Expected Offensive Possession Goals

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Introduction

To score a goal in hockey, a lot of different events have to occur to get into a good position for a successful shot. Those events can happen in a variety of different ways but the goal is the same: get into a position for a shot. Not all shot locations are the same, however. Some locations on the ice have a much greater chance of ending in a goal, and those locations should be sought after for the best chance of scoring a goal. What people see in a box score is the player who scored and the players who made the assist. That doesn't tell you much about the quality of puck movement in the given possession and how much credit each player earned in each goal.

In this project, I will create a model to quantify the probability of a possession ending in a goal from the location of the puck on the ice. This will allow me to quantify how many goals each player is contributing to from their movement of the puck and will allow scouts to better understand the quality of puck movement from each player.

Expected Offensive Possession Goals

To be able to quantify the quality of puck movement for each player, it is important to understand the value in goals each movement on the ice contributes to. Different areas on the ice will lead to different results. For example, a completed pass from the neutral zone to the offensive zone will increase the probability of a possession ending in a goal and the passing player should receive credit for that difference. That is why, instead of only taking into account the goal itself, I grouped each possession together and created a column to indicate if each possession contained a goal or not. In my model, I am predicting the probability a possession ends in a goal. Since it's a binary response variable (goal or no goal), I used a logistic regression model. The predictor variable in the model is just the location of the puck (x and y). It's important to note I only used 5 vs. 5 possessions, as possessions during a power play, or with an empty net would lead to much different results if grouped together. The model has a Brier score of 0.021. Since the majority of possessions don't end with a goal, the data is imbalanced and an accuracy test would not

be as appropriate. I then took every moment a player skated or completed a pass from one location to another on the ice, and took the difference in predicted goals between the initial location and the final location. For the sake of this project, I'll call this probability Expected Offensive Possession Goals or xOPG for short. Below is an xOPG heat map.

xOPG Heat Map

xOPG   0.05   0.10   0.15   0.20
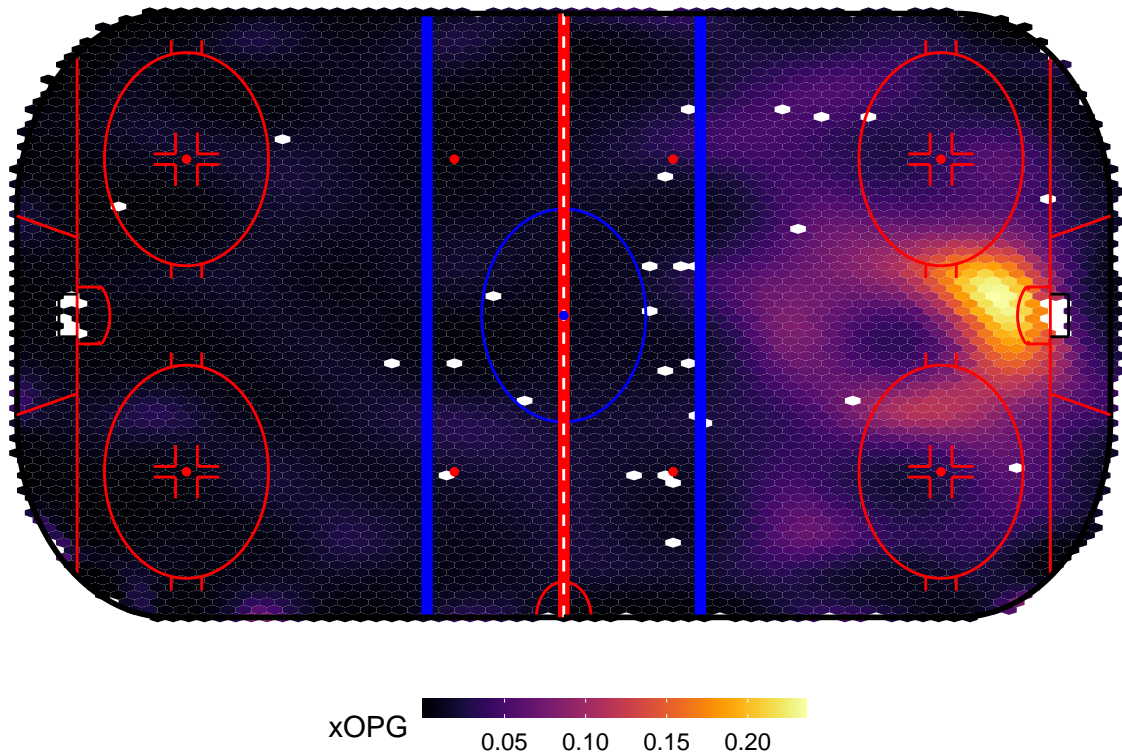
The heat map shows that a possession has a much higher probability of ending in a goal if the puck is controlled in front of the net. This is informative because players who are able to successfully move the puck in front of the net will be rewarded in xOPG and also give their team better quality opportunities which will lead to more goals.

