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CS 5100 - Final Project Proposal

Artificial Intelligent Based Poker Game: Doudizhu

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## Prefix

Dou Dizhu is a popular poker game in China. The name Dou Dizhu literally translates as Fight the Landlord, which refers to the class struggle that happened in China during the transition from feudal society to the new China. In the 1950s after the Chinese Communist Party took over China, peasants took up arms against the landlords. Though the class struggle between peasants and landlords ended decades ago, the game has been passing on through generations after generations. Today it has become one of the most popular card games in China.

## Game Play

Dou Dizhu requires three players and one pack of cards, including the two differentiated jokers. Among the three players, one player plays the landlord, and two other players both play the peasants and need to work together against the landlord. The objective of the game is to be the first player to have no cards left.

When the game starts, a shuffled pack of 54 cards is dealt to three players. Each player is dealt 17 cards, with the last three leftover cards detained on the playing desk, face down. All players first review and appraise their own cards without showing their cards to the other players. Then, players take turns to decide if they want to be the landlord position. The first player decides to be the landlord and will play the landlord position in this game. The other two players automatically play the peasant position. If the first two players both do not want to play the landlord position, the last player automatically plays the landlord position. Then the three leftover wild cards are revealed to all players before being dealt to the landlord.

The landlord starts the first round by playing any Combination he/she desires, and every player plays in order if they can beat the previous cards. Until no one can beat the cards,

that player starts the new round with any Combination. In the end, The landlord wins if he or she has no cards left. The peasant team wins if either of the peasants have no cards left.

## Card Combinations:

Name	Description	Example
Solo	any single card	2 > A
Pair	Two cards of same rank	Q-Q > 3-3
Trio	Three cards of same rank	2-2-2 > 3-3-3
Trio + Solo	Three cards of same rank following one single card	5-5-5-3 > 4-4-4-A
Trio + Pair	Three cards of same rank following a Pair	5-5-5-3-3 > 4-4-4-A-A
Chain	≥ Five consecutive Solo	8-9-10-J-Q > 3-4-5-6-7
Pair Chain	≥ Three consecutive Pair	8-8-9-9-10-10 > 3-3-4-4-5-5
Airplane	≥ Two consecutive Trio	8-8-8-9-9-9-10-10-10 > 3-3-3-4-4-4-5-5-5
Airplane with	Airplane + the same number	A-A-A-2-2-2-3-4 >

Wings	of Solo or Pair	Q-Q-Q-K-K-K-6-A
Bomb	All four of the same rank cards	2-2-2-2 > A-A-A-A
Rocket	Both jokers	> everything

## Rules

Rocket > everything

Bomb < Rocket, but > everything else. Bomb with larger rank > Bomb with smaller rank

Besides Rocket and Bomb, a player can only beat the prior hand using the same Combination but not the others.

Individual cards are ranked. Colored Joker > Black & White Joker > 2 > Ace (A) > King (K) > Queen (Q) > Jack (J) > 10 > 9 > 8 > 7 > 6 > 5 > 4 > 3. Suits are irrelevant.

Compare only the Chains with the same length

Jokers and 2 Cannot be used in Chain

## High Level Design

In this project, there are three players in the game. Two of them are our computer Artificial Intelligence agents, and one is human. The two computer players will find the best algorithm to play the game. Based on what we have learned so far, we are proposing that we can use search algorithms to find the best way to play the game. Besides searching, reinforcement learning will also be used.

The following picture shows a workflow of the whole game play process.



## Future Work

### 1. Game rule implementation

We need to implement the whole game described above. And the AI algorithms should also be implemented.

### 2. UML

Draw the UML to show the relationship of our design