National
College of
IRELAND

Analysis of Consumer Perception and Satisfaction on Choosing Cryptocurrency in India

MSc Research Project
FinTech

Yashvee Choubey
Student ID: X20243499

School of Computing
National College of Ireland

Supervisor: Brian Byrne

National College of Ireland

MSc Project Submission Sheet

School of Computing

Student Name:	Yashvee Choubey
Student ID:	X20243499

Programme:	MSc FinTech	**Year:**	2021-2022

Module:	Research Project
Supervisor:	Brian Byrne
Submission Due Date:	15th August 2022
Project Title:	Analysis of Customer Perception and Satisfaction on Choosing Cryptocurrency in India

Word Count:	5437	**Page Count:**	17

I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.

<u>ALL</u> internet material must be referenced in the bibliography section. Students are required to use the Referencing Standard specified in the report template. To use other author's written or electronic work is illegal (plagiarism) and may result in disciplinary action.

Signature:	Yashvee Choubey
Date:	15/08/2022

PLEASE READ THE FOLLOWING INSTRUCTIONS AND CHECKLIST

Attach a completed copy of this sheet to each project (including multiple copies)	□
Attach a Moodle submission receipt of the online project submission, to each project (including multiple copies).	□
You must ensure that you retain a HARD COPY of the project, both for your own reference and in case a project is lost or mislaid. It is not sufficient to keep a copy on computer.	□

Assignments that are submitted to the Programme Coordinator Office must be placed into the assignment box located outside the office

Office Use Only	
Signature:	
Date:	
Penalty Applied (if applicable):	

Analysis of Consumer Perception and Satisfaction on Choosing Cryptocurrency in India

Yashvee Choubey
X20243499

1.Abstract

In today's time, technology have a huge impact on the life of humans. People are shifting from physical world to the virtual world. Most of the day-to-day activities have been shifted online which have increased the convenience level of people and saves a lot of time. In this digital era, the financial sector has evolved majorly as most of the transaction are shifted from physical cash to online payments. As the monetary system has evolved, people are moving from physical currency to digital currencies like cryptocurrencies. Cryptocurrencies are digital currencies of the 21st century that are intangible, have value, and are used virtually for payment purposes across different networks and geographical boundaries since intermediaries are not needed. In recent times, cryptocurrency is gaining popularity in India even with restriction on its use. The aim of this research is to identify the customer perception and the satisfaction related to cryptocurrency in India. There are many controversies related to the cryptocurrency in India like the safety issues, variation in the value, etc. The main objective of this research is to find out which cryptocurrency the people of India prefer to invest in? Are people of India aware of cryptocurrency other than Bitcoin? whether people consider cryptocurrency as a new investment tool or not. To reach the objective online survey for data gathering, random forest and decision tree machine learning algorithms are used as methodology. Results of both the machine learning algorithm based on their accuracy score are shown in this research paper.

2.Introduction

Digital transactions are required in today's world, and everyone depends on money transactions through online sites. According to Ishak (2020), with cryptocurrency, users can do secure online transactions with a secure payment method, which can be translated into virtual token representations of internal ledger entries. Through the public and private key cryptocurrencies can be send directly between the parties. According to Cantwell (2020), there is no need to reach third-party financial transaction entities for conducting a financial transaction after digital transactions came into the business market. According to Rosic (2016), these transfers are cost effective and can be done with minimal transaction fees. According to Hoffman, Ibáñez and Simperl (2020), decentralisation usually means a dispersion, distribution of taking the financial power away from a central authority and *blockchain* has been using such a distributed ledger that is enabling people to transact with cryptos without authorisation of any central authority. Furthermore, through the decentralised nature of blockchain as any intermediaries for financial transactions can be removed, therefore a *peer-to-peer* transaction system can be established as well (Chen and Bellavitis, 2020).

According to Likos *et all*. (2022), Satoshi Nakamoto initiated the concept of Bitcoin in 2008.Bitcoin is the first decentralised cryptocurrency. In 2008, a white paper was published by Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System" which underlines all the feature of Bitcoin. Bitcoin was first ever transacted in the year 2009 but it did not hold any monetary value.

Mining

Miners of cryptocurrency through extensive energy usage and through a complex computing resource usually mines the cryptocurrency (Samford and Domingo, 2019). Therefore, comparatively a greater number of people that can afford a computer have been seen to be drawn towards mining and the mining pool therefore is created as more and more miners have been seen to be starting to share relevant information of mining that created the mining pools (Iyer and Dipakumar Pawar, 2018).Fig. 1 shows the hardware requirement for mining.

Specifications	Hash rate
Intel® Core™ i7-2600 CPU @3.4GHz (8CPUs) 8 GB RAM(Windows PC)	260.5 KH/S
Intel® Core™ i5-4200 CPU @2.3GHz (4CPUs) 6 GB RAM(Windows Laptop)	187.6 KH/S
Intel® Core™ i5-7200 CPU @2.3GHz (2CPUs) 8 GB RAM (Macbook Pro)	16MH/S
Bitman Antminer U2 (USB Miner)	2.2 GH/S

Fig. 1. Hardware requirements for mining (Ghimire, 2019)

2.1. Motivation of choice over topic

In India, Cryptocurrency is developing on a very fast pace. Bitcoin and other cryptocurrencies are becoming more popular among people investing their money. On the other hand, many are not intended to invest in cryptocurrency because of many reasons like its volatile nature, lack of regulation, etc which paved my way of motivation.

2.2. Research Objective

People have various perception about the cryptocurrencies depending upon their experiences. Some of them consider cryptocurrency as valuable assets and some does not. The objective of this research is to find out what are the different perception of people about the cryptocurrency in India.

2.3. Research Question

As every individual have different thoughts about cryptocurrency, this research paper aim to find out:

- Which cryptocurrency do the people of India prefer or wish to invest in future?
- Are they aware of new cryptocurrencies other than Bitcoin?
- Does people of India consider cryptocurrency as a new tool of investment?

