —the algorithm can specify a 128-bit key (the default), a 192-bit key, or a 256-bit key. AES able to process six times faster compared with the triple DES for the same processing capacity.

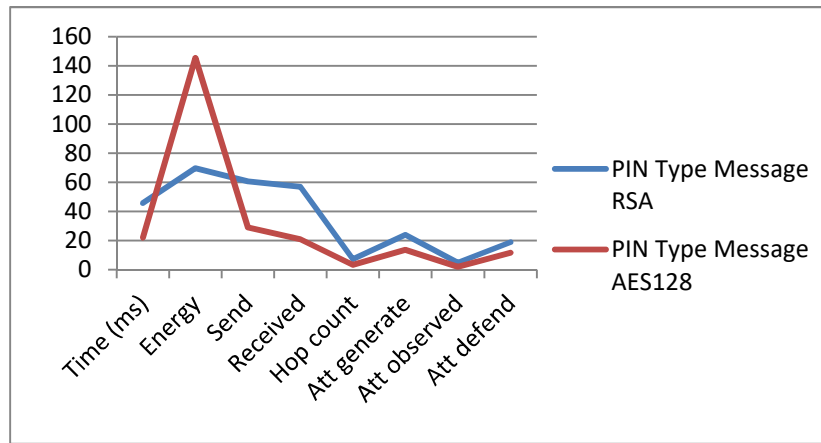


Figure 1. Pin Type Message for RSA& AES Algorithm

III. Observations For Pin Message Type Using RSA & AES128 Algorithm

The analysis done for Pin message type using RSA and AES128 algorithm

Pin Type Message sends and receives PIN identification data of customer. The following parameters observed for each of the message type:

Average Time: - Graph represents the total process time in system execution against each message type so the system would be more efficient. The time counted in milliseconds for the process of encryption and decryption from the time when the card swiped and the server gives acknowledge.

Energy Level: - Graph represents the energy level of each message type in Decibels. It is measured in decibel for the octave message type of the wireless data or frame, which is then sent to the server for processing. Less time and more energy per packet in AES128 algorithm as shown in figure 1.

Send Bytes: - Graph computes the each message type of sending bytes in Time per milliseconds. The number of data byte sent while processing each message type. Sending bytes count are reduced in AES128 algorithm

Receive Bytes: - Graph represents the number of bytes received from each message type can justify that the count for receive byte. The number of data byte received while processing each message type are increased in RSA and the count for receive byte are reduced will take less time in AES128 algorithm.

Time to Defend Per Attack: Graph represents the system will be more secure for transactional data attacks if attack treated and incurred in less time for each message type. In AES128 based system time to defend per attack reduces as compare to RSA.

Hop Count: - This graph noted the number of retransmission packet Hop count against each message type. It represents the count of repetitive data/ request send in case of failure of communication acknowledgement between sending and receiving. Hop count is more in RSA.

Attack generated: - this graph represents the percentage of attack generated in RSA for pin type message transaction.

Attack Defended: - Attack defended parameter graph represents the percentage of attacks defends in system for PIN message type is more in RSA than AES algorithm

IV. Hypothesis Testing And Data Analysis

Null Hypothesis: There is no difference between RSA and AES on average on different parameters studied on pin transaction

Alternate Hypothesis: There is significant difference between RSA and AES on average on different parameters studied.

To verify the above hypothesis following sub hypothesis are tested and verified.

H₀: There is no difference in time parameter of RSA and AES for PIN type message transaction.

H₁: There is significant difference in time parameter of RSA and AES for PIN type message transaction

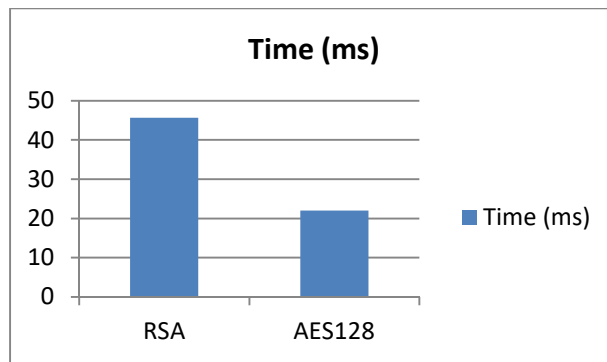


Figure 2. Time for RSA & AES Algorithm

The Statistical Analysis of RSA and AES algorithm for Pin type message shows the average values of all the observed parameters. Pin type is used to identify the customer data for customer data identification. PIN number identification and verification is done through the server and the total time noted in milliseconds. Counting of time is in milliseconds for the process of encryption and decryption of message from the time when the card is swiped and the server acknowledgement. The total time to verify customer details in RSA algorithm is 46 milliseconds whereas AES128 requires 22 milliseconds. Hence the average value of AES algorithm is better than RSA for pin type message.

