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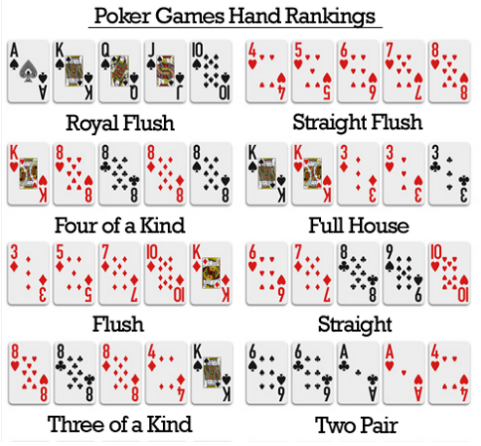
Poker-Hand Prediction

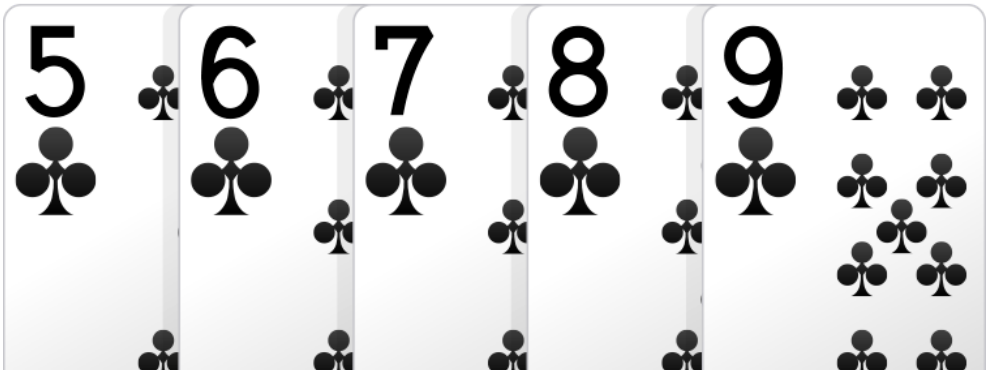
Aditya Bhardwaj Oct 12, 2019 · 6 min read

Through this article I will try to show how can various classification algorithms be used to predict the possible poker-hand(s).

What is a “Poker-Hand” ?

In poker, players structure sets of five cards, called hands, as per the principles of the game. Each hand has a position, which is looked at against the positions of different hands taking an interest in the standoff to choose who wins the pot.





STRAIGHT FLUSH

DATA SET DESCRIPTION

Each record is an example of a hand consisting of five playing cards drawn from a standard deck of 52. Each card is described using two attributes (suit and rank), for a total of 10 predictive attributes. There is one Class attribute that describes the “Poker Hand”. The order of cards is important, which is why there are 480 possible Royal Flush hands as compared to 4 .

POKER-HAND DATA SET SOURCE : http://archive.ics.uci.edu/ml/machine-learning-databases/poker/

Data Set Attribute Description:

1. S1 “Suit of card #1”
   Ordinal (1–4) representing {Hearts, Spades, Diamonds, Clubs}

   2) C1 “Rank of card #1”
   Numerical (1–13) representing (Ace, 2, 3, … , Queen, King)

   3) S2 “Suit of card #2”
   Ordinal (1–4) representing {Hearts, Spades, Diamonds, Clubs}

   4) C2 “Rank of card #2”
   Numerical (1–13) representing (Ace, 2, 3, … , Queen, King)

   5) S3 “Suit of card #3”
   Ordinal (1–4) representing {Hearts, Spades, Diamonds, Clubs}

   6) C3 “Rank of card #3”
   Numerical (1–13) representing (Ace, 2, 3, … , Queen, King)

Ordinal (1–4) representing {Hearts, Spades, Diamonds, Clubs}

8) C4 “Rank of card #4”
Numerical (1–13) representing (Ace, 2, 3, … , Queen, King)

9) S5 “Suit of card #5”
Ordinal (1–4) representing {Hearts, Spades, Diamonds, Clubs}

10) C5 “Rank of card 5”
Numerical (1–13) representing (Ace, 2, 3, … , Queen, King)

11) CLASS “Poker Hand”
Ordinal (0–9)

TYPES OF POKER HANDS:

0: Nothing in hand; not a recognized poker hand
1: One pair; one pair of equal ranks within five cards
2: Two pairs; two pairs of equal ranks within five cards
3: Three of a kind; three equal ranks within five cards
4: Straight; five cards, sequentially ranked with no gaps
5: Flush; five cards with the same suit
6: Full house; pair + different rank three of a kind
7: Four of a kind; four equal ranks within five cards
8: Straight flush; straight + flush
9: Royal flush; {Ace, King, Queen, Jack, Ten} + flush

IMPORTING ALL THE LIBRARIES

```
import warnings
warnings.filterwarnings('ignore')
```