2.4. Research structure

This research paper discusses about the overview of cryptocurrency in section . The methodology of the research is discussed in section The Implementation specification are discussed in section The result and evaluation are discussed in section The research paper discusses the conclusion and future work in section

2.5. Research Beneficiaries

This research can be used as a base for knowledge on satisfaction level of the customers using cryptocurrency and for gaining the insights about the customer perception and the factors which effects the customer satisfaction about the cryptocurrency future.

3.Literature Review

3.1. Overview of Cryptocurrencies

Cryptocurrency can be referred to as a digital currency that can be used as an alternative form of financial transactions with encrypted algorithms. As per the statements of Arikan, (2020), this type of currency gets operated by using blockchain technologies that can help to securely transact financial values. Encryption technologies such as blockchain technologies is utilised by this type of currency.

Types of cryptocurrencies

There are several types of cryptocurrencies that can be used for different purposes. There are mainly three types of cryptocurrencies, and they are *coins, tokens,* and *altcoins*. Every type of cryptocurrency has several types, and all of these can be used to conduct digital financial transactions.

3.2. Customers' perceptions toward cryptocurrency

People think that cryptocurrency is a great revolution in the financial industry. According to Wu *et al.* (2021), many people use cryptocurrencies for financial transactions as there is no involvement of third parties. Cryptocurrency has been found to be a matter of criticism and people have mixed feelings about using cryptocurrency. According to Gupta *et al.* (2017), in India cryptocurrency is still in its growing phase. It has still not gained much popularity in India. As per the statements of Vujičić *et al.* (2018), trading through cryptocurrency is increasing over time and currently, 39% of investors are actively using cryptocurrency for business trades. According to Gupta *et al*. (2017), it is likely that cryptocurrency adoption will increase if people are educated about cryptocurrency and e-commerce websites and banks accept cryptocurrency. It is also important to control price fluctuation in order to make adoption easier, as people are afraid of fluctuating prices.

3.3. Benefits of cryptocurrency and improvement in customer satisfaction over time

People were worried about the negative sides of cryptocurrency and therefore, cryptocurrency was not beloved in this country in the early days. As this currency is decentralised, it has made people worried, and people were not interested in investing in this currency. Thereafter, bitcoin was the first used cryptocurrency that got popular for its effectiveness in the business market. According to the views of Nazifi *et al.* (2021), increasing taxes for financial transactions has made people aware of transacting financial values by using cryptocurrency

and therefore, people got attracted to cryptocurrency. Thereafter, this transaction process was found to be safer than other methods of financial transactions. It has gained trust from its early customers and the customers got benefits in the financial transaction process. For its benefits and higher security from cyber-attacks, people got attracted to this currency over time. According to Gupta *et al. (*2017), the major reason for people using cryptocurrency was that it was peer-to-peer, thus reducing the cost per transaction significantly since it doesn't require intermediaries or brokers.

3.4. Decrease of fraudulent in digital transactions by cryptocurrency

Cryptocurrency is one of the most efficient digital transaction currencies for conducting safer transactions. According to the statements of Luchkin *et al.* (2020), blockchain technologies are used for transacting financial values through cryptocurrency, which is one of the most secure processes of digital transactions. Digital transactions can be done securely with this type of currency as the transaction process is much more secure than other digital transactions. Blockchain can reduce the scams in digital transaction processes as it is distributed. Therefore, accessing transactions in the blockchain cannot occur by any outsiders, which can reduce fraud in transactions. As per the views of Shih *et al.* (2021), fraudulent digital exchange of financial assets has been improved by implementing secure block chain technologies. Blockchain helps in preventing fraud and corruption, which allows the industries to conduct safer transactions. Adapting blockchain technologies in cryptocurrency transactions has improved financial transduction security. Blockchain technologies are encrypted with higher security and accessing a transaction is nearly unimaginable for hackers. This technology blocks accessing records of transactions and gets divided into various storages. Every block in this technology has separate storage and it implements encryption in the transaction process, which makes it impossible to be hacked.

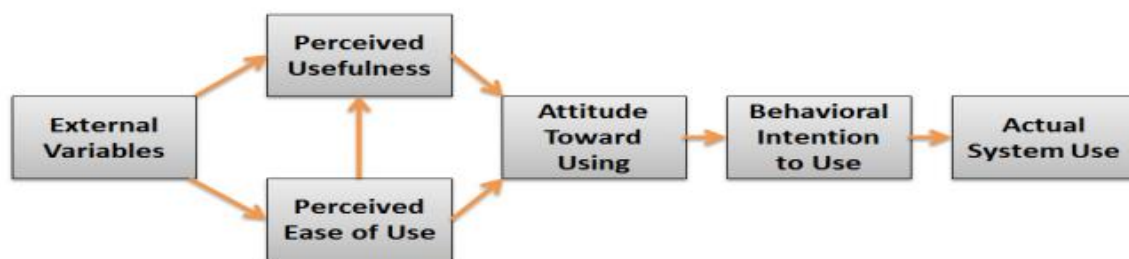## 3.5. Impacts of TAM model on customers for using cryptocurrency.

