NASA-Asteroid Prediction

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Code

```
#Importing Data astr<-read.csv("D:/R
FOLDER/nasa.csv")

#Checking Data
head(astr) str(astr)
tail(astr)

#Data Correction sum(is.na(astr)) pairs(astr[,1:4], col =
astr$Miles.per.hour, main = "Astroid Speed Ploting")

#Collecting data for Sampling set.seed(123)#collect
the data in random order sample_indices <-
sample(1:nrow(astr),0.7*nrow(astr)) train_data <-
astr[sample_indices,] test_data<-
astr[sample_indices,]

#Histogram
# Create a colorful histogram hist(astr$Epoch.Date.Close.Approach,
col = rainbow(12), breaks = 12,      main = "Colorful Histogram of
Epoch Date Close Approach",      xlab = "Epoch Date Close Approach")
model <- lm(Absolute.Magnitude~Mean.Motion, data = astr) plot(model)
summary(model)

#Finding Something Relatable avg_sp
<- mean(astr$Miles.per.hour)
cat("Average Speed:",avg_sp , "\n")
#Plotting Some graph
IrisPlot <- ggplot(astr, aes(Inclination, Orbit.Uncertainity)) + geom_point()
print(IrisPlot)

#Prediction new_data <- data.frame(Mean.Motion = c(0.5, 1, 1.5))# Create a new data
frame with some values of Mean.Motion new_pred <- predict(model, new_data)# Predict the
Absolute.Magnitude using the model cat("Predictions for new data:", new_pred, "\n")#
Print the predictions
 library(rpart)
model<- rpart(Neo.Reference.ID~Absolute.Magnitude + Relative.Velocity.km.per.hr +
Orbital.Period + Miss.Dist..miles., data = train_data)  library(rpart.plot)
rpart.plot(model,main="decision tree")
```

Output

```
#Importing Data
> astr<-read.csv("D:/R FOLDER/nasa.csv")
> #Checking Data
> head(astr)
  Neo.Reference.ID    Name Absolute.Magnitude Est.Dia.in.KM.min.
1          3703080 3703080               21.6        0.127219878
2          3723955 3723955               21.3        0.146067964
3          2446862 2446862               20.3        0.231502122
4          3092506 3092506               27.4        0.008801465
5          3514799 3514799               21.6        0.127219878
6          3671135 3671135               19.6        0.319561887
  Est.Dia.in.KM.max. Est.Dia.in.M.min. Est.Dia.in.M.max.
1         0.28447230         127.219879          284.47230
2         0.32661790         146.067964          326.61790
3         0.51765448         231.502122          517.65448
4         0.01968067           8.801465           19.68067
5         0.28447230         127.219879          284.47230
6         0.71456210         319.561887          714.56210
  Est.Dia.in.Miles.min. Est.Dia.in.Miles.max. Est.Dia.in.Feet.min.
1           0.079050743             0.1767628             417.3881
2           0.090762397             0.2029509             479.2256
3           0.143848705             0.3216555             759.5214
4           0.005468975             0.0122290              28.8762
5           0.079050743             0.1767628             417.3881
6           0.198566489             0.4440082            1048.4314
  Est.Dia.in.Feet.max. Close.Approach.Date Epoch.Date.Close.Approach
1              933.30809          1995-01-01               788947200000
2             1071.58106          1995-01-01               788947200000
3             1698.34153          1995-01-08               789552000000
4              64.56914          1995-01-15               790156800000
5              933.30809          1995-01-15               790156800000
6             2344.36393          1995-01-15               790156800000
  Relative.Velocity.km.per.sec Relative.Velocity.km.per.hr Miles.per.hour
1                     6.115834                    22017.00       13680.51
2                    18.113985                    65210.35       40519.17
3                     7.590711                    27326.56       16979.66
4                    11.173874                    40225.95       24994.84
5                     9.840831                    35426.99       22012.95
6                    10.808844                    38911.84       24178.30
  Miss.Dist..Astronomical. Miss.Dist..lunar. Miss.Dist..kilometers.
