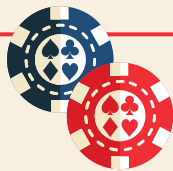# Poker

Hand Classification

By Group 18: Matthew Danque, Ronak Chaudhuri, Xiaodi Zhao, Christian Coirin

Purpose

The purpose of this project is to receive a hand in poker and classify what kind of hand you have. Mainly its a means to learn quickly what kind of hand you received and/or to learn to identify what kind of hand that you have.

Background

We chose this project mainly because of our keen interest in poker games and our desire to explore machine learning classification techniques. Poker is a complex strategic game with a wealth of data and underlying patterns. Through this project, we aim to investigate how machine learning techniques can be utilized to swiftly and accurately classify poker hands, thereby deepening our understanding of the domain and challenging our technical proficiency in machine learning.
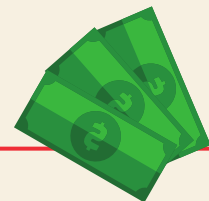
Our Data

The data we used was directly pulled from the **UC Irvine Machine Learning Repository.** **https://archive.ics.uci.edu/dataset/158/poker+hand**
The data that we used is a multivariate dataset that contains 10 features and 1025010 instances in total, 1 million in the testing data and 25010 in the training data.

The 10 Features that are defined in this dataset are as follows:
> **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**
> **Class of Poker Hand**

Explaining Our Data

Our Classification of the hand data varies from 0 to 9 where

0 - Nothing in Hand

1 - One Pair

2 - Two Pairs

3 - Three of A Kind

4 - Straight

5 - Flush

6 - Full House

7 - Four of A Kind

8 - Straight Flush

9 - Royal Flush

KNN Model

- Used Cross Validation to find Optimal K(k=17)
- Trained a KNN classifier using the optimal k
- Use the trained classifier to predict labels for the testing data.
- Compared the predicted labels with the true labels from the testing data and calculated the accuracy.
- Minimal Accuracy: 57%
- Struggled With Rarer Hands

Average Accuracy vs. K Value

Distribution of Actual and Predicted Classes
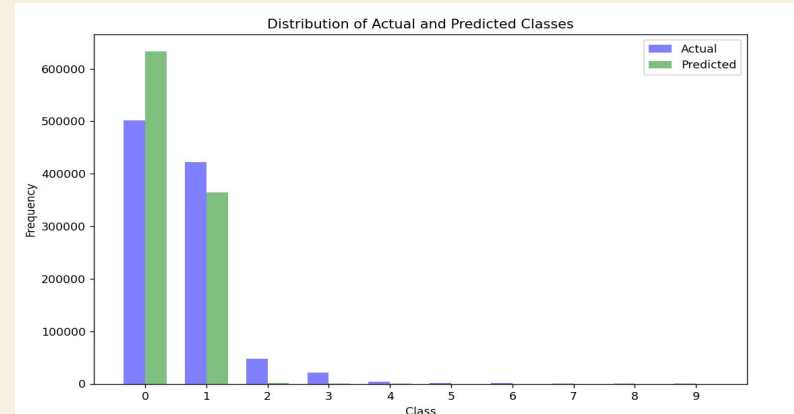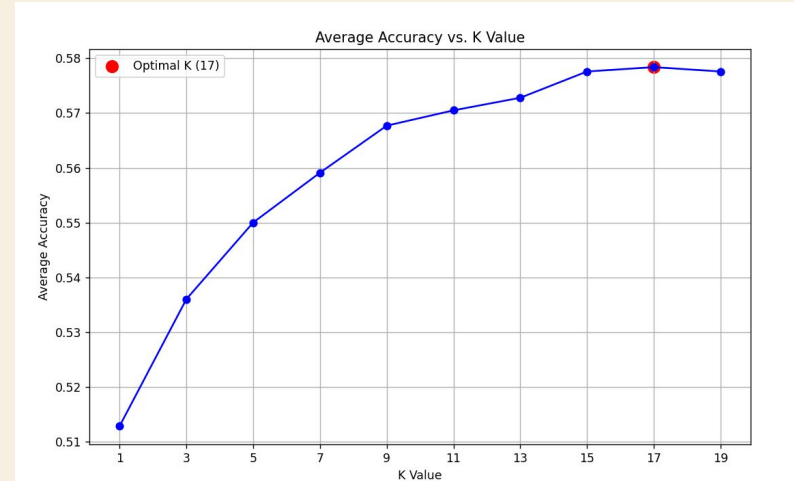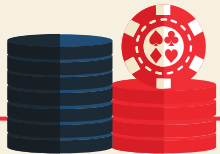
SVM