Let's look at an example. Below is a possession from the Sudbury Wolves that ended with a goal. The size of each point is the xOPG from that spot on the ice. Each movement of the puck, whether that be from skating or a pass, leads to a different xOPG and the difference is the text near each point. The player responsible for the movement is the player who gets credit for the difference. The player in yellow is Emmett Serensits. Serensits recovers the puck with a 0.02 xOPG on this given possession from his current location. He skates and moves into a new position with an xOPG of 0.00781. He receives -0.0121 xOPG for that movement. He then passes to Chase Stillman (red) and Stillman receives the pass at 0.0192 xOPG. Serensits is credited with 0.0113 (0.0192 - 0.00781) xOPG from that pass. Stillman skates from 0.0192 to 0.0206 and is credited with 0.0015 xOPG. He then makes a good pass to Quinton Byfield (blue) from 0.0206 to 0.0702 for 0.0496 xOPG. Byfield skates from 0.0702 to 0.161 for 0.0911 xOPG. It wouldn't have mattered if Byfield scored or not. The players are only credited for the movement of the puck. For the entire possession, Serensits

is credited with -0.0008 goals, Stillman with 0.0511, and Byfield with 0.0911. Notice the biggest difference occurs when Byfield skated from where he received the puck, to where he shot. That shows the importance of getting the puck within striking distance of the net.

Difference in xOPG by Play
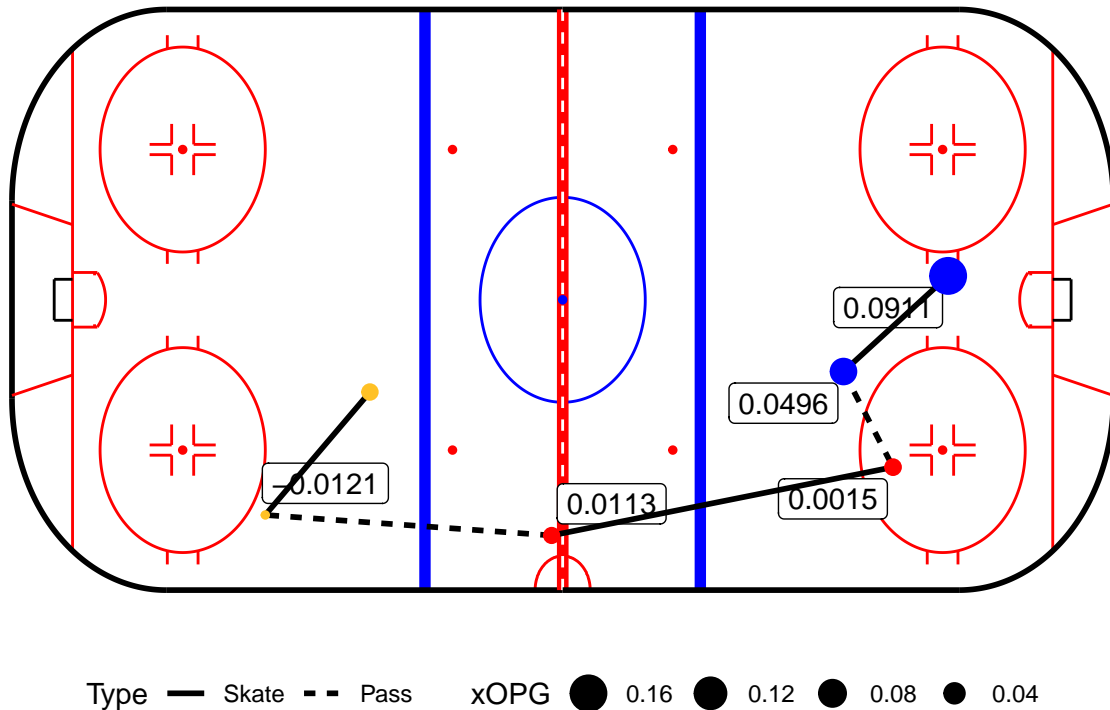
Sudbury Wolves goal by Quinton Byfield