1               0.41948253         163.17871                62753692
2               0.38301446         148.99263                57298148
3               0.05095602          19.82189                 7622912
4               0.28532233         110.99039                42683616
5               0.40783217         158.64671                61010824
6               0.39278478         152.79327                58759768
  Miss.Dist..miles. Orbiting.Body Orbit.ID Orbit.Determination.Date
1          38993336         Earth       17      2017-04-06 08:36:37
2          35603420         Earth       21      2017-04-06 08:32:49
3           4736658         Earth       22      2017-04-06 09:20:19
4          26522368         Earth        7      2017-04-06 09:15:49
5          37910368         Earth       25      2017-04-06 08:57:58
6          36511628         Earth       40      2017-06-04 06:16:52
  Orbit.Uncertainity Minimum.Orbit.Intersection Jupiter.Tisserand.Invariant
1                  5                    0.0252819                       4.634
2                  3                    0.1869350                       5.457
3                  0                    0.0430579                       4.557
4                  6                    0.0055118                       5.093
5                  1                    0.0347980                       5.154
6                  1                    0.2722130                       4.724
  Epoch.Osculation Eccentricity Semi.Major.Axis Inclination
1          2458001    0.4255491        1.407011    6.025981
2          2458001    0.3516743        1.107776   28.412996
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3          2458001    0.3482483        1.458824    4.237961
4          2458001    0.2165783        1.255903    7.905894
5          2458001    0.2104479        1.225615   16.793382
6          2458001    0.5634411        1.323532   17.927751
  Asc.Node.Longitude Orbital.Period Perihelion.Distance Perihelion.Arg
1          314.37391       609.5998           0.8082589       57.25747
2          136.71724       425.8693           0.7181996      313.09197
3          259.47598       643.5802           0.9507910      248.41504
4          57.17327       514.0821           0.9839016       18.70770
5          84.62931       495.5978           0.9676866      158.26360
6          178.97195       556.1606           0.5777998      198.14597
  Aphelion.Dist Perihelion.Time Mean.Anomaly Mean.Motion Equinox Hazardous
1      2.005764         2458162    264.83753   0.5905514   J2000      True
2      1.497352         2457795    173.74111   0.8453298   J2000     False
3      1.966857         2458120    292.89365   0.5593708   J2000      True
4      1.527904         2457902     68.74101   0.7002772   J2000     False
5      1.483543         2457814    135.14213   0.7263954   J2000      True
6      2.069265         2458009    354.23737   0.6472951   J2000     False >
       str(astr)
'data.frame': 4687 obs. of  40 variables:
 $ Neo.Reference.ID           : int  3703080 3723955 2446862 3092506 3514799 3671135
2495323 2153315 2162463 2306383 ...
 $ Name                       : int  3703080 3723955 2446862 3092506 3514799 3671135
2495323 2153315 2162463 2306383 ...
 $ Absolute.Magnitude         : num  21.6 21.3 20.3 27.4 21.6 19.6 19.6 19.2 17.8 21.
5 ...
 $ Est.Dia.in.KM.min.         : num  0.1272 0.1461 0.2315 0.0088 0.1272 ...
 $ Est.Dia.in.KM.max.         : num  0.2845 0.3266 0.5177 0.0197 0.2845 ...
 $ Est.Dia.in.M.min.          : num  127.2 146.1 231.5 8.8 127.2 ...
 $ Est.Dia.in.M.max.          : num  284.5 326.6 517.7 19.7 284.5 ...
 $ Est.Dia.in.Miles.min.      : num  0.07905 0.09076 0.14385 0.00547 0.07905 ...
 $ Est.Dia.in.Miles.max.      : num  0.1768 0.203 0.3217 0.0122 0.1768 ...
