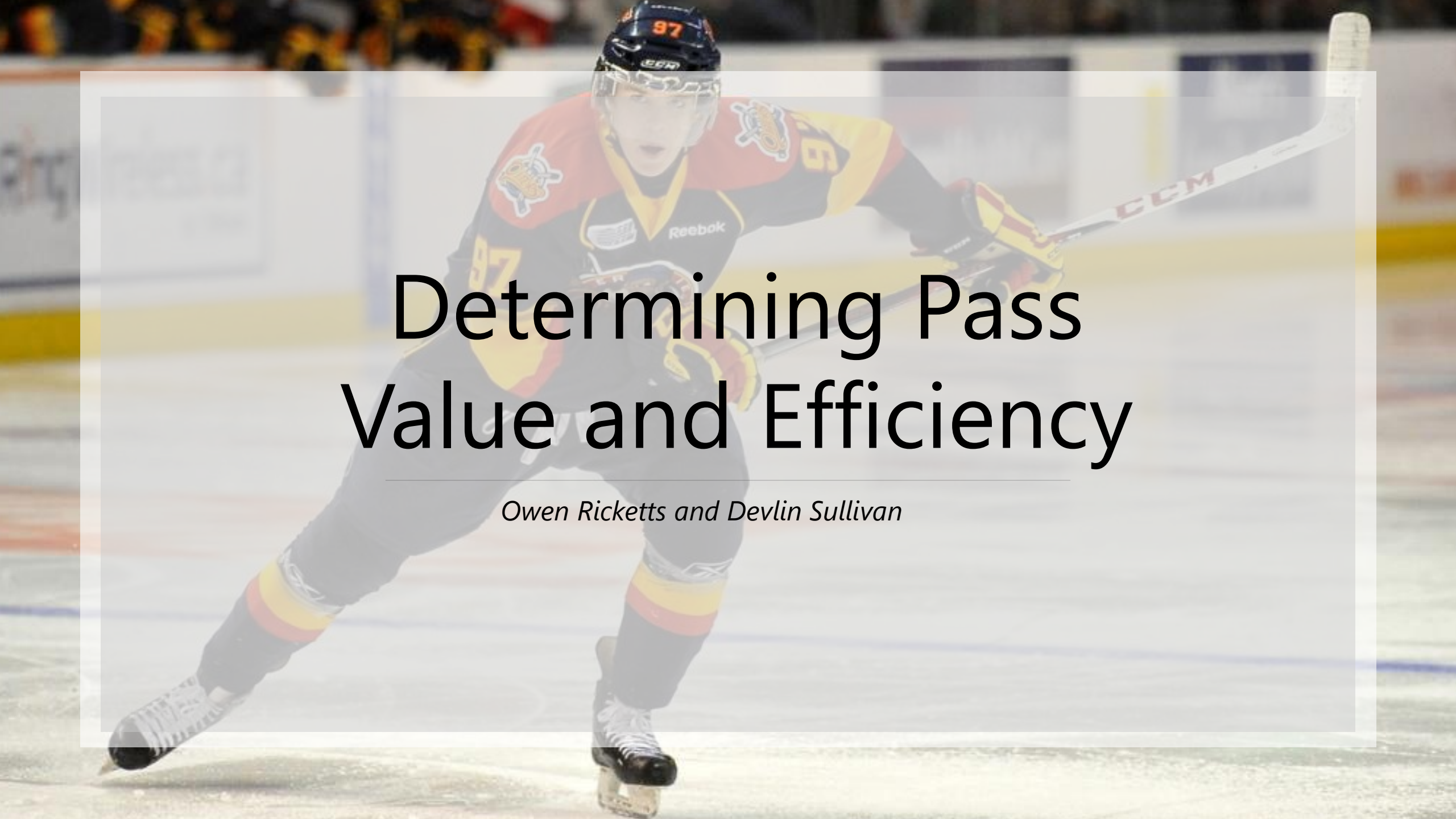


Determining Pass Value and Efficiency

Owen Ricketts and Devlin Sullivan

Agenda

1. Background
2. xG Model
3. Pass Similarity Model
4. Application
    a. Tactical Evaluation
    b. Player Evaluation
5. Areas for Improvement
6. Further Exploration
7. Conclusion

Background

- Dataset: 40 Games from Erie Otters 2019/2020 season
- Problem:
  - What is the probability of completing a pass?
  - What is the value of a completed pass?
- Objective: Develop a flexible way to answer these questions and apply to the Erie Otters
  - Precedent: Weinberger on passing clusters

