Capstone Project

Mobile price classification

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I.Definition

Project over view:

- Now a days the mobiles are used all around the world . In the present situation we cannot imagine the world without mobile .
- Mobile plays an important role in our economy
- It a part of our life style. The mobile has devolped our economy very well. Now a days a person can live without eating food and water but he cannot live without a mobile phone. In this manner the mobile have become a most important thing in the life of a common man
- It has many uses so it is very important for a common man to predict the price of. A mobile phone.
- The price of the mobile it effected by some of the important features they are:
    1. RAM
    2. BATTERY LIFE
    3. INTERNAL MEMORY
    4. FOUR G CAPABILITY
    5. FRONT CAMERA
    6. PRIMARY CAMERA
    7. WEIGHT OF THE MOBILE
    8. CORE OF THE MOBILE
    9. Brand of a mobile
- These are some of the factors that effect the price of the mobile

- These are very important for a customer to buy a mobile. Infact many people observe these features to buy the mobile phone mainly ram is a very important feature which will decide the price and internal memory is a second important feature which the common man observe while he purchase a mobile and he even observes the front and back camera these are three main factors effect the mobile price

  https://www.kaggle.com/iabhishekofficial/mobile-price-classification

  History:
- In the ancient period the mankind have made communication through pigeons through letters
- There are many different ways to transmit information from one person to another through make the communication process easier the man has invented a telephone. The telephone has made the communication easier
- Previous days the telephone is only used to make calls from one location to another as the population was increasing and the demands were increasing the man need a portable device which can be used to communicate from one location to another location.
- There began evolution of mobile phone. In the initial days there was a feature phone which is used for communication from one location to another and this is a portable phone.
- Later on the needs are increasing for the man he had invented a smart phone
  This has made the world more advanced and living of mankind was very easy.

Early services:

- MTS
- In 1949 At &T commercialized mobile telephone service. From its start in st.louis in 1946 ,At &t introduced mobile telephone service to one hundred towns and high way corridors by 1948
- IMTS

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- At &t introduced first major improvement to mobile telephony in 1965 giving improved service the obvious name of improved mobile telephone services. IMTS used additional radio channels allowing more simultaneous calls in a given geographic area introducing customer dialing, eliminating manual call set up by an operator and reduced size and weight of subscriber equipment
- RADIO COMMON CARRIER :
- Radio common carrier was a service introduced in 1960 by independent telephone companies to compete against AT&T IMTS. Rcc systems are used to paired UHF and VHF 152/158 frequencies near those used by imts. Rcc based services were provided until 1980 when cellular AMPS systems made Rcc equipment obsolete
- Some rcc systems were designed to allow customers of adjacent carriers to use their facilities but equipment of modren roming because of technical standards were not uniform.

Generations :

- 1G :It was introduced in October 1983 In america the phone had a talk time of just 35 mins and took 10 hours to charge .
- 2G : This is digital cellular in 1990 s second generation mobile systems emerged. Two systems completed for supremacy in global market one is GSM and CDMA. These were very active . In 1993 IBM simon was introduced. This was probably the worlds first smart phone. It was mobile phone,pager,fax machine and PDA all rolled in one. It included calender,address book, clock,calculater,notepad,email and touch screen with QWERTY keyboard in second generation there was an SMS facility
- 3G: it has internet 2.4mb to 3.1 mb/s it has 3g technology the 3g internet speed the phone has front and back camera which has low clarity
- 4G: native ip networks in 4G technology the internet speed has increased and they were in LTE standard. The camera pixels also have

Increased with good pictures the internal memory In the phone the processing speed of the phone also has increased

Applications :

- The mobile phone has changed the fate of mankind. There are many advantages of the smart phone
- The smart phone make voice calls and vedio calls to persons who are different places it makes the communication very easier. This helps to make the realation ship stronger
- The smart phone make text and messages very easily easily within a fraction of seconds. It very easy to make messages to frnds and parents who are in the far distances. These is fast mode of communication
- The mobile phone is used for exploring thing the exploring is very with a smart phone. We can find new things buy browsing in internet. We can find answers to unknown question which helps increasing knowledge to the students
- It helps in taking pictures which are made as memories for the future every we need to carry camera the smart phone is very easy to carry instead of camera because it a portable device
- Internal memory helps the person to store the photos and vedios as memories and it helps to download and store the useful which are helpful for human being
- Ram makes our lifr faster it access the data fastly