 $ Est.Dia.in.Feet.min.       : num  417.4 479.2 759.5 28.9 417.4 ...
 $ Est.Dia.in.Feet.max.       : num  933.3 1071.6 1698.3 64.6 933.3 ...
 $ Close.Approach.Date        : chr  "1995-01-01" "1995-01-01" "1995-01-08" "1995-01-
15" ...
 $ Epoch.Date.Close.Approach  : num  7.89e+11 7.89e+11 7.90e+11 7.90e+11 7.90e+11 ...
 $ Relative.Velocity.km.per.sec: num  6.12 18.11 7.59 11.17 9.84 ...
 $ Relative.Velocity.km.per.hr : num  22017 65210 27327 40226 35427 ...
 $ Miles.per.hour             : num  13681 40519 16980 24995 22013 ...
 $ Miss.Dist..Astronomical.   : num  0.419 0.383 0.051 0.285 0.408 ...
 $ Miss.Dist..lunar.          : num  163.2 149 19.8 111 158.6 ...
 $ Miss.Dist..kilometers.     : num  62753692 57298148 7622912 42683616 61010824 ...
 $ Miss.Dist..miles.          : num  38993336 35603420 4736658 26522368 37910368 ...
 $ Orbiting.Body              : chr  "Earth" "Earth" "Earth" "Earth" ...
 $ Orbit.ID                   : int  17 21 22 7 25 40 43 22 100 30 ...
 $ Orbit.Determination.Date   : chr  "2017-04-06 08:36:37" "2017-04-06 08:32:49" "201
7-04-06 09:20:19" "2017-04-06 09:15:49" ...
 $ Orbit.Uncertainity         : int  5 3 0 6 1 1 1 0 0 0 ...
 $ Minimum.Orbit.Intersection : num  0.02528 0.18693 0.04306 0.00551 0.0348 ...
 $ Jupiter.Tisserand.Invariant : num  4.63 5.46 4.56 5.09 5.15 ...
 $ Epoch.Osculation           : num  2458001 2458001 2458001 2458001 2458001 ...
 $ Eccentricity               : num  0.426 0.352 0.348 0.217 0.21 ...
 $ Semi.Major.Axis            : num  1.41 1.11 1.46 1.26 1.23 ...
 $ Inclination                : num  6.03 28.41 4.24 7.91 16.79 ...
 $ Asc.Node.Longitude         : num  314.4 136.7 259.5 57.2 84.6 ...
 $ Orbital.Period             : num  610 426 644 514 496 ...
 $ Perihelion.Distance        : num  0.808 0.718 0.951 0.984 0.968 ...
 $ Perihelion.Arg             : num  57.3 313.1 248.4 18.7 158.3 ...
 $ Aphelion.Dist              : num  2.01 1.5 1.97 1.53 1.48 ...
 $ Perihelion.Time            : num  2458162 2457795 2458120 2457902 2457814 ...
 $ Mean.Anomaly               : num  264.8 173.7 292.9 68.7 135.1 ...
 $ Mean.Motion                : num  0.591 0.845 0.559 0.7 0.726 ...
 $ Equinox                    : chr  "J2000" "J2000" "J2000" "J2000" ...
$ Hazardous                  : chr  "True" "False" "True" "False" ...
> tail(astr)
     Neo.Reference.ID    Name Absolute.Magnitude Est.Dia.in.KM.min.
4682          3662283 3662283             20.700        0.192555078
4683          3759007 3759007             23.900        0.044111820
4684          3759295 3759295             28.200        0.006089126
4685          3759714 3759714             22.700        0.076657557
4686          3759720 3759720             21.800        0.116025908
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4687          3772978 3772978             19.109        0.400640618
     Est.Dia.in.KM.max. Est.Dia.in.M.min. Est.Dia.in.M.max.
