

# 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

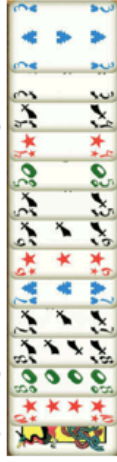
### Grand Tichu:

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.

$P_{grand}$  (8 cards, patterns)

$P_{tichu}$  (14 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.

## Simulations for a betting Strategy

### Expected score:

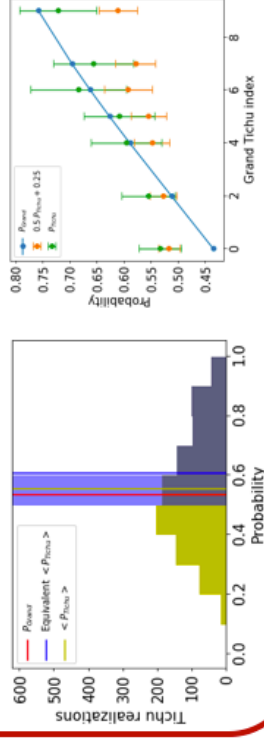
- Grand Tichu:  $200 * (2P_{Grand} - 1)$
- Tichu:  $100 * (2P_{Tichu} - 1)$

### Strategy (When $P_* > 0.5$ )

- Call Grand:  $P_{Grand} > 0.5P_{Tichu} + 0.25$
- Call Tichu:  $P_{Grand} < 0.5P_{Tichu} + 0.25$

### Simplified index for Grand: (coeffs from Log Reg)

- $2 * \#ace + 5 * \#phoenix + 4 * \#bomb \geq 4$



## Guiding Questions

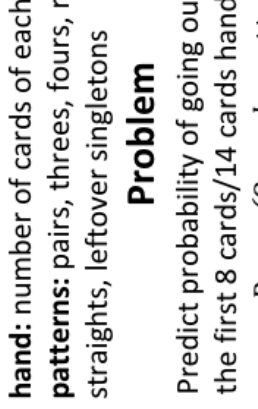
- How well can we predict Grand Tichu and Tichu success rate from the hand?
- How do we develop a good betting strategy from the fitted model?

## Dataset

15000 matches from [onlinetichu.com](http://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.