DATA PRE-PROCESSING

```
data_train=pd.read_csv("poker-hand-training-true.data",header=None)
data_test = pd.read_csv("poker-hand-testing.data",header=None)
col=['Suit of card #1','Rank of card #1','Suit of card #2','Rank of
card #2','Suit of card #3','Rank of card #3','Suit of card #4','Rank
of card #4','Suit of card #5','Rank of card 5','Poker Hand']

data_train.columns=col
data_test.columns=col

y_train=data_train['Poker Hand']
y_test=data_test['Poker Hand']
y_train=pd.get_dummies(y_train)
y_test=pd.get_dummies(y_test)

x_train=data_train.drop('Poker Hand',axis=1)
x_test=data_test.drop('Poker Hand',axis=1)

print('Shape of Training Set:',x_train.shape)
print('Shape of Testing Set:',x_test.shape)

>>Shape of Training Set: (25010, 10)
>>Shape of Testing Set: (1000000, 10)
```

1.NEURAL NETWORK

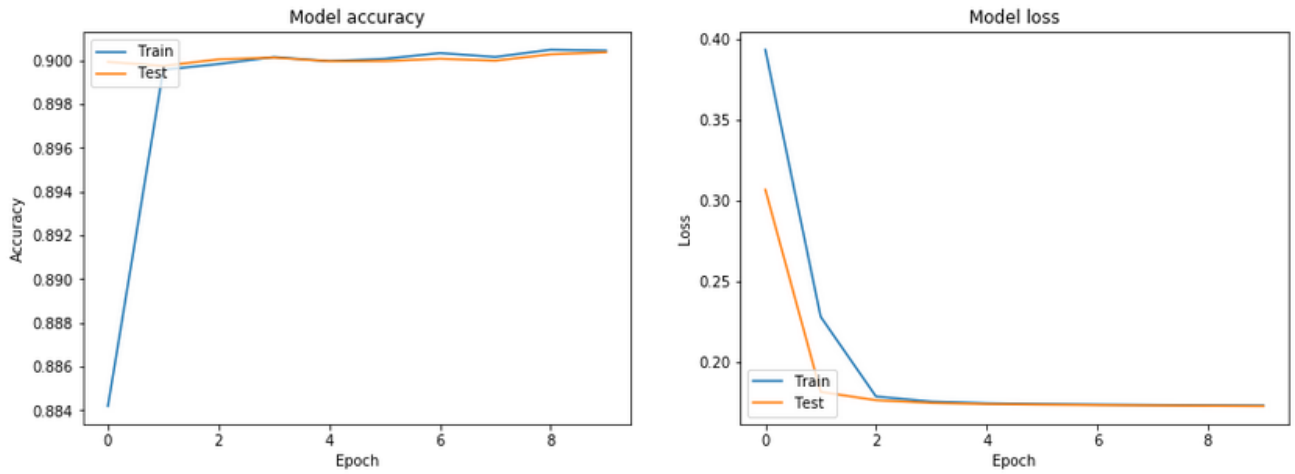
A neural network is a progression of algorithms that attempts to perceive fundamental connections in a lot of information through a procedure that copies the manner in which the human brain works. Neural network can adjust to changing input; so the network produces the most ideal outcome without expecting to redesign the output criteria.

To create NN we used Keras library which is a high-level API wrapper for the low-level API, capable of running on top of TensorFlow, CNTK, or Theano.

```
import keras
from keras.models import Sequential
from keras.layers import Dense, Dropout, Activation
from keras.optimizers import SGD
from keras import regularizers


model = Sequential()
model.add(Dense(15, activation='relu', input_dim=10))
model.add(Dense(10, activation='relu'))
model.add(Dense(10, activation='softmax'))
model.compile(loss='binary_crossentropy',
              optimizer='adam',
              metrics=['accuracy'])


history = model.fit(x_train, y_train, epochs = 10, batch_size = 256,
verbose=1,validation_data=(x_test,y_test),shuffle=True)


score = model.evaluate(x_test, y_test, batch_size=256)

##OUTPUT

Train on 25010 samples, validate on 1000000 samples
Epoch 1/10
25010/25010 [==============================] - 4s 156us/step - loss:
0.3935 - acc: 0.8842 - val_loss: 0.3070 - val_acc: 0.8999
Epoch 2/10
25010/25010 [==============================] - 4s 147us/step - loss:
0.2283 - acc: 0.8996 - val_loss: 0.1818 - val_acc: 0.8997
Epoch 3/10
25010/25010 [==============================] - 4s 145us/step - loss:
0.1790 - acc: 0.8998 - val_loss: 0.1767 - val_acc: 0.9000
Epoch 4/10
25010/25010 [==============================] - 4s 143us/step - loss:
0.1758 - acc: 0.9001 - val_loss: 0.1750 - val_acc: 0.9001
Epoch 5/10
25010/25010 [==============================] - 4s 149us/step - loss:
0.1748 - acc: 0.9000 - val_loss: 0.1743 - val_acc: 0.9000
Epoch 6/10
25010/25010 [==============================] - 4s 144us/step - loss:
0.1743 - acc: 0.9001 - val_loss: 0.1740 - val_acc: 0.9000
Epoch 7/10
25010/25010 [==============================] - 4s 146us/step - loss:
0.1740 - acc: 0.9003 - val_loss: 0.1737 - val_acc: 0.9001
Epoch 8/10
25010/25010 [==============================] - 4s 147us/step - loss:
```

```
0.1733 - acc: 0.9005 - val_loss: 0.1732 - val_acc: 0.9005
Epoch 10/10
25010/25010 [==============================] - 4s 151us/step - loss:
0.1734 - acc: 0.9004 - val_loss: 0.1730 - val_acc: 0.9004
1000000/1000000 [==============================] - 3s 3us/step
```