Data sets and Inputs :

- The data set which I am working is downloaded from kaggle .This data set has 21 features of the mobile and 2001 number of data of different Mobiles
- There are two data set one is train data set and another one is test data set

Problem Statement :

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- The aim of this project is to predict the price of the mobile based on the given features of the mobile phone. This problem is a regression problem i am going to use the regression algorithms to solve this problem.
- My solution is to apply decision trees to this problem and i will use linear regression as a bench mark model.

METRICS :

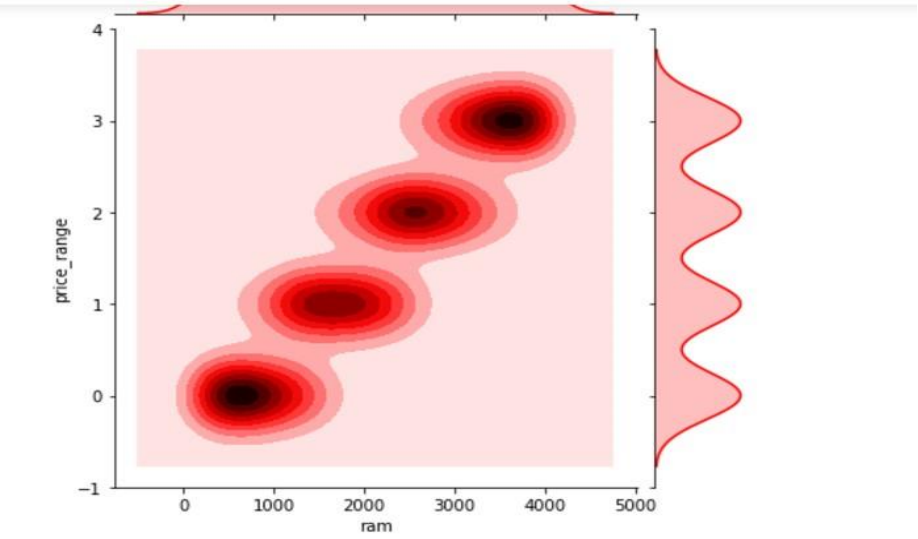
- Since my problem is regression problem i will use score() as a metrics inorder to calculate the performance of the model and by this i will get high score for linear regression model.

II.ANALYSIS

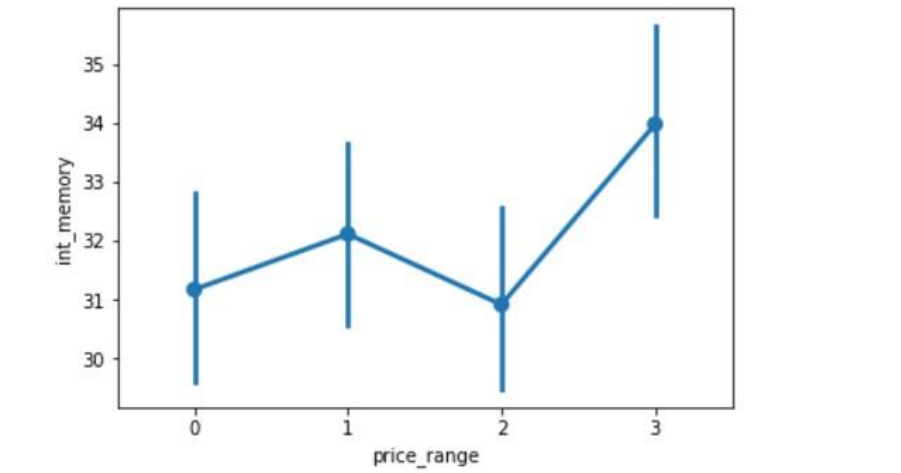
Data Exploration :