xG Model

Developed using `LogisticRegressionCV` from Scikit-Learn

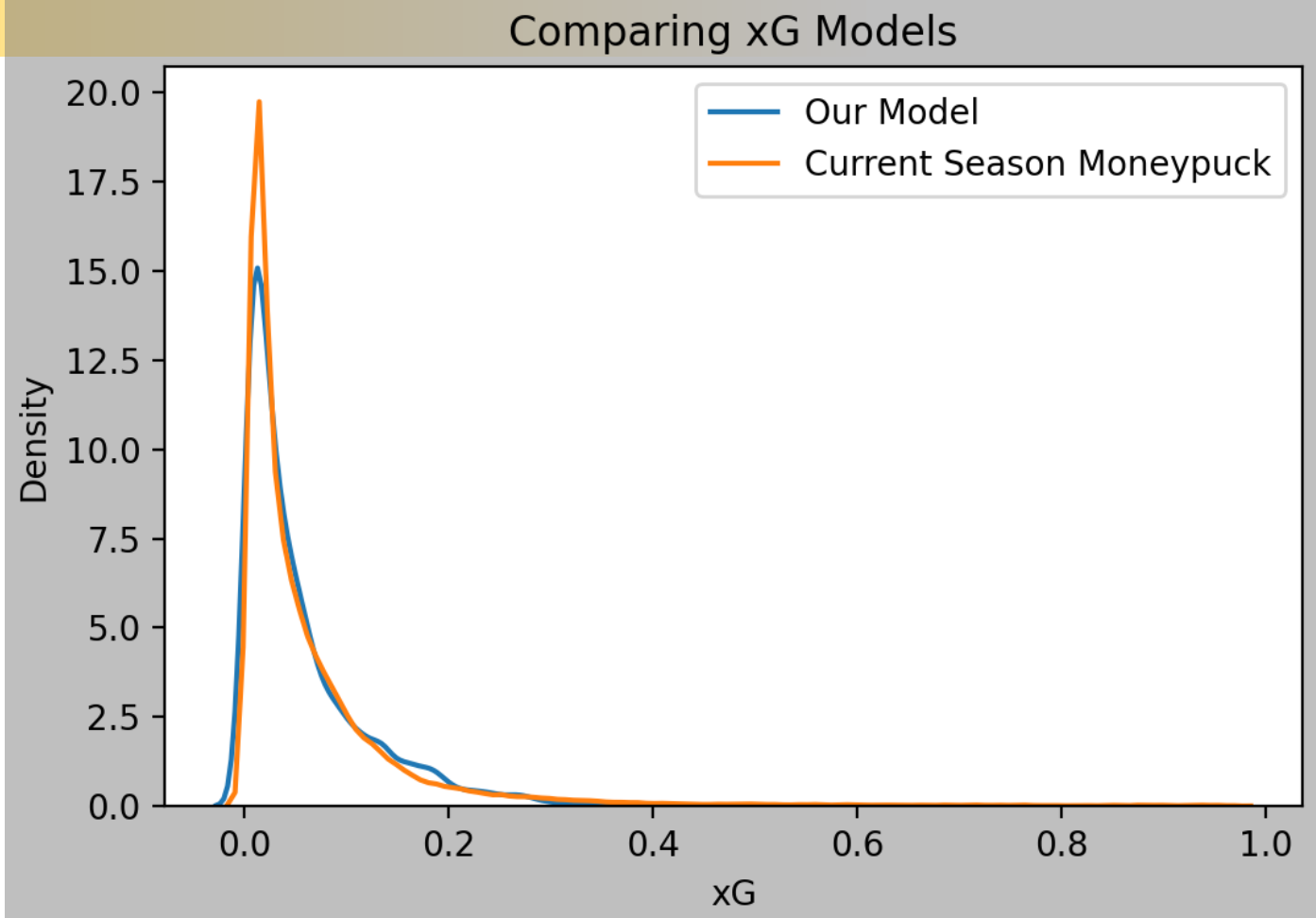
ROC AUC Score: 0.793

Feature	Coef.
Opp Team Skaters	1.15
Last Was Zone Entry	0.29
Wrap Around	0.09
Is Powerplay	0.05
Snapshot	0.02
Lateral Since Last	0.01
Y Coordinate	0.01
Shot Angle	-0.01
X Coordinate	-0.04
Shot Distance	-0.09
Slapshot	-0.28
Last Was Takeaway	-0.29
Last Was Shot	-0.31
Time Since Last	-0.41
Last Was Puck Recovery	-0.50
Deflection	-1.04
Fan	-1.41

xG Model

Developed using `LogisticRegressionCV` from Scikit-Learn

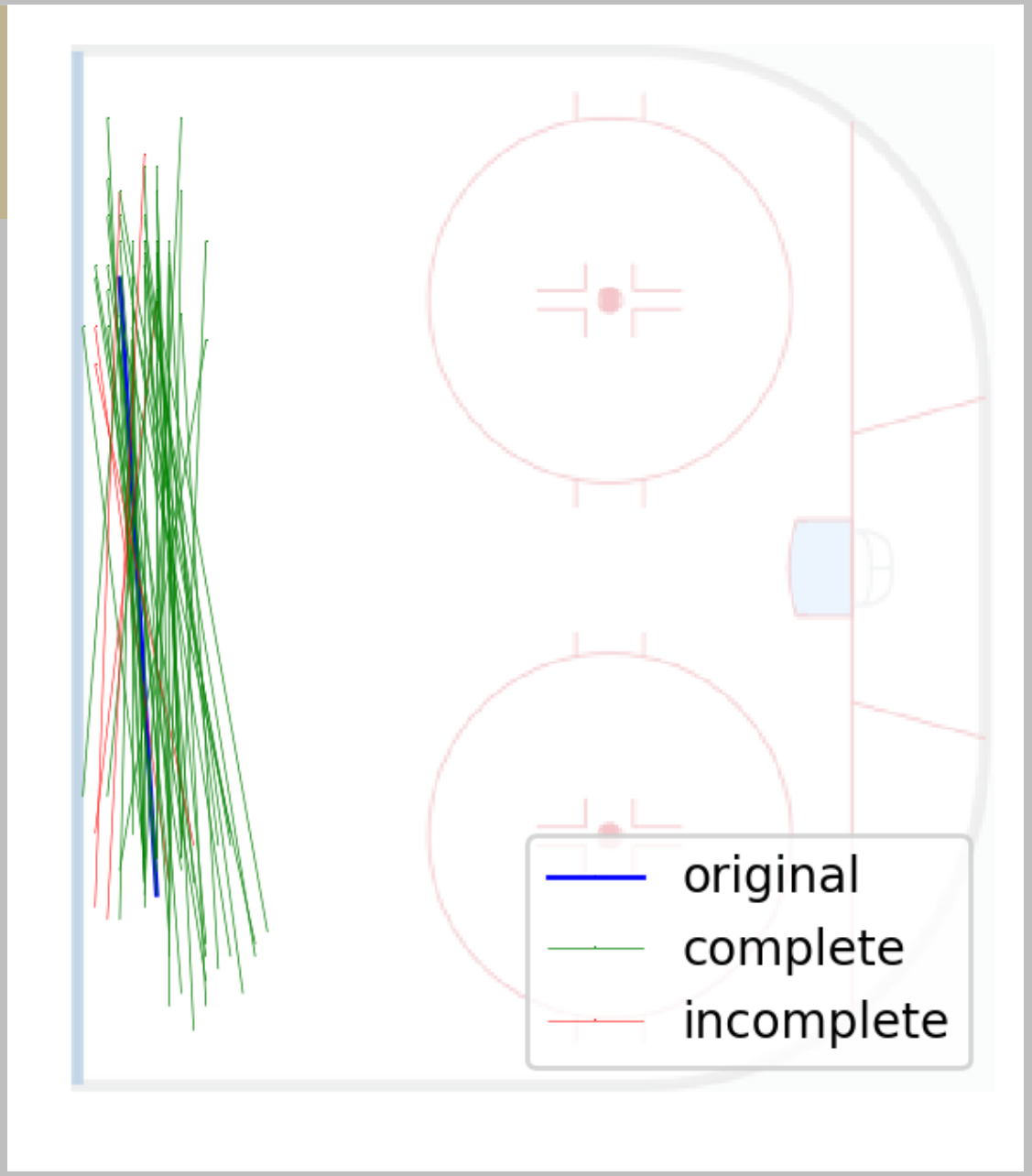
ROC AUC Score: 0.793



Pass Model

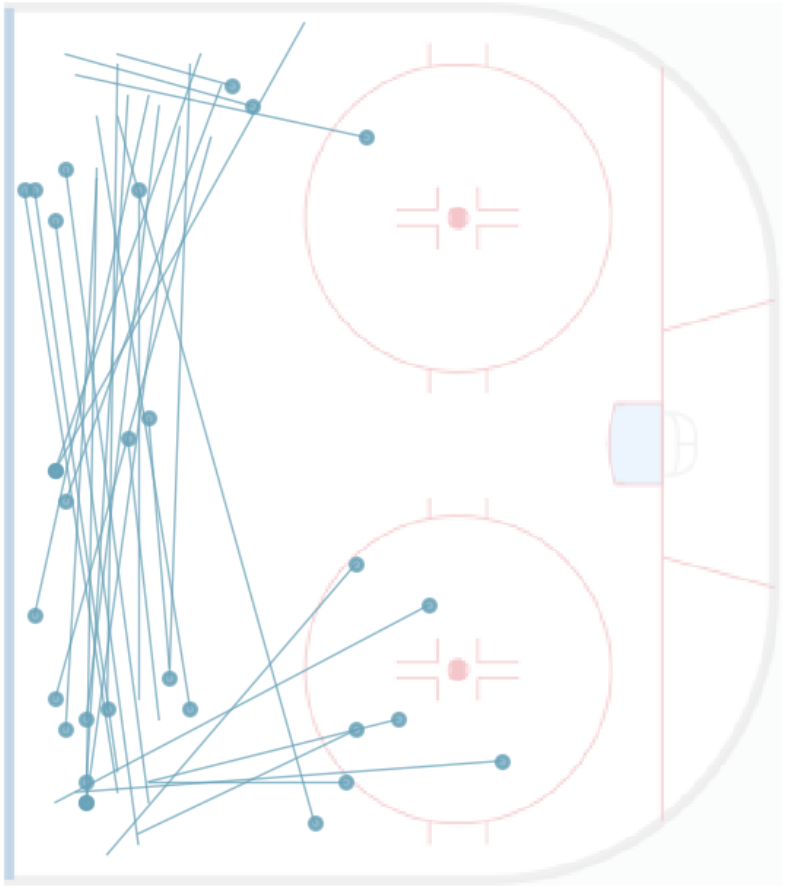
- Compared each pass to 50 nearest neighbors
- Distance computed as sum of distance between endpoints
- Utilized only Direct, 5v5, OZ data
- Pass value:

$$\sum_{e \in (t, t+45s)} xGF_e - xGA_e$$

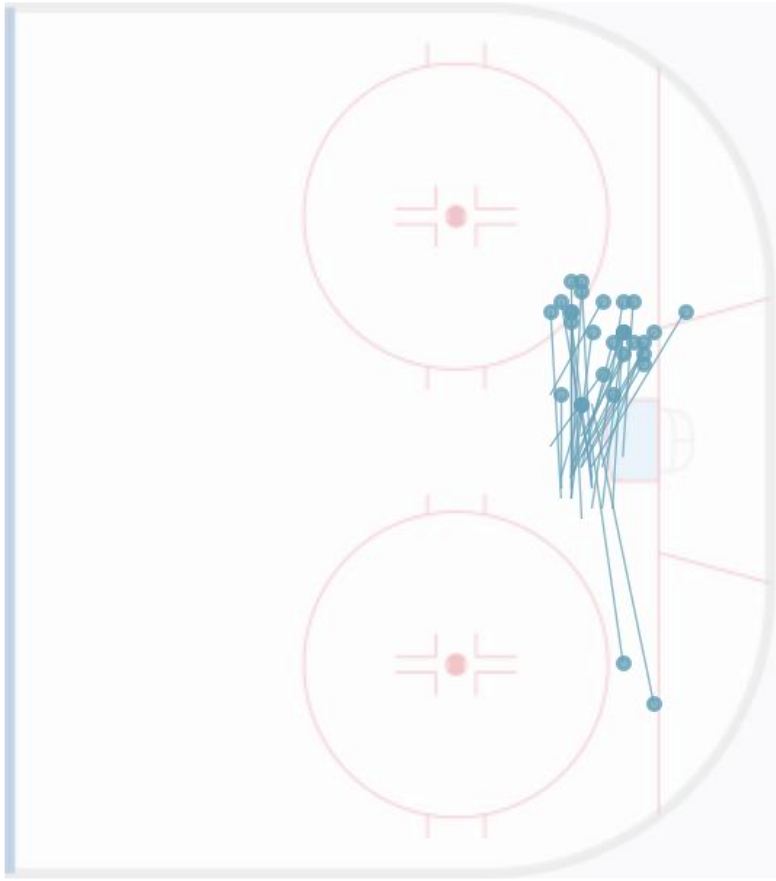


Immediate Takeaways

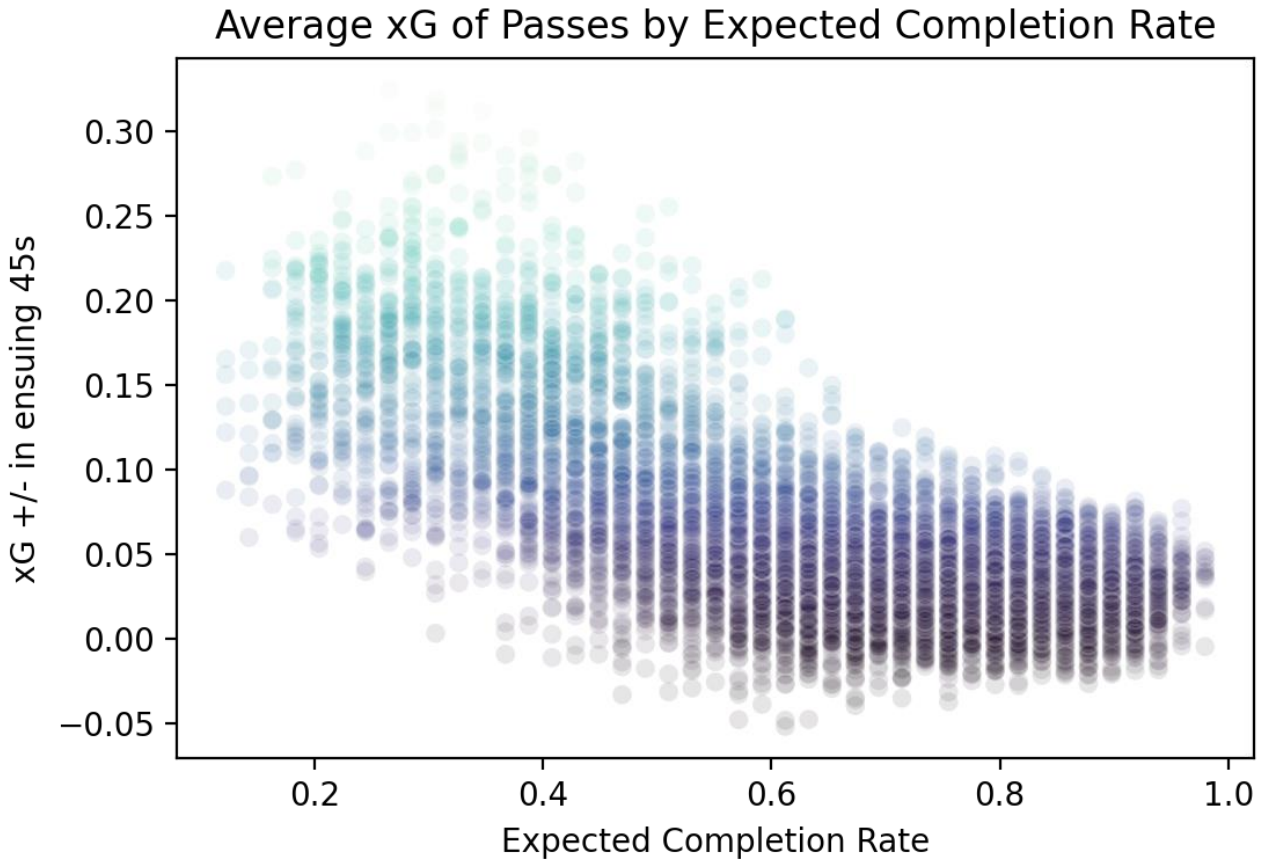
30 Safest Pass Attempts



30 Highest Value Pass Attempts



Immediate Takeaways