H₀: There is no difference in energy parameter of RSA and AES for PIN type message transaction.

H₁: There is significant difference in energy parameter of RSA and AES for PIN type message transaction

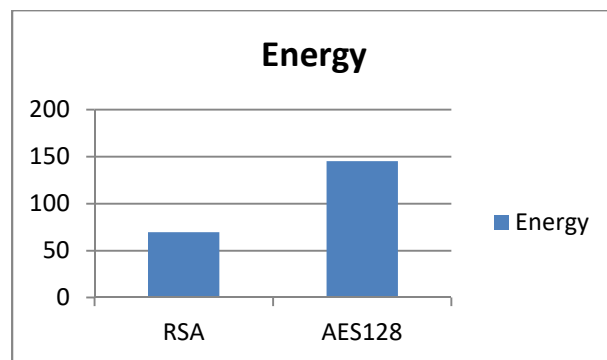


Figure 3. Energy of RSA & AES Algorithm for Pin type message

Total Energy measured in terms of decibels for sending the number of packets for PIN verification. Measurement of energy in decibel for the octave message type of the wireless data, or frame which is sent to the server for processing. Energy level per packet is higher with AES128 algorithm which is 145 as compare to RSA which is 70 for pin “Msg Type”.

H₀: There is no difference in send parameter of RSA and AES for PIN type message transaction.

H₁: There is significant difference in send parameter of RSA and AES for PIN type message transaction

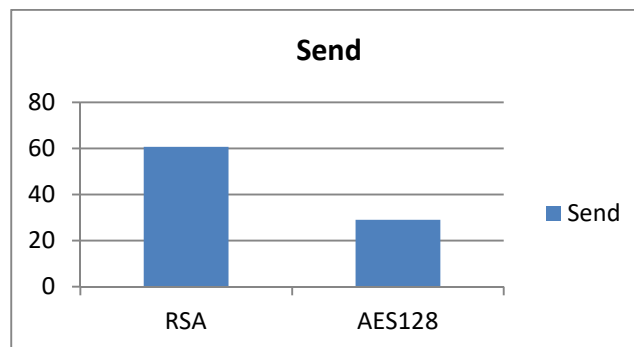


Figure 4. Send bytes of RSA & AES Algorithm for Pin type message

The number of data byte sent while processing pin message type. For PIN verification the number of data bytes required for RSA is 61 whereas AES128 requires 29 bytes.

H₀: There is no difference in Received parameter of RSA and AES for PIN type message transaction.

H₁: There is significant difference in Received parameter of RSA and AES for PIN type message transaction

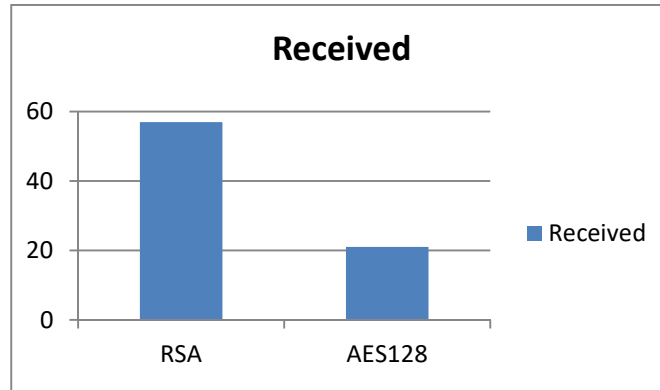


Figure 5. Received bytes of RSA & AES Algorithm for Pin type message

The number of data byte received while processing pin message type. For PIN identification, required less received bytes in AES128 than RSA.

H₀: There is no difference in hop count parameter of RSA and AES for PIN type message transaction.