- The data plays a very important role in price prediction of the mobile
- There are many important features that effect the price of the phone
- The main important features are RAM, ROM, camera, battery life is the phone 4 g compatibility or not
- They play major role in deciding the rate of the phone
- The customers think if having a good phone which is bery faster and they need the enough memory to store their data. They need a good camera to take selfies they want long battery life for their mobile
- There many others features even to give price to the mobile

Now let us consider plot between price and ram



Now let us consider a point plot between price range and internal memory as the internal memory increase the price will also get imcreased



Now let us see the pie chart for how many phone support 4G . Mostly half of the phones support 4G technology

Now let us consider a pie chart to see about 4g mobiles

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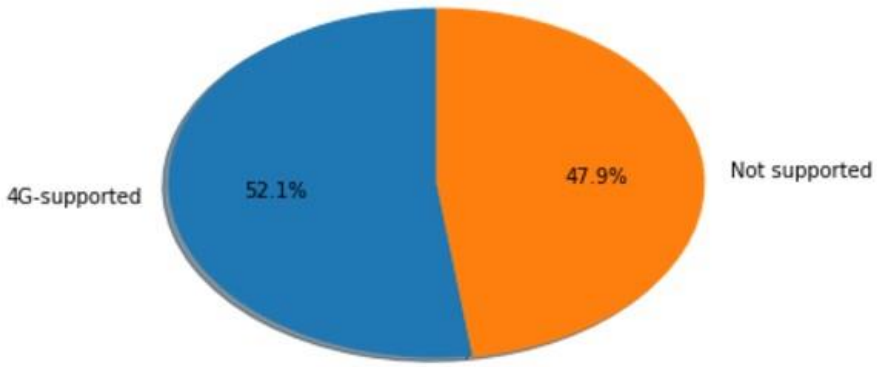
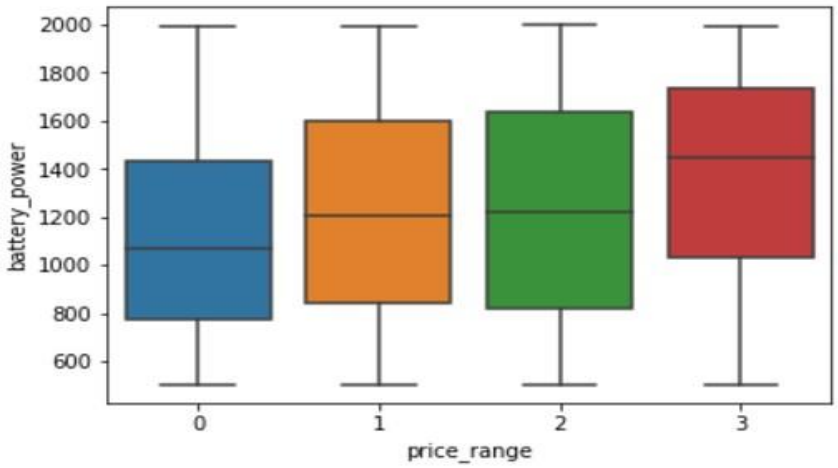


Around52 percent phones support 4g

Now let us consider a box plot about the relationship between battery life and price range

As the battery life incrxease price increases it helps us knowing the impotance of battery life



