

# Settlers of Catan

## **What is Catan?**

Settlers of Catan is a popular board game that involves players taking on the roles of settlers on the fictional island of Catan. The objective of the game is to accumulate points by building settlements and cities, acquiring resources through trade with other players or the game board, and earning special development cards.

The game is played on a modular board randomly generated at the start of each game, allowing for different strategies and gameplay every time. Players must also contend with a limited supply of resources and the potential for conflict with other players as they fight to control the island.

## **How to Win?**

The simple answer is to be the first to get to 10 points!

(Psst... it's easier said than done)

Here are some important things to consider in order to win!

1. Resource Management
2. Trading
3. Expansion
4. Development Cards
5. Risk Assessment

These are some components that are usually considered when playing. Players who are good with those skills often find their way to victory!

## **Questions of Interest**

1. Which resource-related attributes or actions contribute to the most points gained for a player?
2. How important is controlling a harbor in the early game? Does it lead to more points/victory?
3. Is it better to focus on resource production early or to focus on resource diversity?

## Hypothesis

1. Individual production of resources should be the most important thing in order to gain the most points. Being self-sufficient pays well as there's no need to rely on other players for resources.
2. A harbor in the early games pays off well especially when resource production tiles required for the harbor trade are nearby.
3. Resource production leads to more expansion potential, therefore, is better than resource diversity

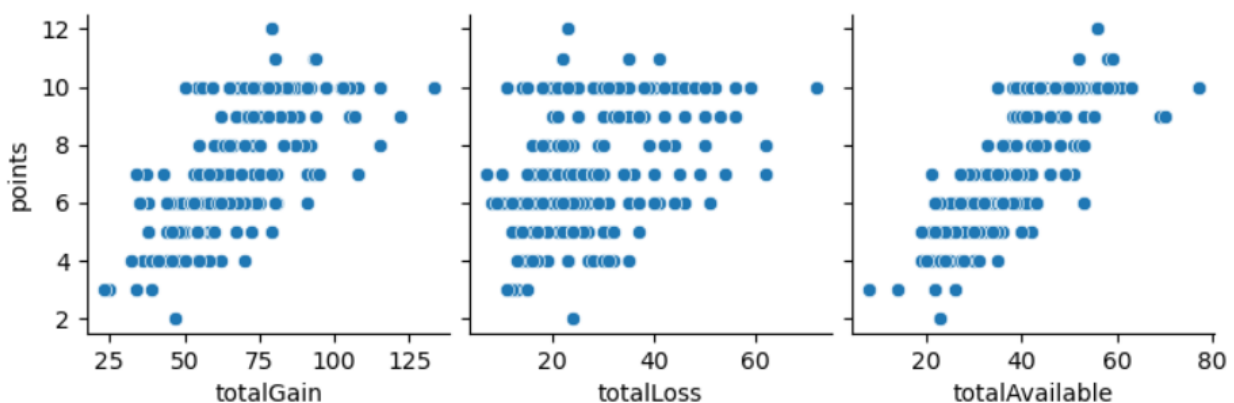
## Data Analysis

### Question 1

To answer question 1, I decided to choose the features that play a role in resource productions:

1. Production
2. TradeGain
3. RobbersCardsGain
4.  $\text{TotalGain} \sim (\text{Production} + \text{TradeGain} + \text{RobbersCardsGain})$
5. TradeLoss
6. RobberCardsLoss
7. Tribute
8.  $\text{TotalLoss} \sim (\text{TradeLoss} - \text{RobberCardsLoss} - \text{Tribute})$
9.  $\text{TotalAvailable} \sim (\text{TotalGain} - \text{TotalLoss})$

First, I want to see whether resource availability has any correlation to the points obtained by players. Let's take a look at the features that encompass most of the other features.

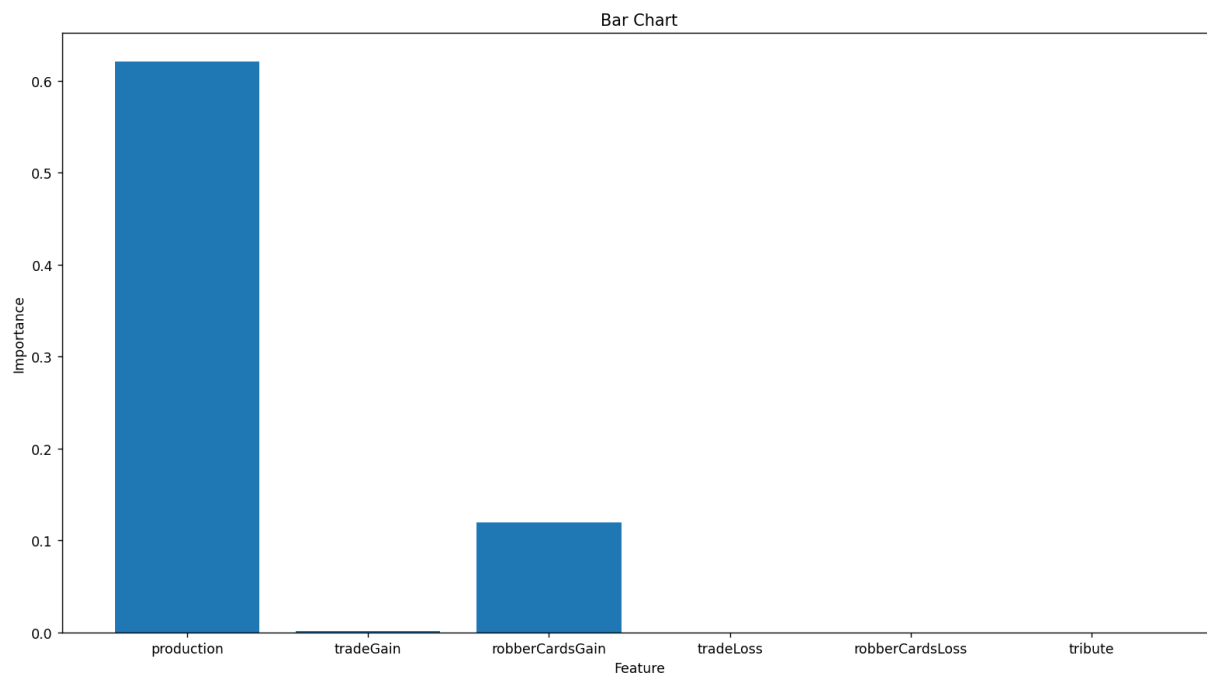


It seems like the TotalGain is somewhat correlated to the number of points obtained. However, even more compelling, the TotalAvailable shows a clearer correlation to the points obtained. This is to be expected as the TotalAvailable is calculated by  $\text{TotalGain} - \text{TotalLoss}$ . This represents the amount of actual usable resources instead of pure resources obtained in the game.

### **Obtaining resources does seem to play a role in winning the game of Catan! But which resource-obtaining action is most important?**

To figure this out, I decided to use Elastic Net Regression to compare different features' abilities in predicting points obtained by players.

The coefficient obtained from Elastic Net regression can be used to determine the importance of features by analyzing the magnitude of the coefficients. A larger magnitude of the coefficient indicates that the corresponding feature has a stronger effect on the target variable, while a smaller magnitude indicates a weaker effect.



The following graph is obtained from the best-performing model. Production and RobberCardsGain are important features to gain points. Overall, the most important aspect is just to produce as many resources as you can on your own!