H₁: There is significant difference in hop count parameter of RSA and AES for PIN type message transaction

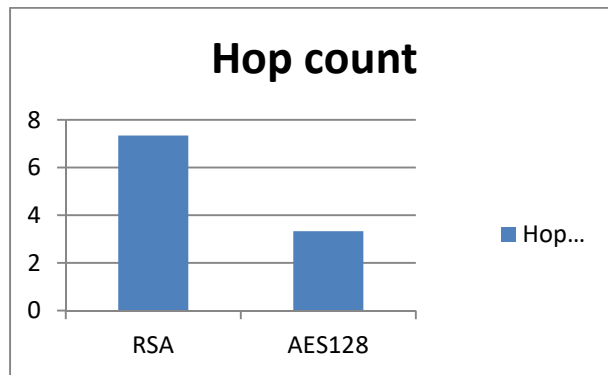


Figure 6. Hop count of RSA & AES Algorithm for Pin type message

It represents the count of repetitive data/ request send in case of failure of communication acknowledgement between sending and receiving. In PIN message type, the HOP count of repetitive data is 3 in AES128 and 7 in RSA.

The number of attack generated while executing the process through hop count. In PIN message type, the average attack generated noted to be less in AES128 vis-à-vis RSA System. The number attack needs to be observed depends upon the vulnerability to attack generated on message. The average of attack observed at the time of PIN verification is 2 in AES128 whereas in RSA observed attack is 5. The percentage of attack defends in system after applying the attack. The percentage of attack defend at the time of PIN verification is more in AES128 than RSA

PIN Type Message	parameter/ Mode	Time (ms)	Energy	Send	Received	Hop count	Attack generate	Attack observed	Attack defend

Table 1. Result Specification and comparisons of RSA and AES128 for PIN type message

RSA	Average	46	70	61	57	7	24	5	19
AES128	Average	22	145	29	21	3	14	2	12

Table 2. Statistical Analysis of RSA & AES Algorithm

	<i>RSA</i>	<i>AES</i>
Mean	36.04167	31
Variance	641.7282	2219.683

The statistical analysis of pin type message for RSA and AES128 algorithm author used nine parameters to calculate the average value of pin type message. On the basis of average, the value of Mean and Variance is calculated. The Mean value for AES128 is 31 which is less than RSA (36.041) and the variance of AES128 is more than RSA algorithm.

The Mean and Variance of RSA and AES calculated by using T-test (two tailed & one tailed) Method. Hence on the basis of the above observation Null Hypothesis is rejected and alternative hypothesis is accepted. This proves that there is a significant difference between RSA and AES on average on different parameters studied. Hence AES performs better as compared with RSA algorithm for PIN type message.

V. Conclusion

In this study with the help of various parameters influencing the RSA & AES algorithm for Pin type message performance were observed. Quantitative research was conducted to determine the comparative statistical analysis between RSA and AES algorithm. There was one independent variables Pin type message against eight different dependent variables including; time, energy, send, receive, hop count, attack defended, attack generated and attack observed to reach the conclusion. In turn, it would help the bank and customer to process the transaction securely and safely by applying strong (cryptographic) authentication system together with additional security through Pin type message. The comparative results of AES and RSA algorithm was calculated based on different parameters against pin type message and found that AES128 is more efficient, faster, less time consuming and limited memory utilization as compare to RSA .In the end it was concluded that there is a significant difference between RSA and AES on average on different parameters studied. Hence AES performs better as compared with RSA algorithm for PIN type message.

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A Review of Role of Data Mining Techniques in Portfolio Management

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Abstract---Finance is the process of fund management. It includes allocation of liabilities and assets depending on time. Time value of money is the key component of finance. Features of finance include investment and profitable opportunities, optimal mix of funds, system of internal controls and future decision making. Nowadays several researchers are exploring how data mining techniques can be applied in finance domain. Different avenues for data analysis under finance domain include Portfolio Management, Risk Management, Fraud Detection, Bankruptcy prediction etc. Data mining capabilities such as automated prediction of trends, behaviors and automated discovery of previously unknown patterns help in financial data analysis. This paper reviews several research works that describe application of data mining techniques in financial management from application to technical outlook.

Index Terms---Data Mining, Stock Management, Mutual Funds, Investment Management, Portfolio Management

I. Introduction

This paper reviews application of Data Mining techniques in Finance Domain. Data Mining is a process of discovering correlations or patterns among various fields in huge relational database. Data mining techniques help to reveal hidden patterns, trends for further prediction in financial market. In this era of computer science, data mining techniques like

Association Rule, Decision Tree, Clustering, Classification, Neural Network and Time Series Analysis are very much important for quick decision making.

