Betting Strategy for the game Tichu
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The card game Tichu

Rules:
- 52 cards plus dragon, phoenix, mahjong and dog
- 4 players on two teams (like in bridge)
- players competing to get rid of their hands

Grand Tichu:
- Bet 200pt to go out first after looking at the first 8 cards

Tichu:
- Bet 100pt to go out first after looking at all 14 cards

Strong cards and patterns:
- dragon, phoenix
- 4 of a kind (bomb)
- royal flush (bomb)
- long straights

Features

hand: number of cards of each value
patterns: pairs, threes, fours, royal flush, straights, leftover singletons

Problem

Predict probability of going out first with the first 8 cards/14 cards hand.

\[
P_{\text{grand}}(8 \text{ cards, patterns})
P_{\text{Tichu}}(14 \text{ cards, patterns})
\]

Models

- Logistic Regression
- Naive Bayes
- AdaBoost
- Random Forest

Logistic Regression preferred because it has well calibrated (prediction = probability) results, which we need for betting strategies.

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Simulations for a betting Strategy

Expected score:
- Grand Tichu: \(200 \times (2P_{\text{grand}} - 1)\)
- Tichu: \(100 \times (2P_{\text{Tichu}} - 1)\)

Strategy (When \(P_+ > 0.5\))
- Call Grand: \(P_{\text{grand}} > 0.5P_{\text{Tichu}} + 0.25\)
- Call Tichu: \(P_{\text{grand}} < 0.5P_{\text{Tichu}} + 0.25\)

Simplified index for Grand: (coeffs from Log Reg)
- \(2*\#ace+5*\#dragon+5*\#phoenix+4*\#bomb \geq 4\)

Guiding Questions

- How well can we predict Grand Tichu and Tichu success rate from the hand?
- How do we develop a good betting strategy from the fitted model?

Dataset

15000 matches from onlinetichu.com
- First 8 cards / All 14 cards
- Grand Tichu / Tichu bets
- order of players going out (whether the bets are made.)

ROC on validation set

Feature/Model comparison area under ROC

Log Reg | Naive Bayes | Ada Boost | Rand Forest
---|---|---|---
Raw Hand | 0.785 | 0.783 | 0.786 | 0.783
Compressed hand | 0.791 | 0.789 | 0.804 | 0.802
Minimal Pattern (7 features) | 0.827 | 0.827 | 0.82 | 0.827
Full Pattern (13 patterns) | 0.834 | 0.74 | 0.832 | 0.837
Full Pattern + Compressed hand | 0.837 | 0.8 | 0.833 | 0.835

Discussion

- Specifying patterns as features improves the accuracy significantly.
- With the fitted model plus simulations, we obtained a useful criteria for when to call Grand Tichu.
- With a larger dataset, it might be possible for the models to learn the useful patterns directly from the hand.
- Some game mechanics are not considered, such as cards being passed between players, and points that are not from bets.
- An alternative approach is to solve the regression problem to predict the points for each game directly.