In the boxscore, Quinton Byfield scored with assists from Chase Stillman and Emmett Serensits. However, Stillman increased the probability of a goal more than Serensits. Scouts can look at this and understand how much credit each player deserved for this goal. There is a short video of the game highlights and a short clip of this goal at 0:50 at the link here: https://ontariohockeyleague.com/gamecentre/24049/boxscore

Using this method could be a good way to evaluate the quality of puck movement. Some of the toughest passes to complete are right in front of the net, because it's well guarded, but players are rewarded if they have the skills to do that.

Leaders in xOPG

Top Players in xOPG
2019/2020

Player	xOPG	Games	Team
Maxim Golod	7.74	39	Erie Otters
Emmett Sproule	3.70	39	Erie Otters
Chad Yetman	3.63	38	Erie Otters
Daniel D'Amato	2.47	39	Erie Otters
Brendan Hoffmann	2.45	39	Erie Otters
Brendan Sellan	2.06	39	Erie Otters

This leaderboard combines both xOPG in skating with and passing the puck for each player. Maxim Golod has created the most offensive goals at 7.74. It might also be important to understand how each player is contributing to goals from skating and passing separately.

Skating and Passing xOPG Leaders

Top Players in xOPG through Passing
2019/2020

Player	Type	xOPG	Games	Team
Maxim Golod	Pass	0.87	39	Erie Otters
Daniel Murphy	Pass	0.18	27	Erie Otters
Cam Hillis	Pass	0.15	5	Guelph Storm
Drew Hunter	Pass	0.13	28	Niagara Ice Dogs
Drew Hunter	Pass	0.13	28	Erie Otters
Aidan Campbell	Pass	0.04	17	Erie Otters

Top Players in xOPG through Skating
2019/2020

Player	Type	xOPG	Games	Team
Maxim Golod	Skate	6.87	39	Erie Otters
Daniel D'Amato	Skate	4.57	39	Erie Otters
Emmett Sproule	Skate	4.42	39	Erie Otters
Chad Yetman	Skate	4.08	38	Erie Otters
Austen Swankler	Skate	3.66	36	Erie Otters
Brendan Hoffmann	Skate	3.61	39	Erie Otters

As you can see, xOPG is much higher when skating than passing. This is probably because there are more turnovers through passing than skating. Players are deducted xOPG when they turn the puck over and a lot of players have a negative xOPG when passing. Any player with a positive xOPG when passing can be considered a great passer. Good skaters can add more xOPG than good passers which puts a premium on good skaters. This surprised me because I assumed passing was a better way to move the puck but skating is clearly better for offense. Knowing this, developing players should begin to focus on their skating ability with the puck. It can make it easier to get the puck into premium positions while having a smaller chance of a turnover. Golod remains atop these leaderboards as well. He is far better at moving the puck into areas with higher xOPG than any of his teammates.

Limitations

Movement decisions with the puck depend a lot on the situation at hand. Some situations that impact decisions include the location of defenders and location of teammates. A player could decide to move the puck out of a good location because he wants to reset the possession. That can be a smart move in game but it will decrease his xOPG. Successful passes are also dependent on the receiver of the pass. If the receiver misses the pass, the passer will be at fault. With more available data on the speed and position of all players on the ice, the results would look different and be more accurate. However, this is a good start to understanding quality of puck movement for each player.

Conclusion

Instead of using common statistics like points to look at a players skills, I provide a way to quantify which players are best at creating opportunities on movement alone. Controlling the movement of the puck can be a consistent aspect of a player's game and being able to identify which players have these skills can be essential to move up to the next level. Speed of the game increases as the competition gets better and being able to successfully move the puck in Juniors can show scouts and executives which players are ready for that jump.

I hope you enjoyed my research on xOPG and thank you for reading!

Appendix

All code can be found here: https://github.com/mattboyd27/BigDataCup2021

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