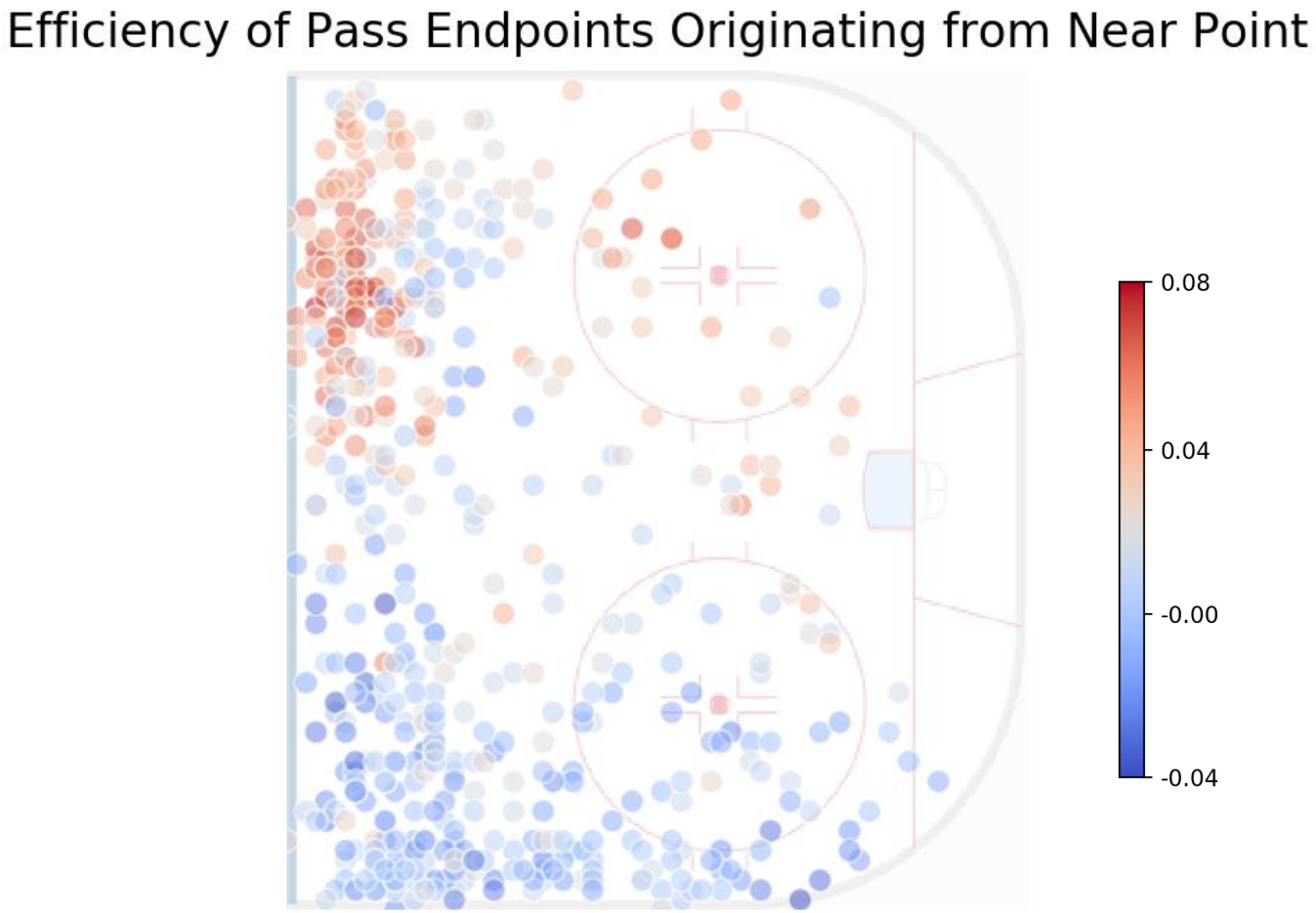
Efficiency

- Efficiency Calculation:

  $P(Success) * \Delta xG$

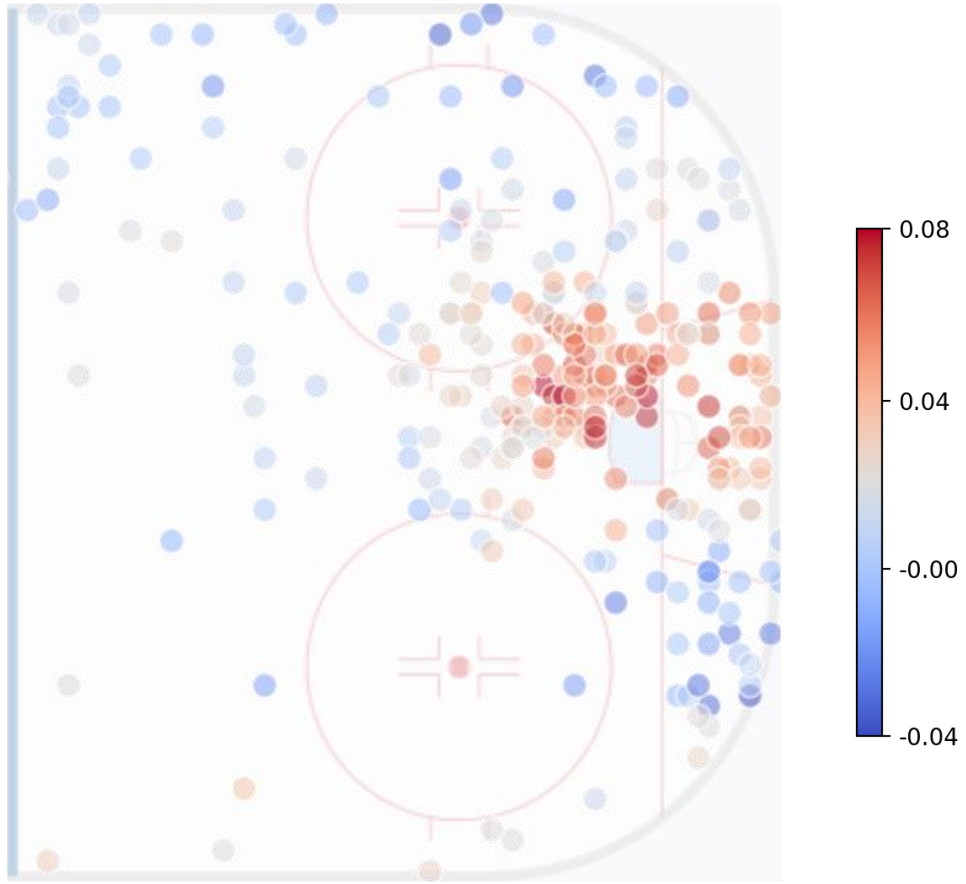
- Use cases:
  - Evaluating best passes from a particular area of the ice