- **Multi Feature - Multiclass Support Vector Machine**
- **Required abit of reprocessing as the data wasn't all clean and ready for the SVM**
- **Data Cut Down to 1500 instances per training and test data sets as a means to optimize time**
- **Total Accuracy was 0.50%**
- **Testing between all data classifiers, the more rarer hands were harder to classify as it was more common to not have any sort of hand (class 0)**

Predicted Real Hand

Predicted no Hand


Test No Hand   Test Is A Hand
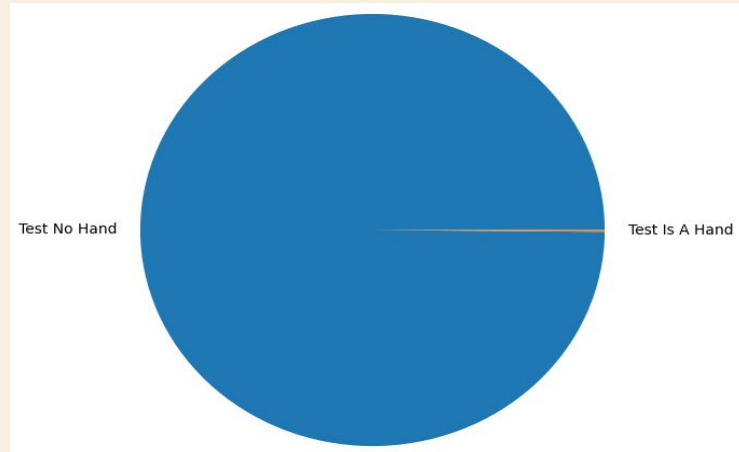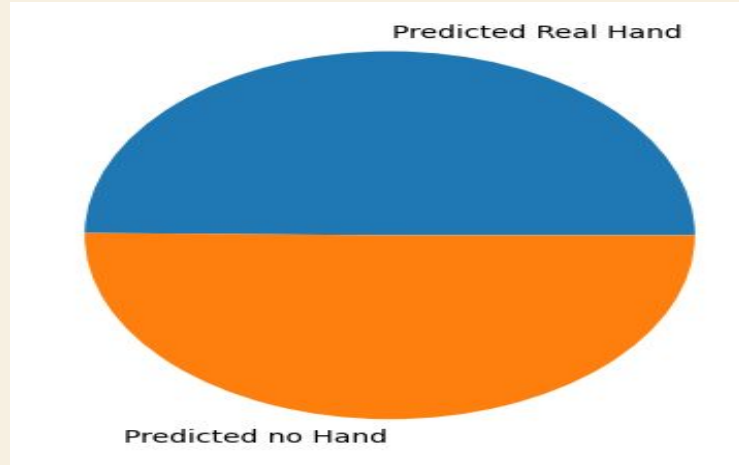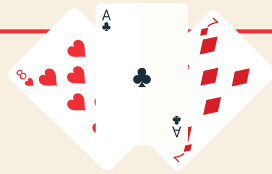
Expected Outcomes

Through this project, we aim to develop a poker hand classifier with a high level of accuracy. Our expected outcome is to achieve a minimum accuracy of 90% and demonstrate stable performance across various testing scenarios. In addition to accuracy, we also expect our classifier to respond quickly, maintaining low inference times even when processing large volumes of data. Ultimately, we aim for our project to provide players with a convenient and accurate poker hand recognition tool, enhancing their competitiveness and enjoyment in the game.
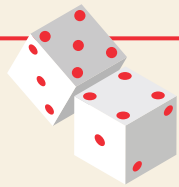
Results

	Accuracy	Inference Speeds
KNN	57%	80s
SVM	50.01%	120s

Thank You!