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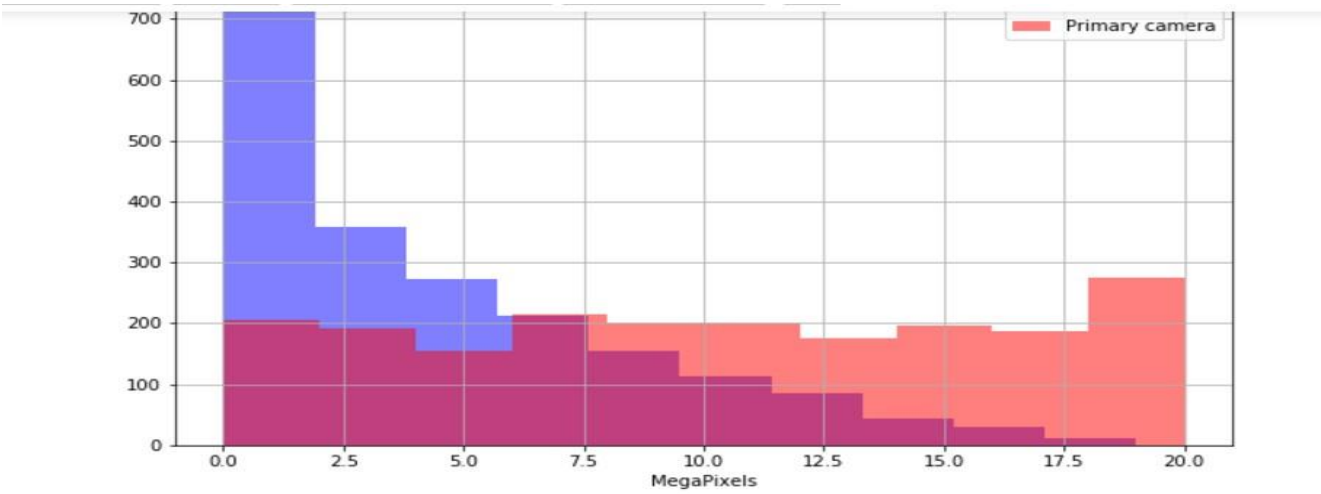
Now let us plot one more graph about camera. In graph we denote the realtionship between camera and price range in this blue color indicates front camera orange indicates primary camera

By this we came to know that as the number of pixels increases the price will increase



Algorithms and techniques :

- Regression algorithms are used for solving we use decision tree and linear regression for this problem.

Decision Tree:

The decison tree is a supervised learning algorithum . Decision tree is to create training model which can use to predict class or value to target variables by learning decison rules infered from prior data. The decision tree break down tha data into smaller sub parts while at same time an asscociated decision tree is incrementally developed The final result is tree with decison nodes and leaf nodes A decison node has two or more braches . If we want to select the node in Decision tree we have to

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calculate entropy . Then we decide the nodes in the decision tree. An example of decison tree.

Bench mark :

I have used linear regression as bench mark model the linear regression has good score when compared with decision tree . This is a linear approch to modelling the relationship between a scalar response and one or more explanatory variables. It is a simplest way and most widely used statistical technique for predictive modelling . It gives an equation where we have our features as independent variables on which our target variable is dependent upon. We should draw a line that best fits our data that means the line should have some distance to the data points. The reason is that our predicted values should be closer to our actual or observed values because there is no point predicting values which are far away from real values . The cost function should be calculated to get the best line.

The bench mark model has good score than Decision tree.

Methodology:

Now i will preprocess the data i will remove outliers for the data and replace the null values in the data and make the as it fit for applying an algorithm.

Implementation :

In implementation i will import train_test_split from sklearn model and i will divide my data into training and test sets and i will give the random state

Now i will import decision tree classifier from sklearn. Tree classifier now i will fit my data into decision tree by using fit()

After that i will calculate score by using score().

Refinement :

The score of the decision tree will be only 82percent this not even bad but it is less than some models the main disadvantage of decision tree is overfitting the data . We will improve the score using another model linear regression we import linear regression . We will fit our data into it and we will calculate the score and we will get the accuracy of 91 percent

Results:

In the final model the score was linear regression it has good score of 91% than decision tree which has the score of 82% . It has good score the model is used for our problem .

Justification

The final results occurred from the bench mark model are strong when compared with the decision tree model the decision have good score on

training set but it have less score on test data set. But linear reggresion have good score on test set. So it is the best model

Conclusion

The decision has training accuracy of 100% but it has testing accuracy of 82% because the decision overfits the data . The linear regression has training accuracy of 92% and testing accuracy of 91% . So the conclusion is linear regression predicts better than decision tree

Reflection :

Firstly I have searched for the problem in kaggle as I am intrested in supervised learning problems I have searched for them , and even I am intrested in electronic gadgets like mobile I have searched problem based on them and I found this problem very intresting and started for solution . I have observed the data . And explored the data I have plotted them I tried different algorithms which are used for classification after that I have realised that they are not useful and used regression algorithms . I have calculate score for them and compared the score and I decided the best model.

Improvements:

We can improve this model by using ensemble methods like ADaBoost classifier,XGboost classifier etc.... so the score can improved in this manner

Reference Links

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