Fig. 2.Technology acceptance model TAM (Davis, 1989)

According to Davis (1989) (Fig. 2.), the important 2 factors which affect the acceptance of technology: Utilization and ease of use are perceived as important factors. These are the 2 factors which directly contribute to a consumers attitude towards using a technology and which help to decide if they want to use it.
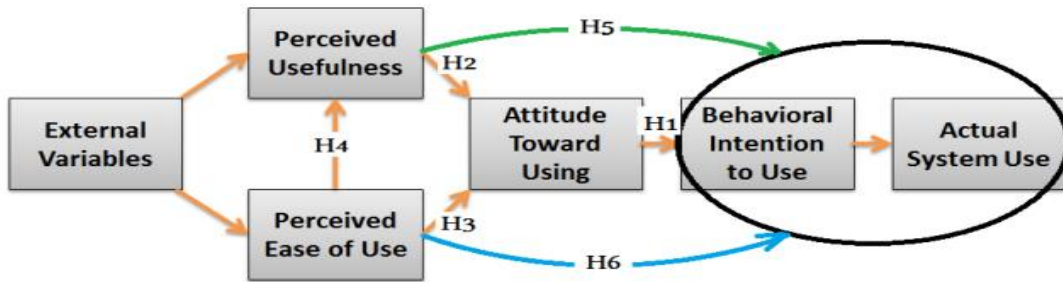
Fig. 3.Conceptual diagram of TAM model for Cryptocurrency Acceptance (Taheri et al.,2022)

To determine the attitude of users towards blockchain-based cryptocurrency transactions, Taheri *et al.* (2022) (Fig. 3.) have developed a conceptual TAM model for cryptocurrency acceptance.

There are four main attributes of TAM model for cryptocurrency acceptance: Usability perception, ease of use perception, attitude, and behavioural intentions are all considered.

In accordance with Taheri *et al* (2022):
- H1-Behaviour intentions in cryptocurrency transactions are influenced significantly by the attitude of users.
- H2-Users' attitudes toward cryptocurrency transactions are significantly influenced by their perception of its usefulness.
- H3-Users perceive cryptocurrency transactions as easy to use, which significantly influences their attitude.
- H4-Cryptocurrency transactions are perceived as more useful by users when perceived as easy to use.
- H5-Users' perception of usefulness has a positive and significant effect on their behaviour in cryptocurrency transactions.
- H6-Users' perception of ease of use indirectly impacts their behavioural intentions with regard to cryptocurrency transactions.

According to Al-Amri *et al.* (2019), there are factors from two prospective which influences the intention of a user to adopt cryptocurrency, one is human prospective, and another is security prospective. There are many factors which influence the human prospective to adopt cryptocurrency such as usefulness, ease of use, facilitating condition and social factors. Factors such as perceives trust, perceives privacy and perceived risk influence the security prospective of the user.

3.6. Cryptocurrency in India
According to Shukla *et al.* (2022), in India, cryptocurrency have come a long way. The starting of the cryptocurrency era was seen in the year 2013 and there were many confusions and doubts related to the development of the cryptocurrency during this year. Reserve Bank of India have also given many statements regarding the cryptocurrency. Reserve Bank of India said that they are closely monitoring the development of the cryptocurrencies in India. In 2017, Cryptocurrencies are not legal tender in India, according to the Reserve Bank of India, because of some legislation in favour of public interest Reserve Bank of India was not able to ban the cryptocurrencies but committees were formed whose primary aim was to investigate the issues related to cryptocurrencies.

In the year 2019, a bill was passed for banning of the cryptocurrency in India. As per the bill passed:

- It is punishable in India to trade, mine, hold, transfer, or use cryptocurrencies with a financial penalty or/and imprisonment up to 10 years.
- The act specifies that anyone who owns, uses, or disposes of cryptocurrency for more than 90 days must declare it/dispose of it within that time frame.
- In the future, the Reserve Bank of India may issue digital rupees as legal tender in India.

As of March 2020, Reserve Bank of India ban on cryptocurrencies has been lifted by the court of appeals in India.

In the year 2021, a committee was formed with aim to study the issue related to cryptocurrencies and to make necessary suggestion. In the same year, a different committee was formed by the head person of standing committee for finance which said that its will be biased to ban the cryptocurrency in India, but it should be regulated. Reserve Bank of India also showed its keen interest in launching digital currency as they consider cryptocurrency as a threat as they were not regulated.

As of now there was no regulation and tax clarity on cryptocurrency. In Union Budget 2022-2023, it was declared that 30% tax deduction will be applicable to the transfer of virtual currency / cryptocurrency. The bill also stated that when digital assets are transferred, 1% of the proceeds will be deducted as tax. Cryptocurrencies may be recognized as legitimate assets and associated trading may be considered a legal activity with this announcement by the Indian government. It may result in an increase in the size of the industry as doubts about tax slabs are clarified.

3.7. Challenges in using cryptocurrency

Scalability of this currency is the greatest issue in using this currency as only a few people are using cryptocurrency at the present time. Therefore, adaptation to cryptocurrency is the main issue while using it and this currency is also not be applicable for every trade. According to Yussof and Al-Harthy, (2018), cryptocurrency is not tangible and therefore, many people have found this currency to be volatile. Value of cryptocurrency is not always the same at all times and therefore, the invested amount can show a loss. Technologies are changing in day-to-day life, which is making people worried about the security of this currency. The safety technologies used in cryptocurrency transactions must be improved over time for security purposes and therefore, it is a matter of concern for all people. According to the study conducted by Baur and Dimpfl (2021), it could be determined that Bitcoin has an extreme level of volatility to itself, In comparison to other exchange rates, it is almost ten times higher. This amount of excessive volatility even has an adverse impact on its potential role in portfolios.

According to Urquhart. (2016), Even though it is a form of commodity, cryptocurrency is said to be weak in that investor-s cannot predict the future because past information is not available.