In finance domain like Stock market, Portfolio Management etc., massive amount of data is generated by organizations which require some techniques for data analysis. With the help of data mining tools, this dynamic and complex data can be tackled easily. Potential benefits of using data mining tools attracted various researchers and commercial market.

Nowadays several researchers are exploring how data mining techniques can be applied to finance domain. Stock market is a market that allows you to buy company share and derivative of company share at a fixed price. Whenever an investor is thinking about investing in stock market, he may come across a large pool of stocks and the very important task is to select the stocks that can earn some profit. It is not necessary that every stock in the market earn profit on the same level. Hence stock selection is a very crucial step in investment management. There is no specific method for price prediction of a company's stock. Research in the field of data mining and its associated technologies discovered improved processes for stock selection and price prediction. Organization of the paper goes like - section two deals with Data Mining and techniques of data mining. Section three deals with Portfolio Management and application of data mining techniques in portfolio management. Section five is composed of Conclusion.

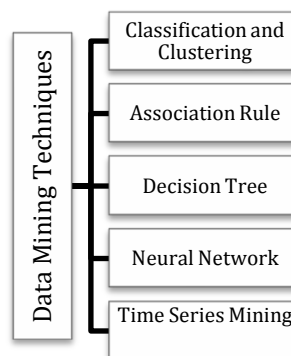


Figure 1. Data Mining Technique

II. Data mining

According to Dunham and Shridhar, Data mining is defined as finding hidden information in a database. It has been also called as exploratory data analysis, deductive learning and data driven discovery. Data mining involves various algorithms to accomplish different tasks. There are three parts of data mining algorithm viz. model, preference and search. Models are categorized as Predictive or Descriptive. A predictive model makes prediction using different data elements whereas descriptive model finds relationships or patterns in data [1]. Depending upon the knowledge which is mined, data mining techniques can be classified into following categories. Figure 1 shows Data Mining Techniques.

A. Clustering

Clustering is a technique in which groups are formed on the basis of data elements and is used to discover particular distribution and patterns of the data. Clustering provides data points on the basis of which data elements are grouped together. Similar type of data elements form a group which is also known as cluster. Clusters do not show the type of relationship between the data elements [2].

In clustering, clusters are not predefined and there is no distinction between dependent and independent variables. Clustering algorithm searches for groups and finds similarities between the data elements. User is allowed to extract the required meaning.

There are various types of clustering algorithms. The K-means algorithm is popular among all. K-means algorithm is simple, easy to understand and can be applied in different scenarios[3].

It is observed that some clustering algorithms generate too many clusters but K-means algorithm can be used to obtain a set of required clusters [4]. The K-means algorithm has been widely used in finance for asset selection and management. As compared to Fuzzy C-means clustering algorithm and Self Organized Map (SOM), K-means reduces the time required for stock selection. It facilitates formation of a group of similar categories into a cluster so that best performing stock can be selected to build a portfolio. Clustering combined with association rule can be used to extract hidden pattern from specified groups [5]. Initially, clustering algorithm is applied on database to form a cluster and then association rule is applied to find particular pattern of a cluster [6].

B. Association Rule (AR)

Association Rule is a mostly used data mining technique for identifying interesting patterns. Association Rules are like If-Then rules where a condition clause triggers a result clause. Association Rules are used for identifying regularities among the products in large transaction data by supermarkets [7]. AR discovers correlation and/or association relationship within data elements of large data-set.

Apriori algorithm is the most commonly used method for association rule mining which uses Large item set property. Association rules are used to find correlation and hence can be applied in finance market and in retail sector. Association rule is used in finance to identify frequent investment patterns of investors. It also assists in building portfolio, analyzing behavioral finance etc.

C. Classification

Classification is the most familiar and popular data mining technique. Classification is the process of determining set of common features and forming their models. It is a two-step process: i] Model construction-where sample is assumed to belong to a predefined class. The model is presented in the form of mathematical formula, decision tree or classification rules. ii] Model usage- Used for classifying unknown objectsbasalto2005clustering. These models are used for future prediction. Estimation and Prediction are the types of classification. Prediction can be considered as the classification of data elements into the possible set of classes. Classification is used to forecast discrete value whereas prediction is used to forecast continuous value. In finance, classification and prediction are mostly used in stock market for stock classification, market value prediction, portfolio construction etc.