Most Efficient Passes

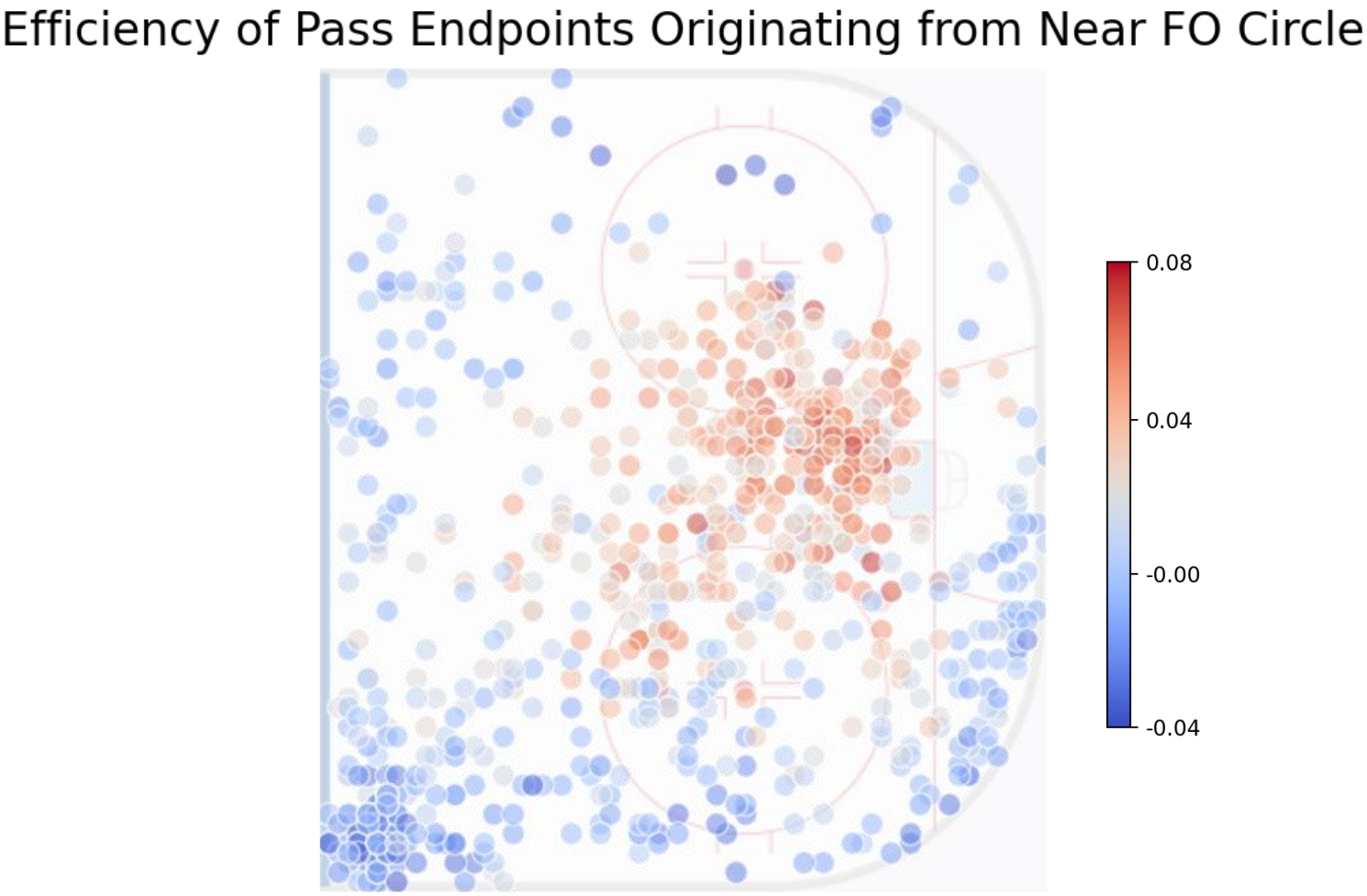


Most Efficient Passes

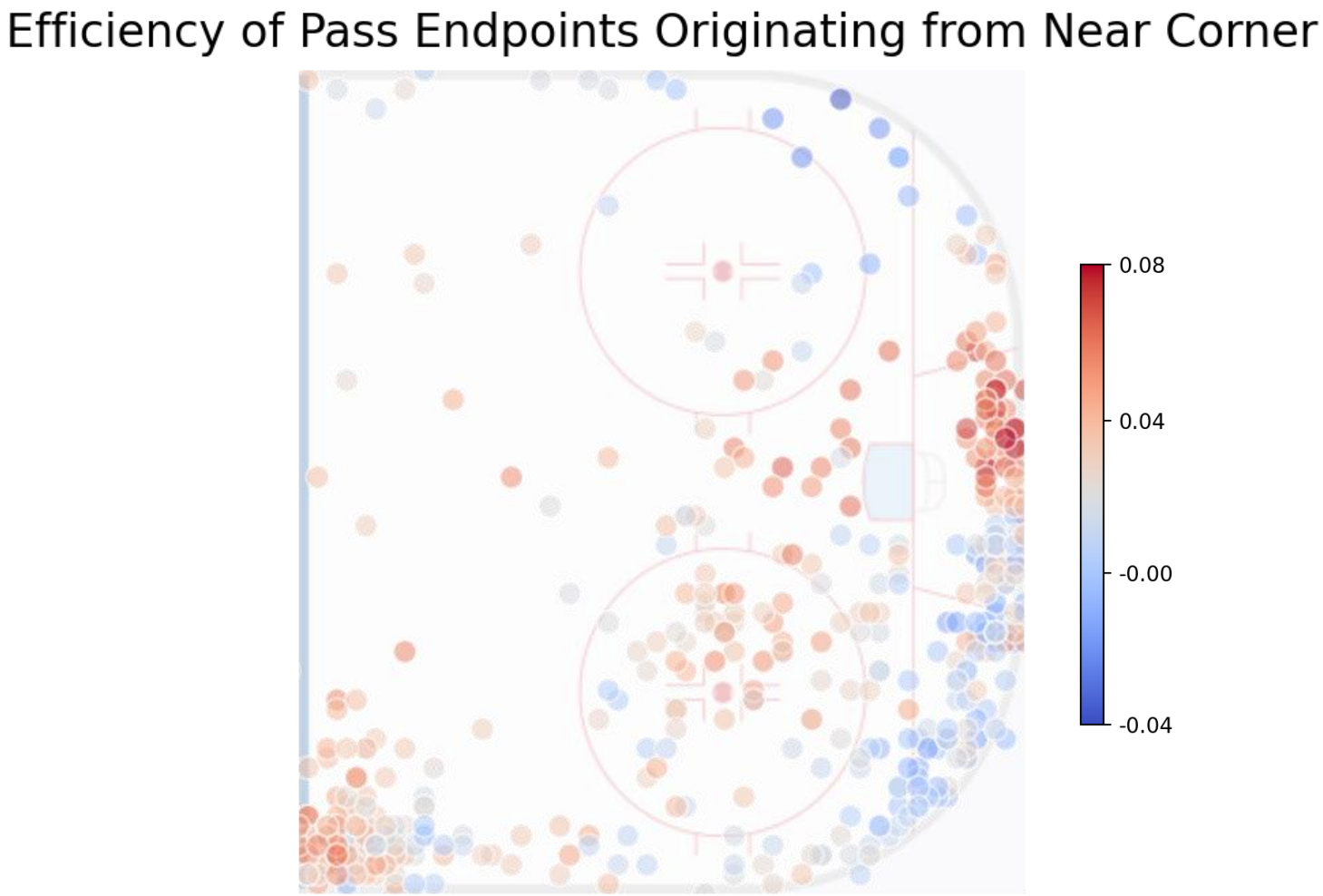
Efficiency of Pass Endpoints Originating from Far Half of Trapezoid