4682         0.43056624        192.555078         430.56624
4683         0.09863703         44.111820          98.63703
4684         0.01361570          6.089126          13.61570
4685         0.17141151         76.657557         171.41151
4686         0.25944182        116.025908         259.44182
4687         0.89585966        400.640618         895.85966
     Est.Dia.in.Miles.min. Est.Dia.in.Miles.max. Est.Dia.in.Feet.min.
4682           0.119648141           0.267541378            631.74240
4683           0.027409806           0.061290189            144.72382
4684           0.003783606           0.008460401             19.97745
4685           0.047632783           0.106510141            251.50118
4686           0.072095135           0.161209622            380.66244
4687           0.248946461           0.556661210           1314.43776
     Est.Dia.in.Feet.max. Close.Approach.Date Epoch.Date.Close.Approach
4682             1412.61896          2016-09-08               1.473318e+12
4683              323.61231          2016-09-08               1.473318e+12
4684               44.67093          2016-09-08               1.473318e+12
4685              562.37374          2016-09-08               1.473318e+12
4686              851.18709          2016-09-08               1.473318e+12
4687             2939.17219          2016-09-08               1.473318e+12
     Relative.Velocity.km.per.sec Relative.Velocity.km.per.hr Miles.per.hour
4682                     26.016058                    93657.81      58195.320
4683                     22.154265                    79755.35      49556.876
4684                      3.225150                    11610.54       7214.338
4685                      7.191642                    25889.91      16086.984
4686                     11.352090                    40867.52      25393.489
4687                     35.946852                    129408.67     80409.513