D. Decision Tree

A decision tree is a predictive modeling technique used in classification, clustering and prediction. Decision tree uses Divide and conquer technique to reduce sample space into subsets. It assists in analyzing multiple variables. With the help of this technique a tree is constructed and is used for modeling classification process. There are two basic steps of this process constructing a decision tree and applying it on the target data-set. Decision trees are used in finance to explore different investment avenues depending on the requirements of an investor [8].

E. Neural Network

Artificial neural networks are the models that emulate the human pattern recognition function through multiple input structures. It consists of a neuron as a fundamental processing unit which is distributed throughout the model. The main advantage of using neural networks is its ability to learn which is accomplished by adjusting the weights on the basis of learning algorithm. Weights are the important factor that affects the output given by the model. There are two types of learning methods i.e. Supervised and Unsupervised [9]. Neural network model learn through the training data set provided to the model. Neural Network is applicable especially in the field of pattern recognition, classification and association activities. Particularly it handles the areas like financial forecasting, investment management, credit risk assessment etc. [10].

F. Time Series Analysis

Time series is a type of predictive analysis. With the help of Time Series Analysis, value of an attribute is examined over the period of time. The values are usually obtained on the basis of evenly spaced time intervals i.e. hourly, daily, weekly, monthly etc. A time-series plot is used for visualization of the attributes. Time series analysis can be applied on continuous or discrete data elements and is used for finding patterns and for future prediction. Detected patterns may include trends, cycles, seasonal or outliers. Trend chart acts as a guideline for the investors. Past trends, seasonal growth of a stock and variations in the stock price can be analyzed with the help of trend chart [11].

III. Portfolio Management

Group of financial assets like bonds, shares, stocks, debt funds, mutual funds is referred as Portfolio. Portfolio theory is stated by Harry Markowitz. Portfolio management guides the investor to select best available securities that will give expected rate of return for given degree of risk and tries to reduce the risk associated with the portfolio. Portfolio management basically involves three basic activities. i.] Decision making regarding what to buy and when to buy. What to sell and when to sell. ii.] Money management as per the preference of investors. iii.] Minimize risk and maximize returns. Portfolios are directly held by investor and/or managed by financial professionals. Investment process comprises of two tasks viz. Security analysis and Portfolio selection. Investment management or portfolio management is a complex activity which may be broken down into following steps: i] Specification of investment objectives and constraints ii] Choice of the Asset mix iii] Formulation of Portfolio strategy iv] Selection of securities v] Portfolio Execution vi] Portfolio Revision vii] Performance Evaluation. For the effective management of portfolios, data mining techniques like decision tree, association rule, clustering, neural networks, time series analysis and classification are utilized.

IV. Application of Data Mining

To extract knowledge is quite similar to create wealth and hence strategic planning is required. Large amount of data is generated by financial market which is to be analyzed to get valuable information. Nowadays several researchers are exploring how data mining techniques can be applied to finance domain. Time series data mining is recognized as one of the major challenging problems in data mining [10] which focuses on trend analysis, similarity search, classification, clustering, segmentation etc. It is easy to uncover dynamic and nonlinear relationship of financial data with the help of data mining. Following section emphasizes on various categories in which data mining is applied in portfolio management.

A. Portfolio Management using Clustering

There are number of studies in the literature that illustrates the application of various clustering methods which can be used for the problems of classification and results are compared. Chiu et al.(2009) [12] applied K-means algorithm for intelligent market segmentation. Many variations of K-means are also used in many fields. Kim et al. (2008) [13] applied GA form of k-means clustering algorithm for developing an e-commerce system for online shopping market. Linter and Sharpe (1965, 1967, 1970) developed Capital Asset Pricing Model (CAPM) and Equilibrium Market Model. Ballestro et al. (1996) illustrated a Compromise Programming Model for Portfolio selection. Parra, Uria et al. (2001) [14] applied fuzzy goal programming method for portfolio selection.

Basalto et al. in 2005 [15] applied a pairwise clustering method for the analysis of Dow Jones index companies for the identification of analogous temporal behavior of the price of the stock. The basic aim is to understand the underlying dynamics which rule the company's stock price. The cluster identification of companies of a given stock market index can be exploited in the portfolio optimization strategies. Shaun et al. in 1993 [16]

proposed stock market forecasting based on ANN. System was trained using 500 composite indexes of last 20 years. The system produced the forecast and adjusted itself by comparing actual results with forecasted result.