4.Methodology

The research methodology of this research paper follows 6 steps namely data gathering, know your dataset, data pre-processing, data transformation, data modelling, result and evaluation which are shown in Fig. 4

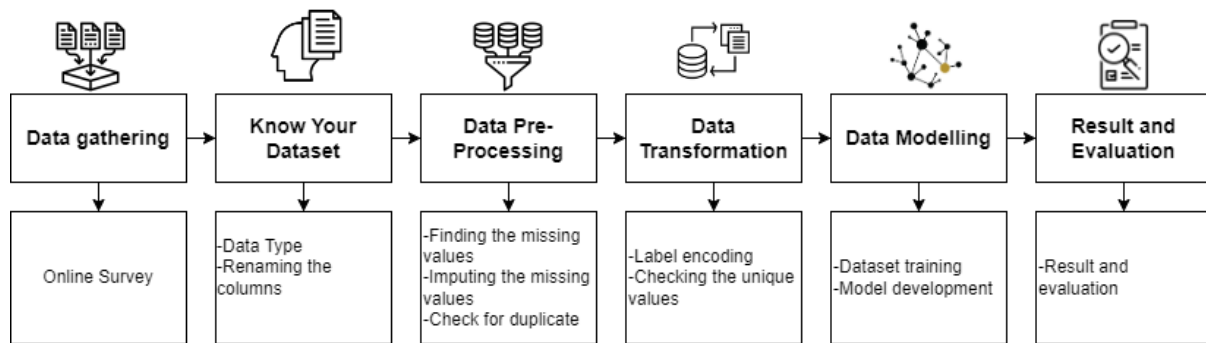**Fig. 4.Research Methodology**

Data Gathering

Data gathering is the first step of the research. In this research, the data is gathering through an online survey which had total 16 questions.
(**https://forms.gle/qTpr4ip4M9VUc9AR8**)

Know your Dataset

The second step is to get well familiar with the dataset. The dataset file (excel file) is imported. Using the *head()* function top 5 rows of the dataset were read. Using *Info(),*the information about every column was observed such as data type and if any missing values present in the dataset. Using the *df. Shape,* got to know the number of rows and columns present in the dataset. There are 103 rows and 18 columns in the dataset. Since the name of the columns were not very short and was lengthy, so renamed the columns for further use while pre-processing. The dataset has 18 columns with different variables like age, gender, profession, etc.

There are 17 independent variable and 1 dependent variable.
The dependent variable is: "Do you think, application of cryptocurrencies has provided an investment tool for the future?"
The independent variables are the remaining 17 Variables:
Timestamp, Consent, Age, Gender, Occupation, Prefer_to_invest_incrypto, Prefer_to_investinfuture, which_crypto_infuture, awareof_newcrypto, Reasonofinvest, Riskyornot, Experince_incrypto, Reasonofexperience, Security_keyasked, Purpose_ofcrypto, needof_twofactor_authentication, App_used.

Data Pre-Processing

This is the third step which involves cleaning of the dataset and making it perfect for data modelling. Missing values in each column were checked in the dataset. There were 1 missing data found from "Age", "Gender", "Occupation", "Riskyornot", "Experince_incrypto", "Purpose_ofcrypto" columns, 3 missing values for "Reasonofexperience" column and 40 missing values for "Prefer_to_investinfuture" column. Then the values were imputed which had the missing values. Check for duplicate was done on the dataset and no duplicate values were found.

Data Transformation

We encode labels and check whether the dataset has unique values. During label encoding, labels are converted into numerical form, which can be readable by machines. In supervised learning, this is an essential step.

Data Modelling

This is the fifth step which involves dataset training and model development. Datasets need to be split into train and test sets to evaluate how well our machine learning model performs. Models are fitted using train sets that have known statistics. In the second set, we have the test data set, which is used exclusively for predicting outcomes. We trained the models using 82 responses, and tested them using 21 responses from a validation dataset.

The dataset is divided into Test and train data for testing and training. X and y are defined for training the model where X is the independent variable and y is the dependent variable. X includes all the columns except "timeseries", and y is "Is Cryptocurrency an investment tool".

Random forest model and decision tree model is used for data modelling. *Random Forest* is used to Predicting Categorical variables and developed on a Decision tree. In the random forest, there are several decision trees representing distinct ways to classify data. Based on the majority of votes received, the random forest technique selects the prediction with the highest probability. Multiple trees prevent overfitting and avoid the use of random forest algorithms. *When training data has a large number of categorical values, decision trees are more effective.* It is easier to prepare data for decision trees during pre-processing. A decision tree does not require the normalization of data. Data scaling is not required for a decision tree.

Result and evaluation

This is the last step which involves evaluation of performance of each model through accuracy score of the respective models.

5.Implementation Specification

The cryptocurrency survey dataset uploaded to *google drive.* Google Colaboratory (Colab) was used to pre-process and train this dataset imported from Google Drive. To train and test and to apply different models on it, libraries are needed, such as (NumPy, pandas, seaborn, sklearn.) After that all the functionalities provided by libraries can be used on the dataset.

In coding, firstly data is splitted into Train and Test data.

*

```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(X,y,train_size=0.8,random_state=42,stratify=y)
```

Defined two variables x and y to split the data. So, x and y are test and train variables and train_size defines the percentage of data that is trained, in this case its 80%. *random_state* is used to generate random seed so that train-test splits are always deterministic. *Stratify_y* is used to make a split in a proportion. Stratify_y, for example, will ensure your random split consists of 25% 0s and 75% 1s if variable y is a binary categorical variable with values 0 and 1.

After training and testing data following machine learning algorithms are used:

1. Random Forest Classifier:

After splitting the data, finding the accuracy and model output is the next step, by putting everything under the confusion matrix which helps to find out the different scores which gives the model score on which the outcome is decided for the dataset. Confusion matrix works on X train and Y train data that is trained in previous step.

Confusion Matrix: The confusion matrix is used to evaluate the performance of the machine learning model. Here is the N*N matrix, where N is the number of target classes. The machine learning model's projected values are compared to the actual target values in the matrix. The effectiveness of a classification model is evaluated using a condensed table.

		Predicted	
		Negative (N) -	Positive (P) +
Actual	Negative -	True Negative (TN)	False Positive (FP) Type I Error
	Positive +	False Negative (FN) Type II Error	True Positive (TP)

Fig. 5.Confusion matrix

True Positive (TP): Model correctly predicts the positive class (prediction and actual both are positive).

