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STAT 306
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Executive Summary

Evaluating NHL Players

We examined the players of all 32 NHL teams to determine how we could best evaluate them and determine their impact on team success. We also wanted to explore any possible similarities and differences between the roster construction of successful teams and non-successful teams despite every team having to obey the salary cap of 83.5 million dollars. To do this, we collected a multitude of performance statistics and sabermetrics for forwards, defensemen, and goalies.

Our first step was using k-means clustering to classify each player of each position into different classes/tiers relating to skill level and specific attributes. We wanted to know whether we could create classes of players at each position and felt that K-means clustering was appropriate. The results of the clustering were pretty good as the clusters were very distinguishable and largely passed the eye test.

Our next step was determining the best method to evaluate each player. While the metric game score does exist and is widely used to evaluate players, the specific formula is not revealed, which made us want to see if we could essentially figure out which metrics most contribute to game score. To do this, we started with exploratory data analysis and multiple linear regression to narrow down the metrics to be used. Once we did this, we used random forests to determine which of these metrics contributed, and at what magnitude, to the game score for forwards, defensemen, and goalies. Our metrics explained a good amount of the variability of game score which allowed us to conclude that our metrics were good predictors for game score. For forwards, the game score was largely based on scoring (points, assists, goals) and puck awareness (rebounds). For defensemen, the value was largely based on puck possession (rebounds, giveaways) with some scoring (assists). Goalie value was largely based on saving less difficult shots (good goalies save most poor shots).

From this, we used the game score metric to determine the best players at each position using the TOPSIS method. The TOPSIS method is a multi-criteria decision analysis method that compares a set of alternatives based on a pre-specified criterion. This allowed us to come up with a list of the most valuable players at each of the three positions which also largely passed the eye test and aligned with common views today.

We then looked at specific teams to determine what classes of players at each position contribute the most value to team success and how much each team spends on these classes of players. Specifically, we looked at two top-tier teams (New York Rangers and Dallas Stars) and two bottom-tier teams (Columbus Blue Jackets and San Jose Sharks). By comparing these teams, we concluded that it is likely that having an above-average goalie is crucial for team success. It

was also clear that the good teams had allocated large amounts of money towards top-tier forwards and defensemen but received large value contributions from these players.

Our work showed that we can cluster players at each position into different classes corresponding to their skill and playstyle. We can also create a fairly accurate estimate of game score, a metric to calculate individual player productivity in each game. This metric can then be used to evaluate players at each position to determine which players are the most valuable. This allows us to look at specific teams and see what types of players contribute the most value and how much money is spent to obtain this value. Given more data on variables and sabermetrics, we could create an even more accurate representation of game scores. We could also look at more teams across more seasons to observe patterns between the successful and unsuccessful teams regarding player value and salary allocation. We could tune the TOPSIS method since the weighting is very abstract and could be tuned in many different ways, it would be beneficial to consider alternative weighting methods. Other methods to be used could be to include XGBoosting to make our player evaluations stronger and more accurate. Lastly, we look into how to compare the three different positions and determine which position generally contributes most to team success.