Vladimir et al. in 2006 [17] studied different characteristics of the market graph and evolution over the period of time and some interesting conclusions are drawn based on the analysis. It is observed that power law structure of the market graph is reasonably stable for the considered time intervals. So it can be stated that self-organized networks are applicable in finance. Another main finding is that edge density of the market graph and maximum clique size is increasing steadily from last few years. Also suggested the way in which financial instruments can be brought into clusters.

B. Portfolio Management using Association Rule

According to Agrawal et al. in 1993, identification of association rules is challenging data mining problem and extensive research is going on the use of association rules for handling data mining problems. Association rule algorithms are used to find relationships among the variables and hence can be applied for portfolio management.

Ting et al. in 2006 [18] studied application of sequential and non-sequential association rule mining for stock analysis. They studied two formulations i.e. inter stock pattern and intra-stock pattern mining. Three association classification methods i.e. best confidence, majority voting and maximum window size are applied for selection of suitable association rule or rules for prediction of stock price.

Shu-Hsien et al. in 2008 [19] examined investments in Taiwan stock market. They adopted two phase data mining method namely association rule and clustering. Apriori algorithm was implemented to find association of stock category and possible investments in specified stock category and later implemented k-means clustering algorithm for finding out possible investment avenues for portfolio management in Taiwan stock market.

Paranjape et al. in 2011 [20] proposed recommender system using association rule mining for stock markets. They implemented association rule mining, fuzzy association rule mining, weighted fuzzy association rule mining with time intervals which are used to predict relationships between various stocks and are used for recommendations of mutual funds for portfolio management.

C. Portfolio Management using classification

Leung et al. in 2000 [21] focused on returns on stockmarket index. On the basis of investment returns and forecast performance, he compared two models using time series comparison method. The classification models are used to predict the direction of stock market which is based on probability and include probabilistic neural network, linear discriminant analysis, probit and logit. For effective trading, set of threshold rules are offered which are driven by the classification models and are proved best for analyzing stock market to maximize the returns from trading.

David Moreno et al. in 2004 [22] applied some nonlinear techniques like k-means neighbors, COM and K-means algorithm for evaluation of Spanish mutual funds. With these methods, it is possible to find mutual funds that are misclassified on the basis of historical performances. It is concluded that approximately 40 percent and above mutual funds could be misclassified. After that alternative classification method was applied. This was based on double step methodology and obtained comparatively lower rate of misclassifications.

Francesco Pattarin in 2004 [23] proposed a classification algorithm for style analysis of mutual funds. In this different statistical methods are combined and utilizes at low cost. Different classification methods give reliable information to the fund managers and investors who wish to compare different financial products. This paper implemented a classification method which comprises of three steps i] Dimensionality reduction on the basis of principal component analysis ii]Clustering iii] Style identification.

D. Portfolio Management Using Decision Tree

In the stock market, it is quite important to buy right stock at right time which is of great interest to investor. To accomplish the objective, decision tree is the most widely used data mining technique. In this section some papers are reviewed which focus on application of decision tree for portfolio management. Lin in 2004 proposed a technique for modification of filter rule by including three decision variables allied with fundamental analysis. In this paper only past information was used for clustering and not the future information and later with the help of decision tree technique stock selection and prediction is done.

Muh-Cherng in 2006 [24] presented a stock trading method by linking decision tree and filter rule. Filter rules are used for generation of candidate trading points. These points are clustered using the application of decision tree which include future information. Taiwan and NASDAQ stock markets are used for justification of the proposed method.

Hui et al. in 2008 [25] presented a data mining method by combining decision tree, information gain and attribute oriented induction. It is used for preprocessing financial data and a decision tree model is constructed for prediction of financial distress. Depending on the one class attributes and financial ratios attributes, data mining model for financial distress prediction is designed.

Jar-Long in 2006 [26] proposed the use of two-layer bias decision tree which include technical indicators for generation of decision rule which guides investors by giving recommendations in stock market. This method facilitates purchasing accuracy. As compared to random purchase technical indicators perform better in terms of stock forecasting and improved returns on investments.