Most Efficient Passes



Most Efficient Passes

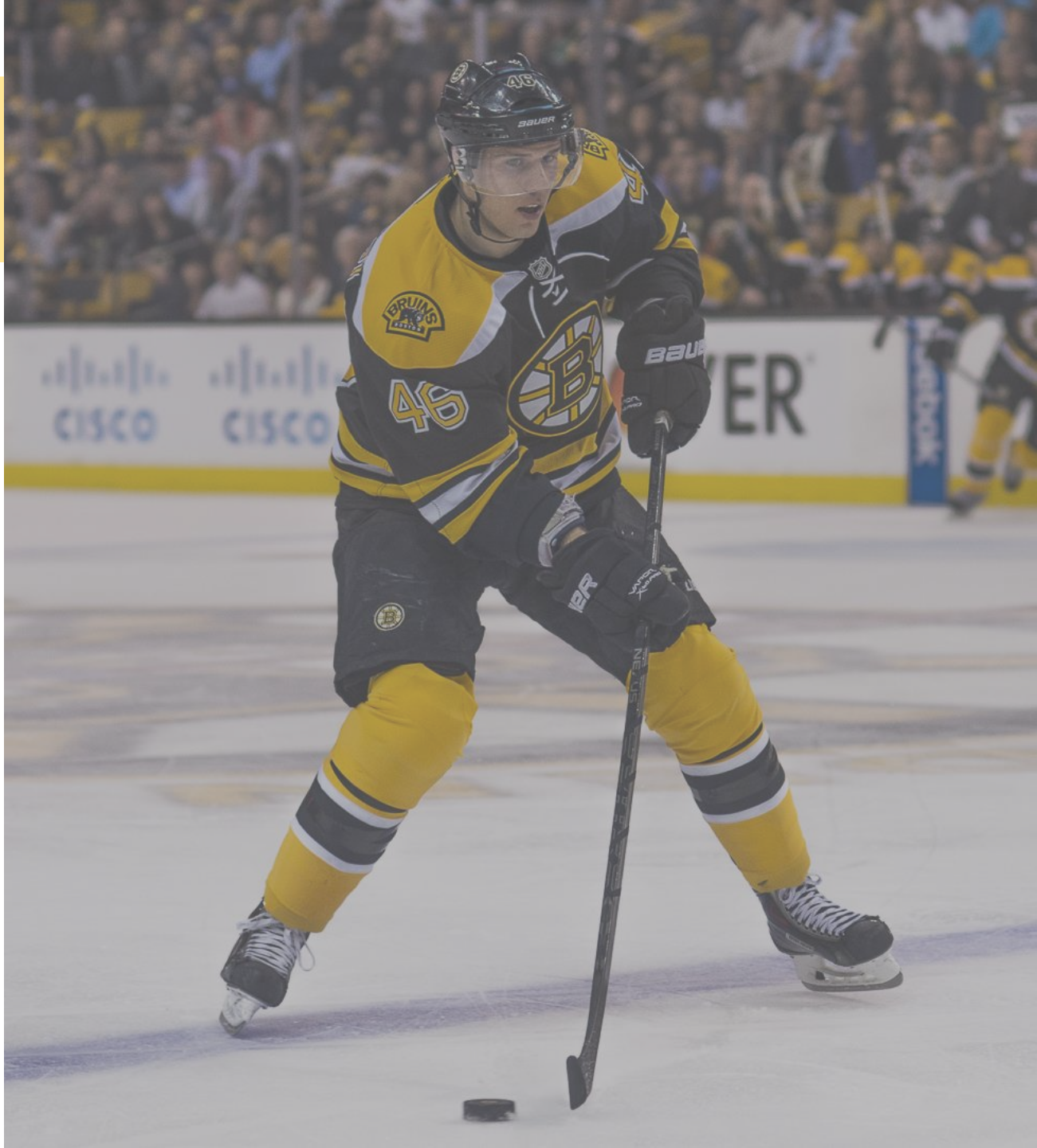


Efficiency

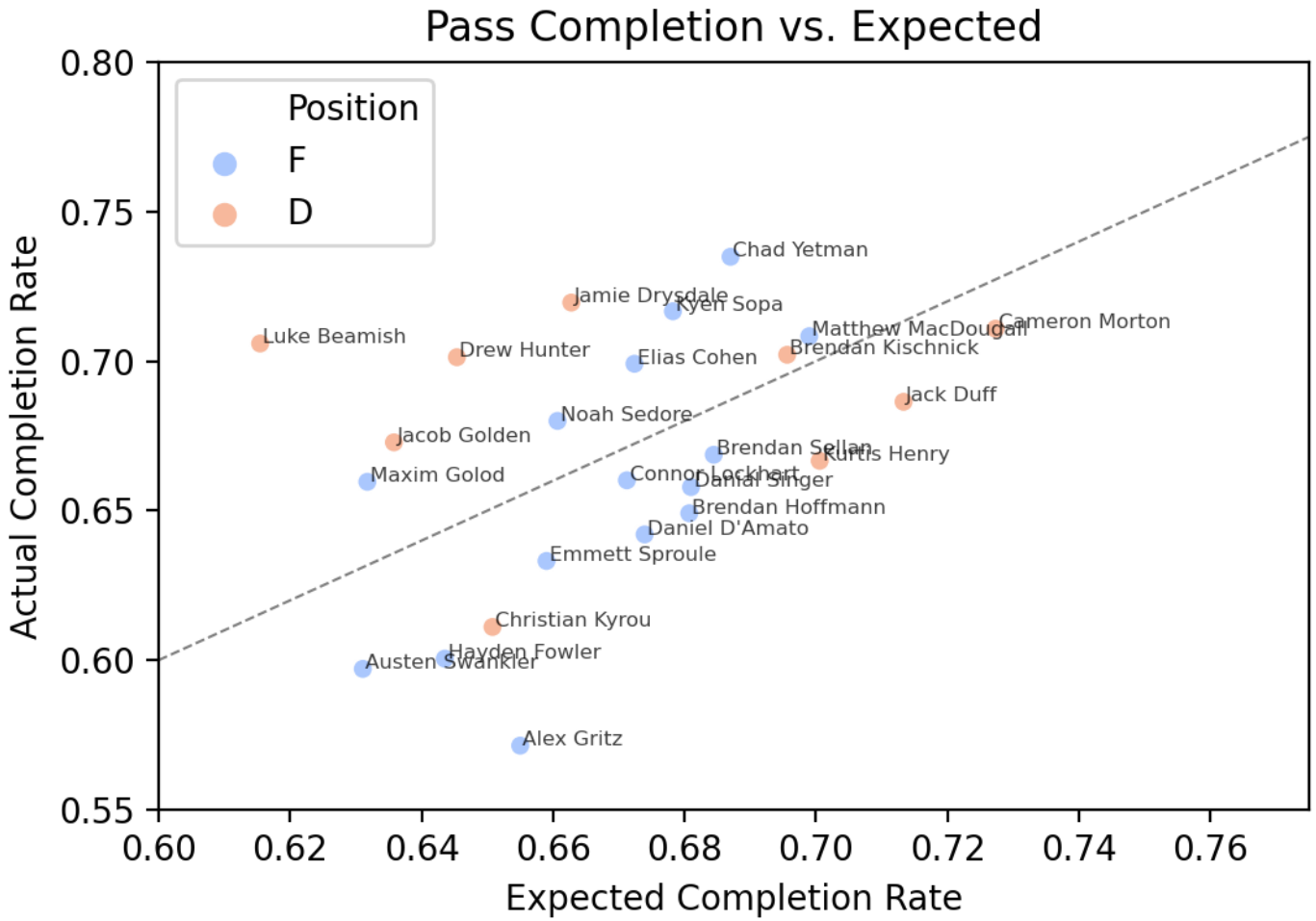
- Efficiency Calculation:

  $P(Success) * \Delta xG$

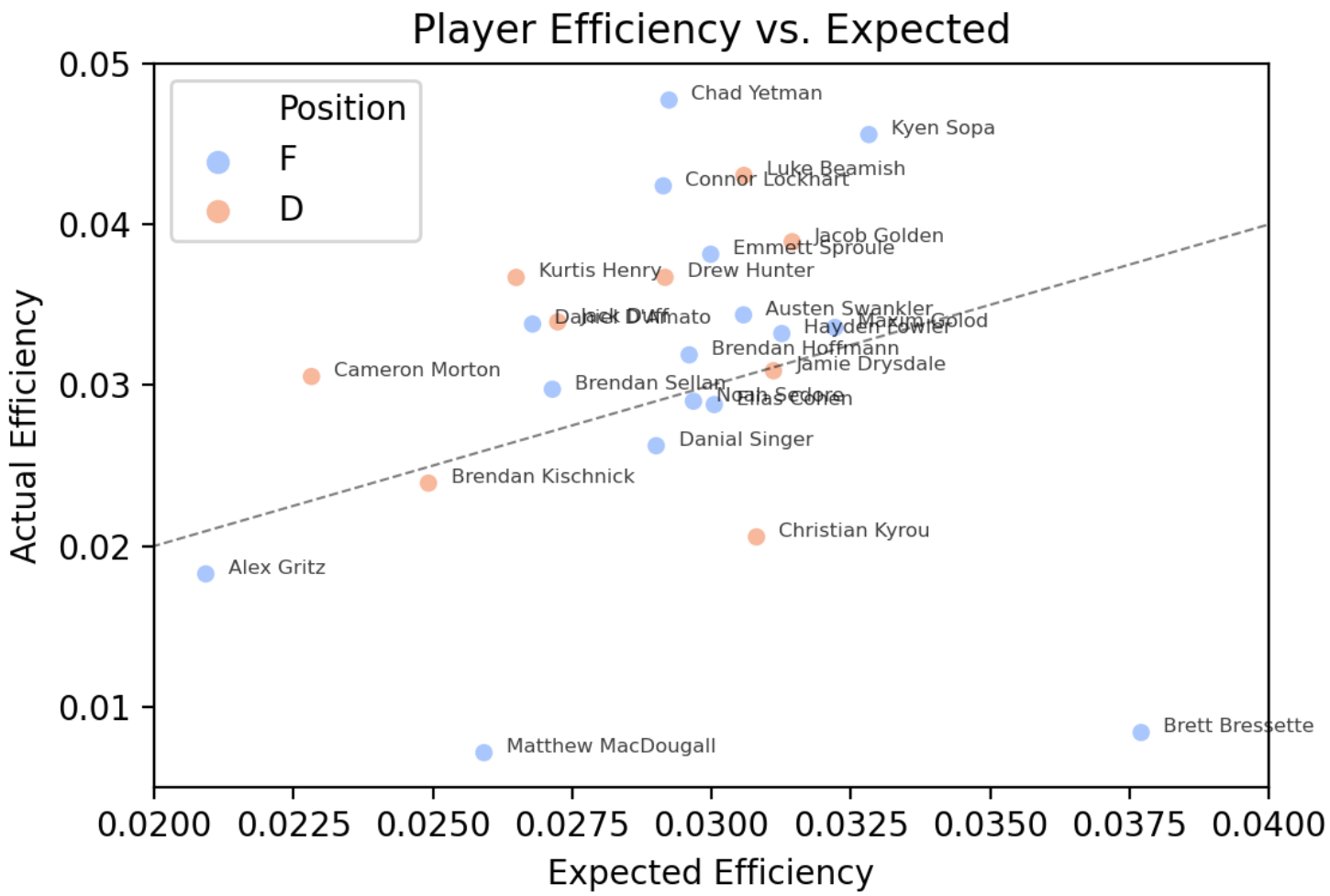
- Use cases:
  - Evaluating best passes from a particular area of the ice
  - Evaluating individual playmaking ability vs expected



Application: Erie Otters



Application: Erie Otters



Areas for Improvement

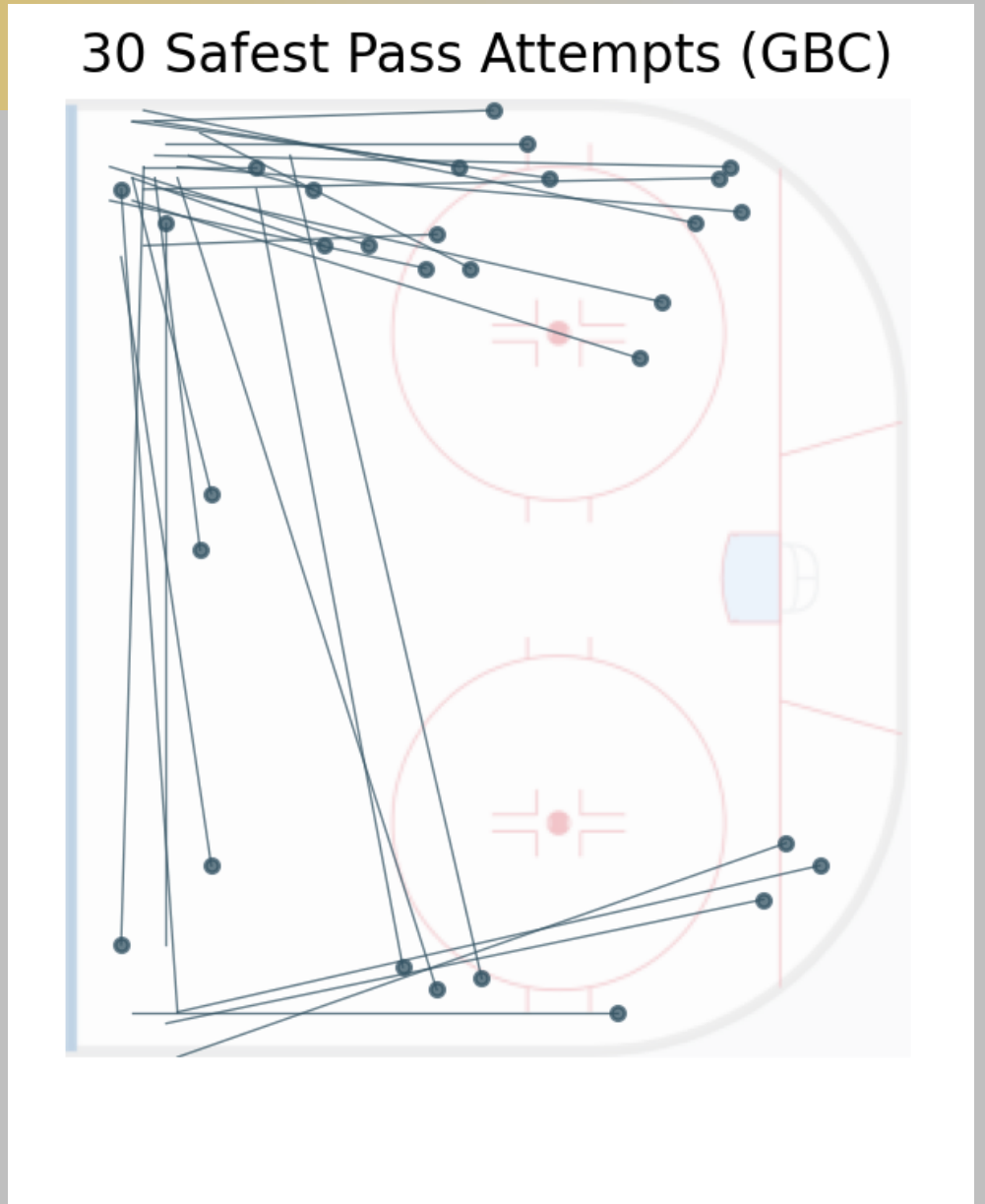
- Considered only a fraction of what makes a pass successful, valuable
- Dataset contained only one team’s games
- Limited predictive value
- Incorporate other players

Further Exploration

Trained Gradient Boosting Classifier on pass success data

Features:

X Coordinate 2	0.446170
Y Coordinate 2	0.297931
Y Coordinate	0.107221
X Coordinate	0.071006
Time Since Last	0.034832
Lateral Since Last	0.032195
Direct	0.010646