Validation accuracy is coming out to be 90.04% .



Now experimenting and comparing with other classification models…

2.LOGISTIC REGRESSION

Like all regression analyses, the logistic regression is a predictive analysis. Logistic regression is used to describe data and to explain the relationship between one dependent binary variable and one or more nominal, ordinal, interval or ratio-level independent variables.

I used the Sci-kit Learn Library to import all algorithms and employed the Logistic Regression method of model selection to use Logistic Regression Algorithm.

```
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score
clf = LogisticRegression(random_state=0,
solver='lbfgs',max_iter=100,multi_class='ovr').fit(x_train, y_train)
y_pred=clf.predict(x_test)
accuracy_score(y_pred,y_test)
```

As you can see the validation accuracy is surprisingly low as compared to that of Neural Network.

Validation accuracy is 50.12%!!

3.Classification And Regression Trees for Machine Learning(CART)

Classification and Regression Trees or CART for short is a term introduced by Leo Breiman to refer to Decision Tree algorithms that can be used for classification or regression predictive modeling problems.

Classically, this algorithm is referred to as “decision trees”, but on some platforms like R they are referred to by the more modern term CART.

The CART algorithm provides a foundation for important algorithms like bagged decision trees, random forest and boosted decision trees.

I used the Sci-kit Learn Library to import all algorithms and employed the Decision Tree method of model selection to use Decision Tree Algorithm.

```
from sklearn.tree import DecisionTreeClassifier
decision_tree = DecisionTreeClassifier(random_state=0,max_depth = 2)
decision_tree = decision_tree.fit(x_train,y_train)
y_pred = decision_tree.predict(x_test)
accuracy_score(y_pred,y_test)

##OUTPUT

0.501209
```

Again the validation accuracy is surprisingly low and is very similar to that of Logistic Regression

Validation accuracy is 50.12%!!

4.Support Vector Machine(SVM)

SVM is a supervised machine learning algorithm which can be used for both classification or regression challenges. However, it is mostly used in classification problems. In this algorithm, we plot each data item as a point in n-dimensional space (where n is number of features you have) with the value of each feature being the value of a particular coordinate.

```
from sklearn import svm
clf = svm.LinearSVC()
clf.fit(x_train,y_train)
y_pred = clf.predict(x_test)
accuracy_score(y_pred,y_test)

##OUTPUT

0.431699
```

The validation accuracy achieved here is 43.16%!

HERE IS MY COMPLETE CODE:

Open in Colab
(https://colab.research.google.com/gist/virgoady7/d3ac3470a196a4f8d01c0fb5dd087f61/home_assign.ipynb)

```
In [18]: !wget http://archive.ics.uci.edu/ml/machine-learning-databases/poke
         r/poker-hand-testing.data
         !wget http://archive.ics.uci.edu/ml/machine-learning-databases/poke
         r/poker-hand-training-true.data
         !wget http://archive.ics.uci.edu/ml/machine-learning-databases/poke
         r/poker-hand.names

         --2019-10-12 19:02:07--  http://archive.ics.uci.edu/ml/machine-lear
         ning-databases/poker/poker-hand-testing.data
         Resolving archive.ics.uci.edu (archive.ics.uci.edu)... 128.195.10.2
         52
         Connecting to archive.ics.uci.edu (archive.ics.uci.edu)|128.195.10.
         252|:80... connected.
         HTTP request sent, awaiting response... 200 OK
         Length: 24538333 (23M) [application/x-httpd-php]
         Saving to: ‘poker-hand-testing.data.1’
```

```
2019-10-12 19:02:08 (24.5 MB/s) - ‘poker-hand-testing.data.1’ saved
[24538333/24538333]
```

home_assign.ipynb hosted with ♡ by GitHub view raw

In the end, the **Neural Network using Keras Library** enables us to produce the most accurate results above all!

This is one of my first applications in machine learning. Thank you for reading my article, and I hope I was able to help and inspire students like myself!

Machine Learning Deep Learning Classification Algorithms Poker Hand Ranking

Logistic Regression