E. Portfolio Management using neural network

In this section literature regarding use of Neural Network for portfolio management is reviewed. According to the paper reviewed, the standard neural networks have the capacity to learn existing relationships between the data elements. Multilayer perceptron is the most popular neural network which uses back-propagation algorithm networks. Such type of neural network is best for classification and prediction and is widely used in finance domain.

Defu et al. in 2004 [27] considered application of multilayer back-propagation neural network in finance. A transformed neural network model is developed for forecasting and an intelligent mining system is developed. The system is developed for stock forecasting i.e. buying and selling options are predicted as per the future trends. This helps investors indecision making process.

Hadavandi et al. in 2010 [28] developed an expert system using artificial neural network and genetic fuzzy system for stock forecasting. Initially, Stepwise Regression Analysis is used to find factors affecting stock price. In the next step, data is divided in k-clusters using Self Organizing Map neural network. Later, clusters are fed to Genetic Fuzzy System model by using data base tuning and rule base extraction. It is concluded that the proposed method is best for stock price forecasting.

Kara et al. in 2010 [29] presented application of ANN and Support Vector Machine for prediction of stock price index movement direction for Istanbul Stock Exchange. In this, two models are developed and compared for prediction of stock price index movement direction on daily basis for Istanbul Stock Exchange. Models are developed using ANN and SVM and concluded that ANN performs considerably better than SVM.

Mohamed Mostafa in 2010 [30] forecasted the Kuwait Stock Exchange. In this, two neural network architectures - Generalized

Regression neural network and Multilayer perceptron neural network are used for prediction of Kuwait Stock Exchanges closing price movements. He concluded that neuro computational models are most useful tools for forecasting stock exchange movements.

Chiang et al. [31] applied ANN for forecasting end of year NAV of mutual funds. For this Back-propagation, neural network is implemented. NAV of mutual fund is predicted on the basis of historical data that is present in the data base.

F. Portfolio Management using Time Series Forecasting

According to OECD Glossary of Statistical terms, time series is defined as- A time series is a set of regular time-ordered observations of a quantitative characteristics of an individual or collective phenomenon taken at successive, equidistant, periods/points of time This technique is most frequently used in portfolio management for forecasting. In past few years many researchers focused on fuzzy time series for handling forecasting problems.

Chan et al. performed analysis of daily trade data of Shanghai Stock Exchange with the help of neural network. In this two weight initialization and two learning algorithms are compared. He concluded that neural networks can model time series in better manner. The proposed model i.e. MLR weight initialization with conjugate gradient algorithm needless computation cost and learns much better than random initialization with steepest decent.

Tae HyupRoh in 2007 [56] proposed hybrid models using time series and neural network for forecasting stock price volatility on the basis of direction and deviation. He also demonstrated the application of hybrid model for forecasting market volatility. HyupRoh concluded that neural network along with time series analysis is applicable for financial forecasting.

Chi-Jie Lu et al. in 2011 [57] applied Support Vector Regression along with time series for forecasting financial data. He developed a model of financial time series with the help of SVR in which major problem was identification and removal of noise. To overcome this, two stage modeling was used i.e. Support Vector Regression and

independent Component Analysis. Experimental analysis concluded that proposed model performs significantly better than SVR.

Table 1. Data mining Techniques for Portfolio Management

Application	Clustering and Classification	Association Rule	Decision Tree	Neural Network	Time Series Mining
Stock Market Prediction and Analysis	[32],[33], [34], [28]	[35], [36], [37]	[38], [39], [40]	[41], [42], [43] [44]	[45], [46]
Mutual Funds	[47], [48], [49], [50]	[1], [51], [52]	[40]	[31], [53]	[54], [23], [55]

IV. Conclusion

In the growing economic globalization and advancement of information technology, financial data is generated and accumulated rapidly. Hence need some tools and techniques to manage and analyze the data effectively. This will facilitate individual investors and companies for planning their strategies and for decision making. Data mining finds patterns and correlations which can be used to predict future trends in finance. Advantages of using data mining in finance are low cost, revenue generation, awareness and responsiveness. This paper reviews several research works that describe application of data mining techniques in financial management from application to technical outlook. Research papers from last few years are identified which focused on data mining application in portfolio management. In this paper we considered investments in stocks and mutual funds as a part of portfolio and application wise categorization is presented. It is observed that data mining techniques are effective for handling finance data.

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