True Negative (TN): Model correctly predicts the negative class (prediction and actual both are negative). I

False Positive (FP): Model gives the wrong prediction of the negative class (predicted-positive, actual-negative)

$$Recall = \frac{TP}{TP + FN}$$

False Negative (FN): Model wrongly predicts the positive class (predicted-negative, actual-positive).

Precision: A measure of precision is the proportion of correctly predicted positive observations compared to all predicted positive observations. The precision value lies between 0 and 1.

$$Precision = \frac{TP}{TP + FP}$$

Recall: It measures the percentage of positive observations that were correctly predicted compared to all the observations. It is the same as TPR (true positive rate).

F1 Score: It is the harmonic mean of precision and recall. It takes both false positive and false negatives into account. Therefore, it performs well on an imbalanced dataset. Having a good F1-score indicates that the classifier produces fewer false negatives than false positives.

$$F1\ score = \frac{2}{\frac{1}{Precision} + \frac{1}{Recall}} = \frac{2 * (Precision * Recall)}{(Precision + Recall)}$$

Confusion matrix, precision, recall, and F1 score provide better insights into the prediction as compared to accuracy performance metrics.

Following conditions for checking the accuracy of model:

1.True and False condition:

```
print_score(rf_clf, X_train, y_train, X_test, y_test, train=True)
print_score(rf_clf, X_train, y_train, X_test, y_test, train=False)
```

This condition shows Train and Test Result:
Train Result: 100%
Test Result: 85.71%

So here both conditions look overfitting, so by applying grid search cross validation will help to go into the depth of random forest. Grid search will use cross validating and selecting the best machine learning model by grid hyperparameters.
The grid search finds the best parameters by finding and fitting the mentioned parameters into the code.
And it gives the following output.

```
Fitting 3 folds for each of 768 candidates, totalling 2304 fits
Best parameters: {'bootstrap': True, 'max_depth': 2, 'max_features': 'auto', 'min_samples_leaf': 1, 'min_samples_split': 2, 'n_estimators': 100}
```

Here *max_depth* of tree is 2 size , *min_samples_leaf* is 1 to each node and *min_samples_split* is 2 with the estiamtors of 100.
After applying all of this the random forest score on both condition is as follows:

1.True and False condition:

```
print_score(rf_clf, X_train, y_train, X_test, y_test, train=True)
print_score(rf_clf, X_train, y_train, X_test, y_test, train=False)
```
This condition shows Train and Test Result:
Train Result: 86.59%
Test Result: 85.71%

Accuracy score for Test data is 85.71% and After Grid Search the Accuracy score for test data remains the same 85.71%.

2.Decision Tree:

The decision tree shows every possible output from a specific input based on a branching method. The random forest algorithm avoids and prevents overfitting by using multiple trees. For the decision , data need to train and test, so use *x_train* and *y_train* to train the parameters.

1. **True and False condition:**

```
print_score(tree_clf, X_train, y_train, X_test, y_test, train=True)
print_score(tree_clf, X_train, y_train, X_test, y_test, train=False)
```

This condition shows Train and Test Result:
Train Result: 100%
Test Result: 71.43%

As both the conditions looks overfitting, hyperparameter tuning to select best condition out of all the conditions.

```
Fitting 3 folds for each of 4332 candidates, totalling 12996 fits
Best paramters: {'criterion': 'gini', 'max_depth': 2, 'min_samples_leaf': 1, 'min_samples_split': 2, 'splitter': 'random'})
```

Below is the output.
Best paramters: {'criterion': 'gini', 'max_depth': 1, 'min_samples_leaf': 1, 'min_samples_split': 2, 'splitter': random})

The results are as follows:

1. **True and False condition:**

```
print_score(tree_clf, X_train, y_train, X_test, y_test, train=True)
print_score(tree_clf, X_train, y_train, X_test, y_test, train=False)
```

This condition shows Train and Test Result:
Train Result: 89.02%
Test Result: 85.71 %

The Accuracy for Test data is 71.43%. and After Hyperparameter tuning the Accuracy score increases to 85.71%.
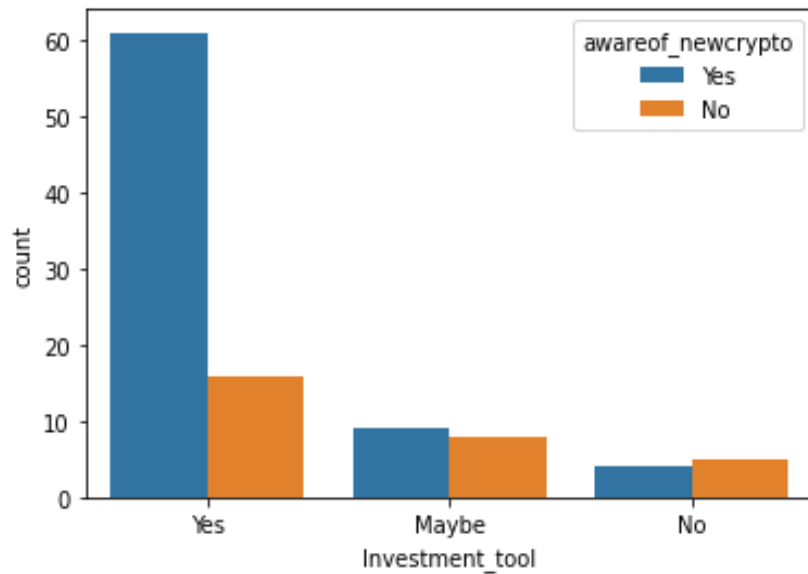
6.Result and Evaluation

