About the Project:

The project aims at predicting the probability of winning (win percent) for a player in Texas Holdem poker based on the player's cards (hand) and community (the flop and the river) cards. The game requires majorly two skills Probability and Psychology for excelling and winning the game.

Methodology:

A program is written in java to predict and analyses probability of various possibilities in the game. Gibbs sampling learned as part course Statistical Methods of AI & ML has been applied to determine the probability of winning.

The program executes in two modes:
   1. Player mode
   2. Statistics Mode

1. Player Mode:

The program takes the inputs as the cards of the player (hand), community cards (if present) and number of players in the table (including the current player). The program takes input cards as "<Card no> <Suite>" "A s" for A spade "A c" for A club "9 d" for 9 diamond.

The program first takes input as number of players in the table and cards of the player, gives the winning chance of the player. Again after the flop is opened the program takes the flop cards (first three community cards) and gives updated probability with information about newly opened cards. After each of the river cards are opened (the fourth and fifth community card) program takes the card opened and gives the updated probability of winning for the player.

The program not only prints winning and losing percentages over all but also gives percentages of winning and losing with different combinations like straight, Flush, Three of a kind. At any point of time program takes input for number of players that has folded in the round and gives updated winning chance.

2. Statistics Mode

In statistics mode program takes input as number of games as input and randomly distributes cards to all the players in the table and the community cards and calculates interesting statistics like how many games end with a highest hand of straight?, how many games end with highest

hand of double pair?, how good is the winning probability with p pocket pair (A pair, K pair, 2 pair) in the hand?, Probability of winning using just the flop of the table?, How many games lost due to kicker card in table? of all sizes ranging from two to nine.

The program plays initially with two players in the table and the increases the players to three and captures all the statistics three player table size and increases the table size up to nine and prints the statistics for each table size.

At the end the program prints the performance of java random function, performance of java random function has been captured by counting number of times the random function returns in an interval of 0.1 (like 0-0.1 range, 0.1-0.2 range ,… up to 0.9-1.0) whenever it is called while generating a sample, as Gibbs sampling results are dependent on random function.

Observations:

It has been observed that a hand in table with fewer number of players has higher chance of winning than in a table with more players.

Winning chance of A pocket pair has winning chance in various table sizes is shown below:

Table size	Winning percentage
2	85.45 %
3	73.64 %
4	63.98 %
5	55.99 %
6	49.23 %
7	43.48 %
8	38.64 %
9	34.47 %

 Winning chance of Three of a kind has in various table sizes is shown below:

Table size	Winning percentage
2	76.16 %
3	65.34 %
4	58.63 %
5	53.67 %

6	49.67 %
7	46.25 %
8	43.24 %
9	40.55 %

Assumptions made:

It is assumed that the deck and the dealer are unbiased.

Future work:

The program currently considers only the probabilities for predicting the chances. In future the program can be extended to learn other players game in the table and predict his response and propose the actions for the player like check, bet, raise or fold using Artificial Intelligence and Machine Learning techniques.

References:

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3. http://en.wikipedia.org/wiki/Gibbs_sampling
4. http://en.wikipedia.org/wiki/Texas_hold_'em
5. http://en.wikipedia.org/wiki/List_of_poker_hands