Group 7 – Poker Tournament

**1st Betting Phase**:

**Draw Phase**: A decision tree is used based on the rank of the player’s hand.

If the rank is greater than or equal to 5, the player discards no cards, as each possible hand with a rank that high has a less than 1% chance of occurring in 5-card draw.

If the hand is a three-of-a-kind that isn’t a full house, the player will discard cards that are not part of the pairing (usually both, but 5% of the time just one).

If the hand has two pairs, the player always gets rid of the loose card, but will also get rid of the lower of the two pairs 1% of the time.

If the hand has only one pair, there are three possible outcomes depending on what the rank could improve to. If there is potential for a straight, the player discards one of the two cards in the pair. If there is potential for a flush, the player discards all of the cards that are not part of the majority suit. In all other cases, the player simply discards the three cards that are not in the pair.

If the hand is merely a high card, the player anticipates the highest possible potential rank that the hand could have after replacing cards. Since a high card cannot have potential for a four-of-a-kind or a full house without being a higher ranking hand in the first place, the player tries to see if it can get a royal flush, a straight flush, a regular flush, or a straight. Once determining the highest possible rank from that subset, the player discards only the cards that do not contribute to the requirements of the potential hand. If, however, the hand does not have the potential to have one of those specified ranks, the player discards three to five of the lowest ranking cards in the hand.

**2nd Betting Phase**: For the second round of betting, the AI uses a decision tree based upon a few different factors including: current pot/bet, the last action taken, the rank of the player’s hand and the value of the player’s hand strength in comparison to hands of the same rank.

If the last action was during the draw phase, then the only viable options are bet, check, or fold. It doesn’t make any sense to fold at this point, which leaves bet and fold. The AI determines its confidence about winning on the rank of its hand multiplied by 10 and then the highest card value within the set that gives the player that rank is added to the product. Taking this number, the AI compares it to set values that represent the level of low and high confidence. If the AI has relatively low confidence about its hand strength then it checks, otherwise it will bet an amount equal to how confident it is.

Otherwise if the AI has to decide upon an action after the other player has already taken their betting 2 turn, the decision tree takes into account what exact action they took.

If the other player bet, then the AI will raise them if they have high confidence in their hand and the amount that the other player just bet isn’t more than their confidence. Otherwise if they have above low confidence but below high confidence about their hand, the AI will call the other player. If they lack any strength in their hand they will fold.

If the other player checks then the AI will act in the same manner as it would as if it got to bet first, betting if it has good confidence and checking otherwise.

If the other player raised, then the player will react the same as if they betted. They will raise if very confident and the other raise was small enough, call if they have good confidence, and fold if they have low confidence.