Fig. 6.Aware of New Cryptocurrencies v/s New Investment tool in Future

*Fig. 6.*shows that the out of 102 respondent, 60 respondent who consider cryptocurrencies as a new investment tool are also aware about the new cryptocurrencies. 15 respondent consider cryptocurrencies as new investment tool, but they are not aware of the new cryptocurrencies. 10 respondent who are not sure about cryptocurrencies as a new investment, but they are aware of new cryptocurrencies. 8 respondents are neither sure about cryptocurrencies nor aware of new cryptocurrencies. 4 respondents do not consider cryptocurrencies as new investment tool, but they are aware of new cryptocurrencies. 5 respondents either consider cryptocurrency as new tool nor they are aware of new cryptocurrencies.
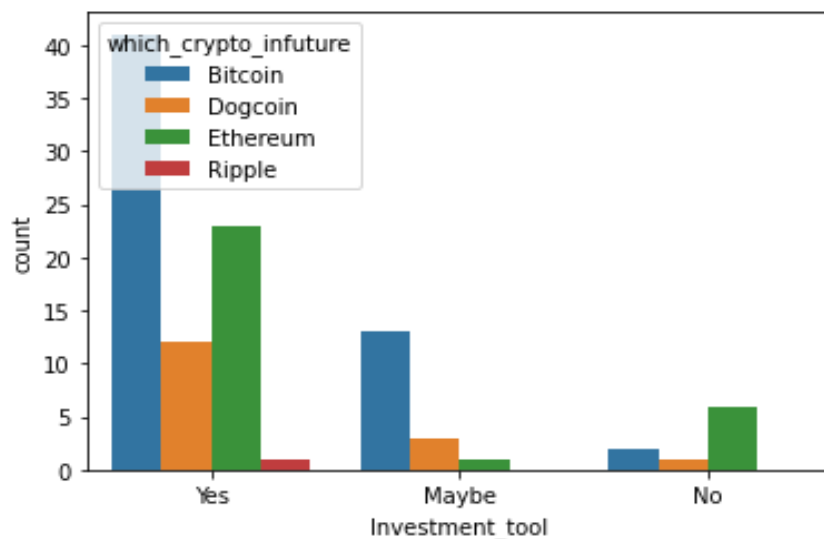

Fig. 7.Preference of type of cryptocurrency v/s New Investment tool In Future

Fig. 7.shows that out of 102 respondent, 77 respondent consider cryptocurrency as an new investment tool. Out of those 77 respondents, 40 respondents prefer to invest in Bitcoin,12

respondents interested to invest in Dogecoin, 24 respondents go with Ethereum, and 1 respondent is interested to invest in Ripple cryptocurrency.

Out of 102 respondents, 16 are unsure about investing in cryptocurrencies, but of those 16, 12 would rather do so in the form of Bitcoin, three would rather do so in the form of Dogecoin, and one would rather do so in the form of Ethereum.

9 out of 102 respondents do not see cryptocurrencies as a new investment instrument, and of those, 2 would rather invest in Bitcoin, 1 would rather invest in Dogecoin, and 6 would rather invest in Ethereum in the future.
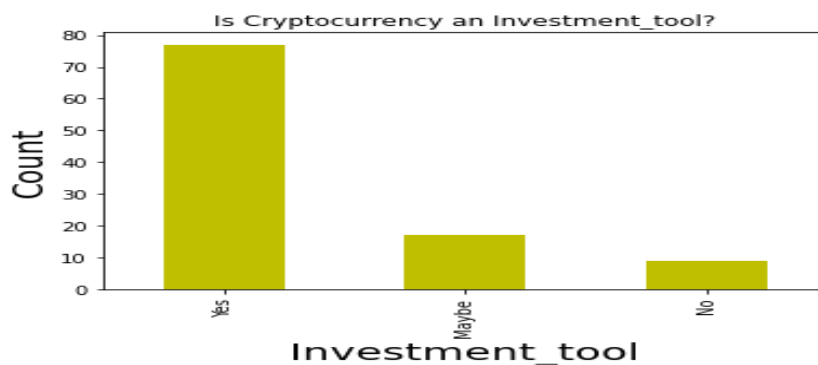

Fig. 8.Is Cryptocurrency a New Investment tool in Future?

The main aim is to find out the cryptocurrency is investment tool for the future or not. Here the above Fig. 8 clearly indicates that 77 respondents think that cryptocurrency is a future investment tool, on the other hand 17 respondents are not sure and 8 respondents do not consider cryptocurrency as a new investment took for the future.
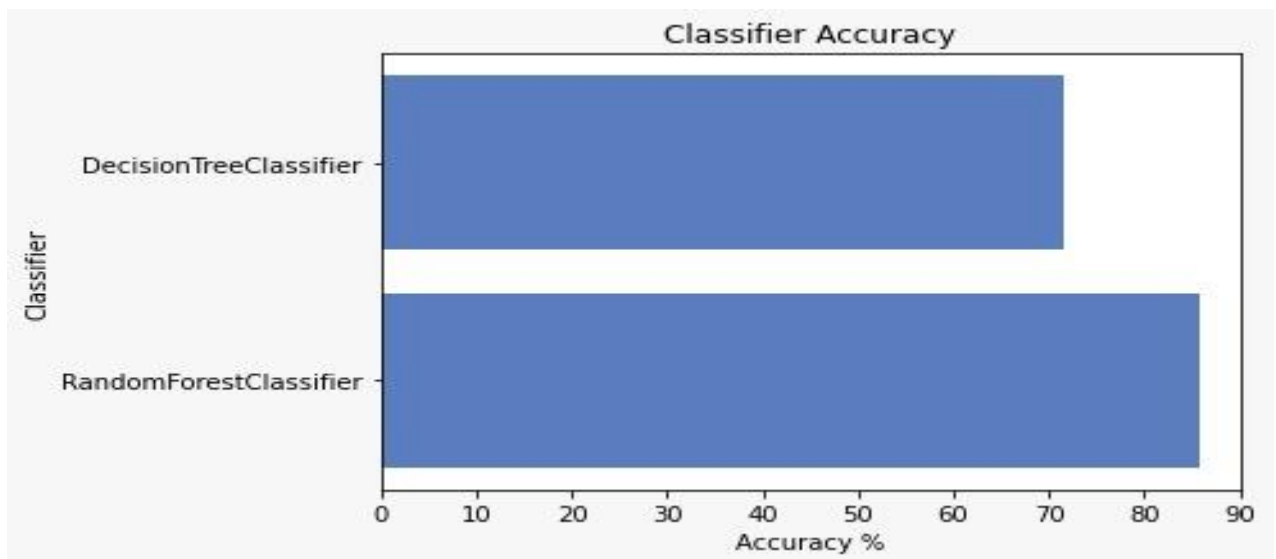
Classifier Accuracy:

Fig. 9.Classifier Accuracy of Decision Tree and Random Forest.

