Project Outline

In this project, we will use the Trueskill approach to rank players in the game of Blood Bowl. We will build an online learning model to produce an overall ranking and a ranking with each of the races available in the game for each player. We build models based on different assumptions on the relations between races and draw rate and between race and results. Lastly we will expand the model to rank the races and explore possible insights about the performance of the races in a competitive context. To evaluate the performance we will use different models to predict the outcomes of games in a test set.

We use data from FUMBBL, which is an online community, where a digital version of the game have been played for about twenty years with data from an abundance of both historical and up to date games accessible.

Research Questions

- What is the skill level of a given player?
- What is the likely outcome of a game?
- To what extend does skill transfer between races?
- What is the power level of each race?
- What races performs best against the strongest races?
- How does different rules sets affect the dynamics of the game?

Data

As a starting point we have a large dataset with games from a variety of formats. While all the games in the dataset have been played with the newest version of the rules - published in 2020 - they are played with significantly different rules and formats. This data will however serve as a good starting point for building and testing the model we are building, and when we have a working model, we can scrape data specifically aimed at answering the specific research questions we are focusing on.

We have chosen a subset of the different columns in the subset to focus on. This is of course subject to change as we work on this project and learn more about the data and how it can affect our models. Initially we find the attributes regarding the match outcome, the race for each team and the ranking for the coach of each team the most important.

Descriptive Statistics

A notebook containing the descriptive statistics of our dataset has been added to the bottom of the file.

Model

To begin with, we start with a simple model based on the Trueskill model. See Figure 1 for a representation of our initial model. We will have some constants/hyperparameters that affect the players individual skills and how likely

it is for the match to be a draw. There is of course some limitations in having these parts of the model as constants/hyperparameters instead of attributes to the model. Based on these constants, then the model will infer a skill and performance of each player which will model the result of the match.
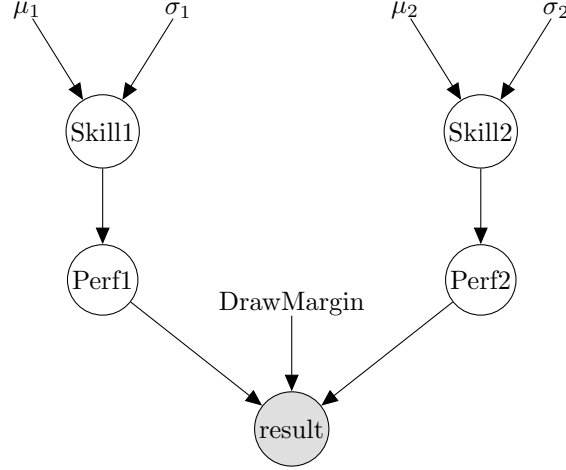

Figure 1: Initial model

Simple assumptions

Before starting working on implementing the model, we have discussed the following simple assumptions:

- Each player has constant skill levels.
- Skill levels follow a Gaussian distribution.
- The performance of a player is independent from game to game and follow a Gaussian distribution with with skill level as mean and a constant variance across all players.
- If the difference in performance in a given game is larger than a constant draw margin, the player with the highest performance wins, otherwise the game is a draw.

To also model changing skill levels over time and race specific skill levels we plan to introduce new assumptions and build a more suitable model.

Elaborate Assumptions

- Each player has skill levels with varying mean and constant variance.
- Each player has a skill level with each race and an overall skill level.
- The variance in skill level is constant for a given player, while the mean is variable.
- A players skill level in a given game depends on their skill levels in the previous game.
- The performance of a player is independent from game to game and symmetrically distributed in a bell shape.