     Miss.Dist..Astronomical. Miss.Dist..lunar. Miss.Dist..kilometers.
4682              0.167563751         65.182297              25067180.0
4683              0.041360957         16.089413               6187511.0
4684              0.006468891          2.516399                967732.4
4685              0.061008722         23.732393               9126775.0
4686              0.260759621        101.435493              39009084.0
4687              0.462371921        179.862671              69169856.0
     Miss.Dist..miles. Orbiting.Body Orbit.ID Orbit.Determination.Date
4682          15576024.0         Earth       16      2017-04-06 08:42:24
4683           3844741.0         Earth        4      2017-04-06 08:24:07
4684            601321.1         Earth        2      2017-04-06 08:23:58
4685           5671115.0         Earth       17      2017-04-06 08:23:43
4686          24239122.0         Earth        6      2017-04-06 08:23:42
4687          42980156.0         Earth       13      2017-04-29 06:18:33
     Orbit.Uncertainity Minimum.Orbit.Intersection
4682                  1                 0.12149900
4683                  8                 0.01977670
4684                  6                 0.00645071
4685                  6                 0.05997250
4686                  5                 0.17751000
4687                  6                 0.05177690
     Jupiter.Tisserand.Invariant Epoch.Osculation Eccentricity
4682                       3.843          2458001   0.65289899
4683                       5.156          2457638   0.36151224
4684                       5.742          2458001   0.07320031
4685                       4.410          2458001   0.36805470
4686                       4.477          2458001   0.20256481
4687                       4.108          2458001   0.40564221
     Semi.Major.Axis Inclination Asc.Node.Longitude Orbital.Period