As a measure of a classification model's performance, classification accuracy can be calculated by dividing the number of correct predictions by the total number of predictions made by the model. Generally, classifier models are evaluated using this metric due to its simplicity of calculation.

Fig. 9 shows Decision tree classifier and Random Forest classifier accuracy in percentage. After hyperparameter tuning both models show same accuracy. As both the models have accuracy nearby, we can select the parameter is Log loss.
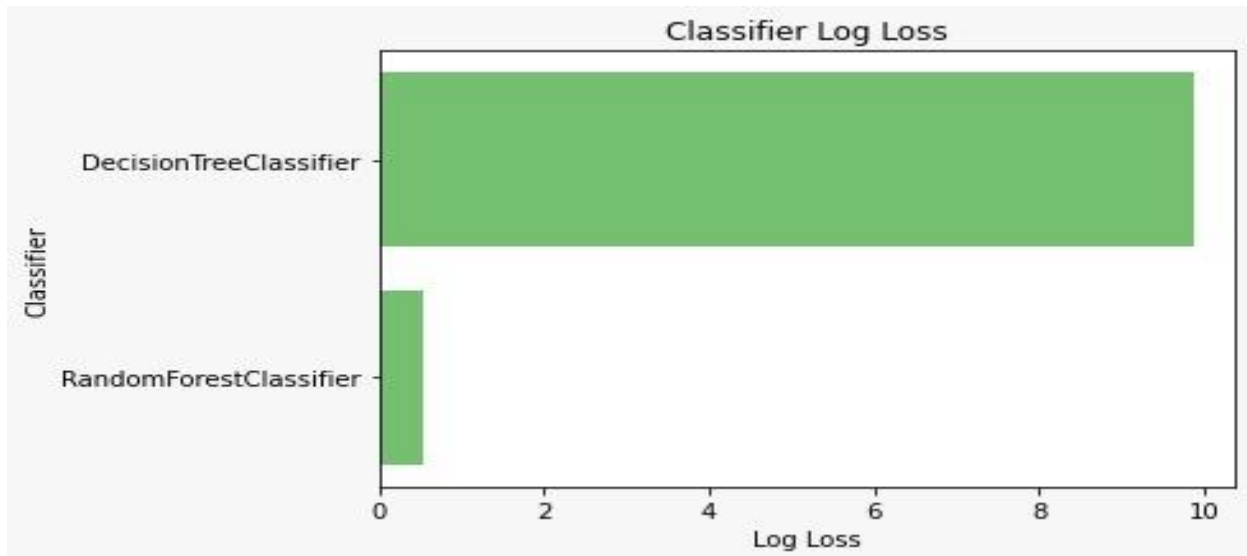
Classifier Log Loss:

Fig. 10.Log Loss of Decision tree and Random Forest Classifier

The log-loss in binary classification shows how well the forecast probability matches the actual value. A difference between expected and actual probability results in a larger log loss.

How closely the forecast probability matches the associated real or true value is shown by log-loss (0 or 1 in case of binary classification). The higher the log-loss number, the more the projected probability deviates from the actual value.

The decision tree classifier is having the **Accuracy of 71.4286%** (Fig. 9) with the **Log Loss of 9. 86822182711734** (Fig. 10)**.** The prediction is closer to the actual values of dependent variable. The random forest Classifier shows the **Accuracy of 85.7143%** (Fig. 9) with the **Log Loss of 0.5214282526130513** (Fig. 10)**.** So, depending on above observation it can be concluded that the Random Forest Classifier is more efficient for making prediction after hyperparameter tuning as compared to the Decision tree Model. Since the log loss of Random Forest is lower than the Decision tree.

7.Conclusion and future work

Survey helped to find out major objective which fulfils and justify the aim of this paper. The data of 102 attendees from survey helped to find out their views about cryptocurrencies. Bitcoin is the most preferred cryptocurrency amongst the people who consider cryptocurrency as a new investment tool. On the other hand, a lot of people are aware of the

new cryptocurrency in addition to Bitcoin, which amply demonstrates the development of cryptocurrencies in the Indian market. To discover the accuracy and best model for the dataset, machine learning methods were utilized. Both the Random Forest and Decision Tree models appear to be effective in achieving the goal of our work. The Random Forest Classifier exhibits lower log loss at the conclusion of model training than the Decision tree Model, indicating that random forest is more accurate at making predictions.

Is cryptocurrency is a new investment tool or not, is still a question as the number of respondent are limited to make the predications and reach the final outcome.

This research paper can be improved by adding logistic regression approach which is used to select a model for the framework based on the dependent variables and optimization of the models and using iterative techniques such as bagging and bosting which will improve the accuracy. Furthermore, if the outcome of survey is high then the probability of getting more accuracy on each model will increase the chance to reach the aim. There are a lot of features with no meaning to predict target variable.

Adding more questionnaire to make more dependent variables which will help to prove the aim of this paper.

References

Agarwal, N., Jain, A., Gupta, A. and Tayal, D.K., 2021, November. Applying XGBoost Machine Learning Model to Succor Astronomers Detect Exoplanets in Distant Galaxies. In International Conference on Artificial Intelligence and Speech Technology (pp. 385-404). Springer, Cham.