4682        1.706178   23.893424           145.03593       814.0198
4683        1.161429   39.880491           164.18331       457.1800
4684        1.075134    5.360249           345.22523       407.1858
4685        1.528234    4.405467            37.02647       690.0543
4686        1.486600   21.080244           163.80291       662.0483
4687        1.474045   53.574923           187.64218       653.6791
     Perihelion.Distance Perihelion.Arg Aphelion.Dist Perihelion.Time
4682           0.5922161      110.72021      2.820140         2457597
4683           0.7415580      276.39570      1.581299         2457708
4684           0.9964343       42.11106      1.153835         2458088
4685           0.9657603      274.69271      2.090708         2458300
4686           1.1854673      180.34609      1.787733         2458288
4687           0.8761102      222.43669      2.071980         2458319
     Mean.Anomaly Mean.Motion Equinox Hazardous
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4682     178.5039   0.4422497   J2000     False
4683     304.3060   0.7874360   J2000     False
4684     282.9788   0.8841173   J2000     False
4685     203.5011   0.5216981   J2000     False
4686     203.5250   0.5437669   J2000     False
4687     184.8204   0.5507289   J2000     False
> #Data Correction
> sum(is.na(astr))
[1] 0
> pairs(astr[,1:4], col = astr$Miles.per.hour, main = "Astroid Speed Ploting")
> #Collecting data for Sampling
> set.seed(123)#collect the data in random order
> sample_indices <- sample(1:nrow(astr),0.7*nrow(astr))
> train_data <- astr[sample_indices,]
> test_data<- astr[sample_indices,]
> #Histogram
> # Create a colorful histogram
> hist(astr$Epoch.Date.Close.Approach, col = rainbow(12), breaks = 12,
+      main = "Colorful Histogram of Epoch Date Close Approach",
+      xlab = "Epoch Date Close Approach")
> model <- lm(Absolute.Magnitude~Mean.Motion, data = astr)
> plot(model)
Hit <Return> to see next plot: summary(model)
Hit <Return> to see next plot: #Finding Something Relatable
Hit <Return> to see next plot: avg_sp <- mean(astr$Miles.per.hour)
Hit <Return> to see next plot: cat("Average Speed:",avg_sp , "\n")
> #Plotting Some graph
> IrisPlot <- ggplot(astr, aes(Inclination, Orbit.Uncertainity)) + geom_point()
> print(IrisPlot)
> #Prediction
> new_data <- data.frame(Mean.Motion = c(0.5, 1, 1.5))# Create a new data frame with s
ome values of Mean.Motion
> new_pred <- predict(model, new_data)# Predict the Absolute.Magnitude using the model
> cat("Predictions for new data:", new_pred, "\n")# Print the predictions
Predictions for new data: 21.87456 22.69999 23.52541
> library(rpart)
> model<- rpart(Neo.Reference.ID~Absolute.Magnitude + Relative.Velocity.km.per.hr + Or
bital.Period + Miss.Dist..miles., data = train_data)
> library(rpart.plot)
> rpart.plot(model,main="decision tree")
```
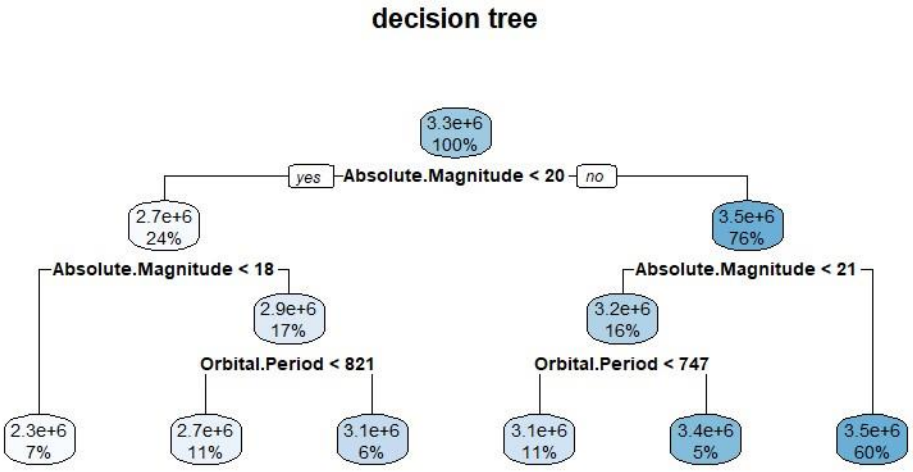
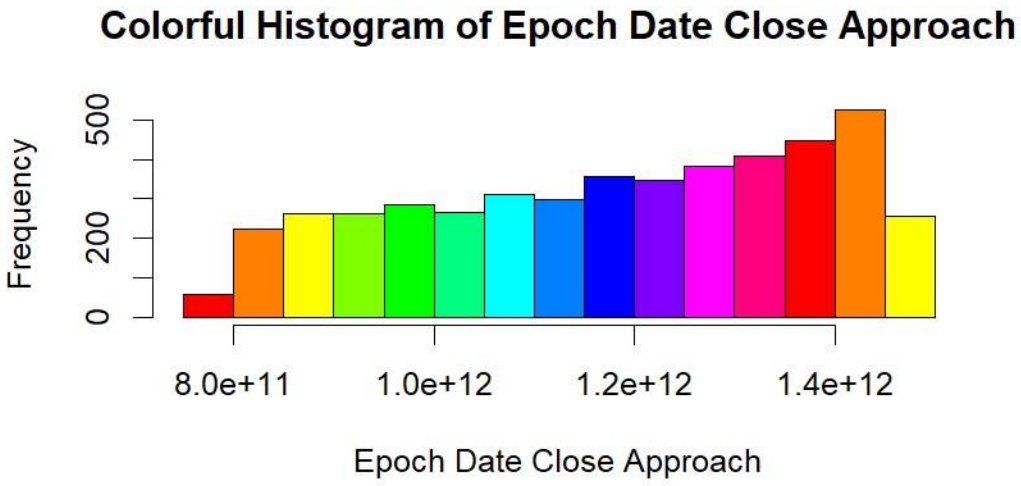
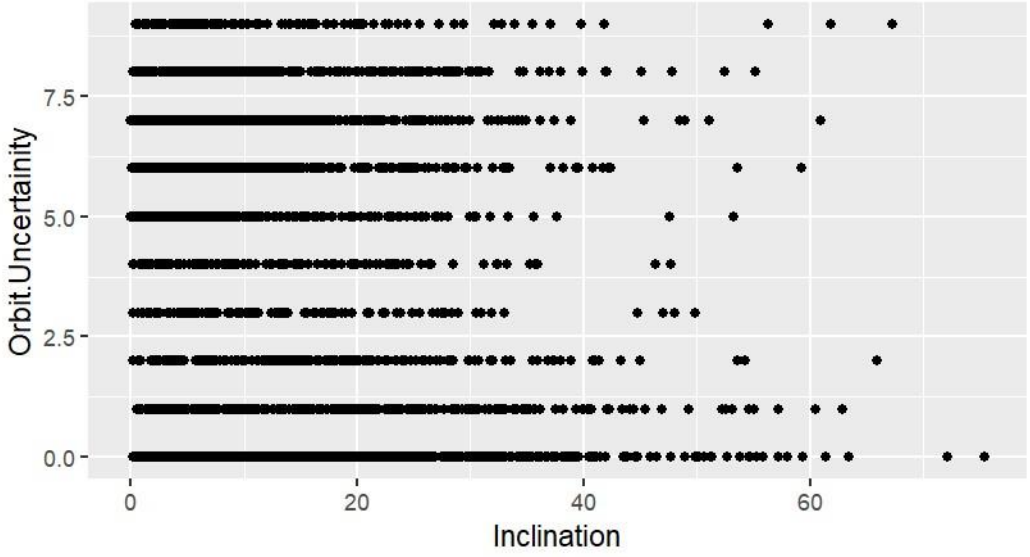
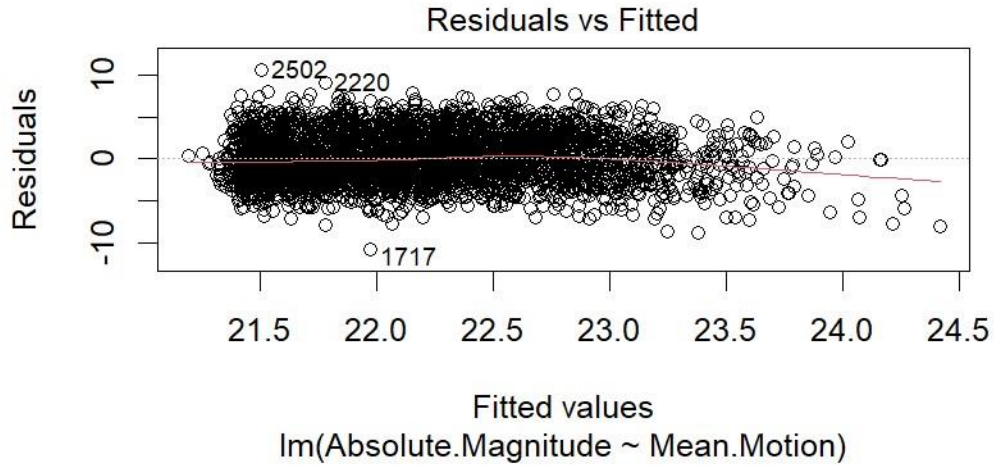
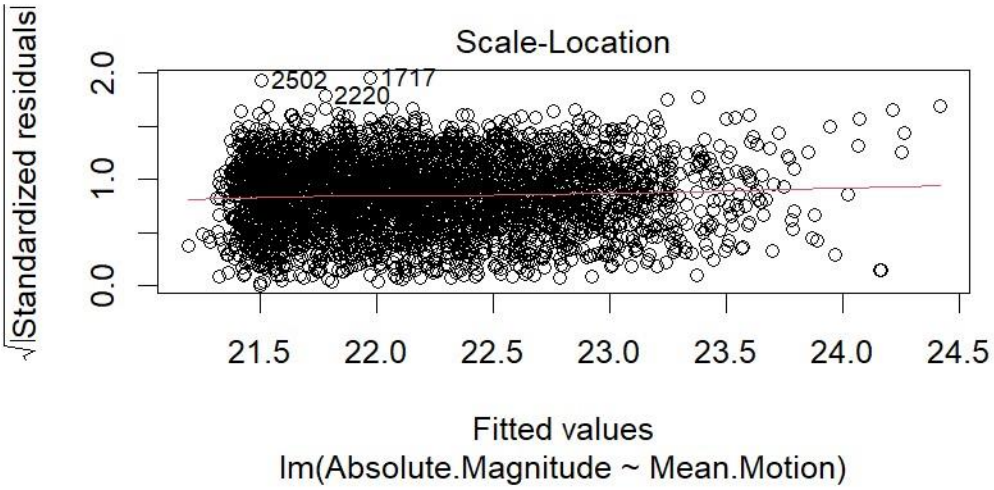


decision tree
3.3e+6
100%
yes
Absolute.Magnitude < 20
no
2.7e+6
24%
3.5e+6
76%
Absolute.Magnitude < 18
Absolute.Magnitude < 21
2.9e+6
17%
3.2e+6
16%
Orbital.Period < 821
Orbital.Period < 747
2.3e+6
7%
2.7e+6
11%
3.1e+6
6%
3.1e+6
11%
3.4e+6
5%
3.5e+6
60%


Colorful Histogram of Epoch Date Close Approach
Frequency
0
200
500
8.0e+11
1.0e+12
1.2e+12
1.4e+12
Epoch Date Close Approach


Orbit.Uncertainity
7.5
5.0
2.5
0.0
0
20
40
60
Inclination


Residuals vs Fitted
Residuals
2502
2220
1717
10
0
-10
21.5
22.0
22.5
23.0
23.5
24.0
24.5
Fitted values
lm(Absolute.Magnitude ~ Mean.Motion)


Scale-Location
√|Standardized residuals|
2502
1717
2220
2.0
1.0
0.0
21.5
22.0
22.5
23.0
23.5
24.0
24.5
Fitted values
lm(Absolute.Magnitude ~ Mean.Motion)