Alakus, T.B. and Turkoglu, I., 2020. Comparison of deep learning approaches to predict COVID-19 infection. *Chaos, Solitons & Fractals*, *140*, p.110120.

Al-Amri, R., Zakaria, N.H., Habbal, A. and Hassan, S., 2019. Cryptocurrency adoption: current stage, opportunities, and open challenges. *International journal of advanced computer research*, *9*(44), pp.293-307.

Arikan, N.İ., 2020. an Overview of the cryptocurrencies; the theory of money perspective. *Malatya Turgut Özal Üniversitesi İşletme ve Yönetim Bilimleri Dergisi*, *1*(2), pp.147-165.

Baur, D.G. and Dimpfl, T. (2021). The volatility of Bitcoin and its role as a medium of exchange and a store of value. *Empirical Economics*. [online] doi:10.1007/s00181-020-01990-5.

Cantwell, A., 2020. *Raising the Stakes: The Use and Future Adoption of Cryptocurrency within Online Gambling in Ireland* (Doctoral dissertation, Dublin, National College of Ireland).

Chen, Y. and Bellavitis, C., 2020. Blockchain disruption and decentralized finance: The rise of decentralized business models. *Journal of Business Venturing Insights*, *13*, p.e00151.

Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, pp.319-340.

Gupta, M. and Bagga, T., (2017) "STUDY OF CONSUMER AWARENESS ON CRYPTOCURRENCY IN INDIA.

Hoffman, M.R., Ibáñez, L.D. and Simperl, E., 2020. Toward a formal scholarly understanding of blockchain-mediated decentralization: A systematic review and a framework. *Frontiers in Blockchain*, *3*, p.35.

Ishak, N., 2020. Public Financial Transaction Database: The Overview of Cryptocurrency. *International Journal of Advanced Research in Economics and Finance*, *2*(1), pp.38-47.

Iyer, S.G. and Pawar, A.D., 2018, August. GPU and CPU accelerated mining of cryptocurrencies and their financial analysis. In 2018 2nd International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC) I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC), 2018 2nd International Conference on (pp. 599-604). IEEE.

Likos, P. and Hicks, C., 2022. *The History of Bitcoin, the First Cryptocurrency*. [online] Available at: https://money.usnews.com/investing/articles/the-history-of-bitcoin

Luchkin, A.G., Lukasheva, O.L., Novikova, N.E., Melnikov, V.A., Zyatkova, A.V. and Yarotskaya, E.V., 2020, August. Cryptocurrencies in the global financial system: problems and ways to overcome them. In *Russian Conference on Digital Economy and Knowledge Management (RuDEcK 2020)* (pp. 423-430). Atlantis Press.

Medium. n.d. *What is a confusion matrix?* [online] Available at: https://medium.com/analytics-vidhya/what-is-a-confusion-matrix-d1c0f8feda5

Nazifi, A., Murdy, S., Marder, B., Gäthke, J. and Shabani, B., 2021. A Bit (coin) of happiness after a failure: An empirical examination of the effectiveness of cryptocurrencies as an innovative recovery tool. *Journal of Business Research*, *124*, pp.494-505.

Researchgate, 2022. *Technology Acceptance Model (TAM) model for adopting blockchain technology in Internet of Things (IoT) environment.* Available at: *https://www.researchgate.net/figure/Technology-Acceptance-Model-TAM-model-for-adopting-blockchain-technology-in-Internet-of_fig1_34235826*

Rezaei, A., Fathony, R., Memarrast, O. and Ziebart, B., 2020, April. Fairness for robust log loss classification. In *Proceedings of the AAAI Conference on Artificial Intelligence* (Vol. 34, No. 04, pp. 5511-5518).

Rosic, A. (2016). What is Cryptocurrency: [Everything You Need to Know!] [online] Available at : https://blockgeeks.com/guides/what-is-cryptocurrency/

Samford, H. and Domingo, L.F., 2019. The political geography and environmental impacts of cryptocurrency mining. *The Henry M. Jackson School of International Studies*, pp.July-10.

Shih, D.H., Huang, F.C., Chieh, C.Y., Shih, M.H. and Wu, T.W., 2021. Preventing return fraud in reverse logistics—A case study of ESPRES solution by Ethereum. *Journal of Theoretical and Applied Electronic Commerce Research*, *16*(6), pp.2170-2191.

Shukla, V., Mishra, M. and Chaturvedi, A., 2022. Journey of Cryptocurrency in India In View of Financial Budget 2022-23. [online] Available at: https://doi.org/10.48550/arXiv.2203.12606

Taheri Tolu, M., Yazdanian, N., Hemmati, H., Kordlouoie, H. (2022). 'Accepting Financial Transactions Using Blockchain Technology and Cryptocurrency based on the TAM Model: A Case Study of Iranian Users', *Iranian Journal of Accounting, Auditing and Finance*, 6(2), pp. 97-109. doi: 10.22067/ijaaf.2022.41763

Urquhart, A., 2016. The inefficiency of Bitcoin. *Economics Letters*, *148*, pp.80-82.

Vujičić, D., Jagodić, D. and Ranđić, S., 2018, March. Blockchain technology, bitcoin, and Ethereum: A brief overview. In *2018 17th international symposium infoteh-jahorina (infoteh)* (pp. 1-6). IEEE.

Wu, J., Liu, J., Zhao, Y. and Zheng, Z., 2021. Analysis of cryptocurrency transactions from a network perspective: An overview. *Journal of Network and Computer Applications*, *190*, p.103139.

Yacouby, R. and Axman, D., 2020, November. Probabilistic extension of precision, recall, and F1 score for more thorough evaluation of classification models. In *Proceedings of the first workshop on evaluation and comparison of NLP systems* (pp. 79-91).

Yussof, S.A. and Al-Harthy, A.M.H., 2018. Cryptocurrency as an alternative currency in Malaysia: issues and challenges. *ICR journal*, *9*(1), pp.48-65.