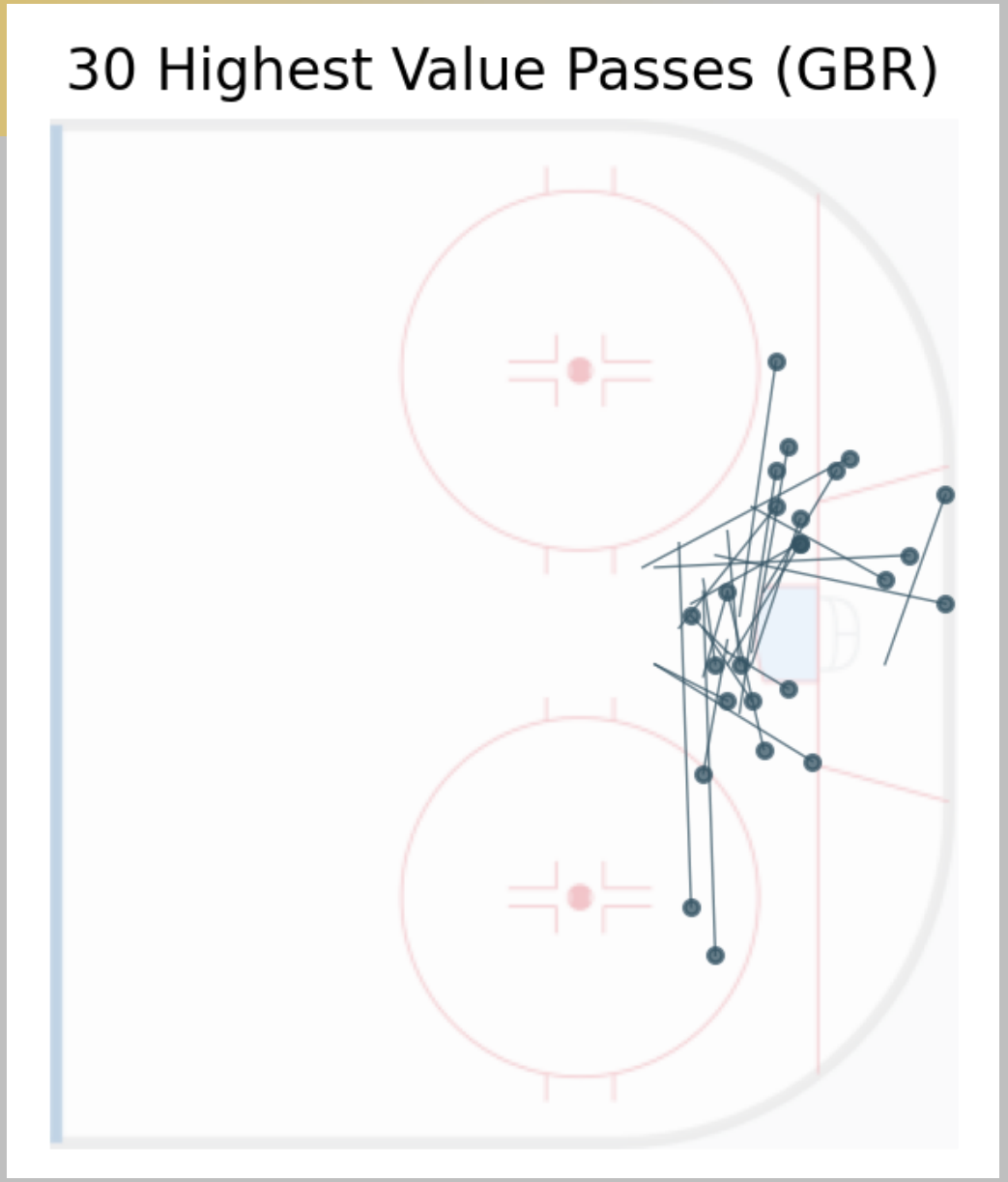


Further Exploration

Trained Gradient Boosting Regressor on pass value data

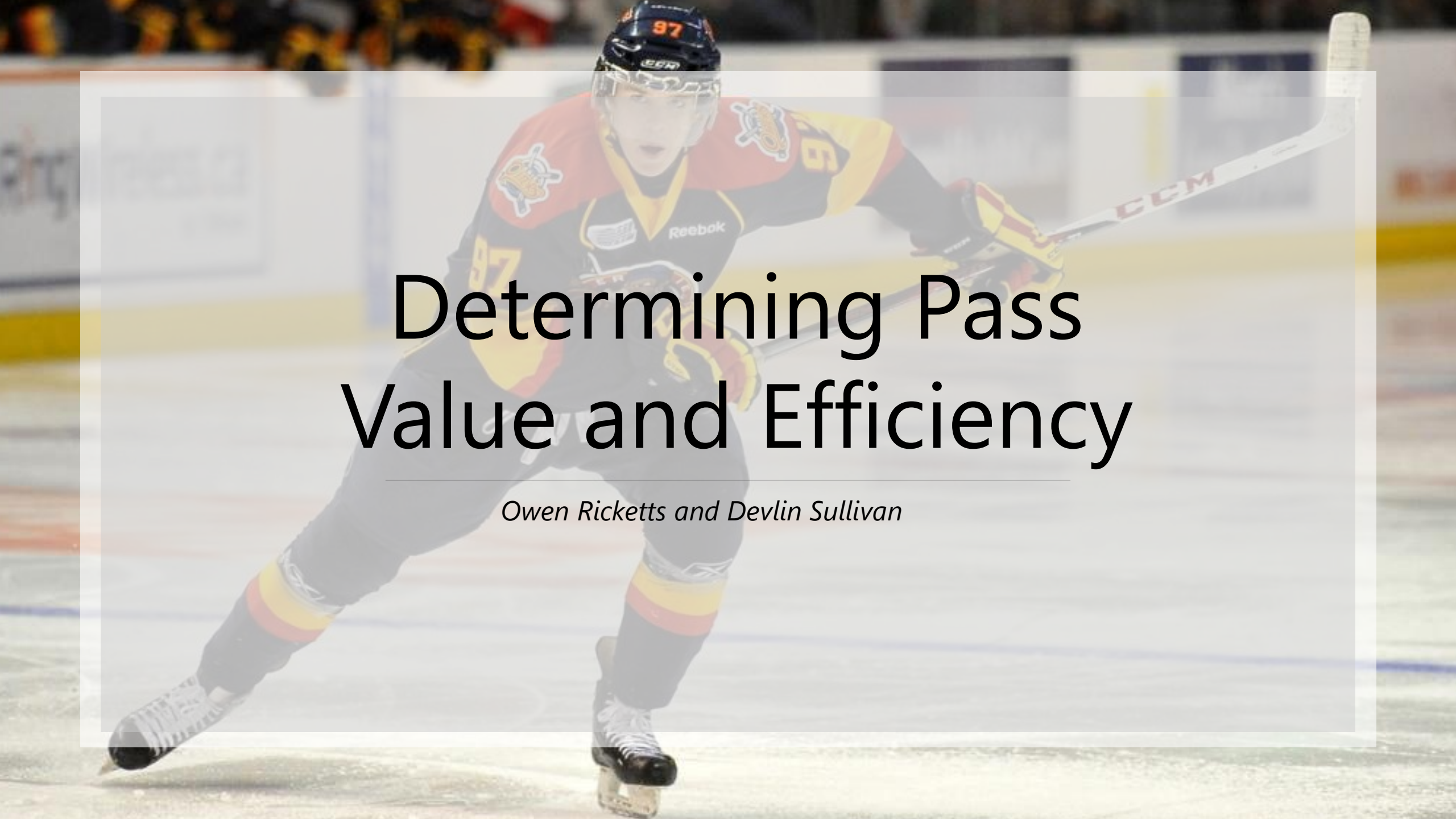
Features:

Time Since Last	0.043786
Lateral Since Last	0.071281
Y Coordinate	0.111698
X Coordinate	0.113387
X Coordinate 2	0.268750
Y Coordinate 2	0.391097



Conclusion

- High risk/reward passes are good
- Larger sample, more robust predictiveness/stability testing needed
- Location of more players would be nice
- Potential room for improvement with current pass selection
  - Avoiding low probability, low value passes
  - Generally confirms existing research



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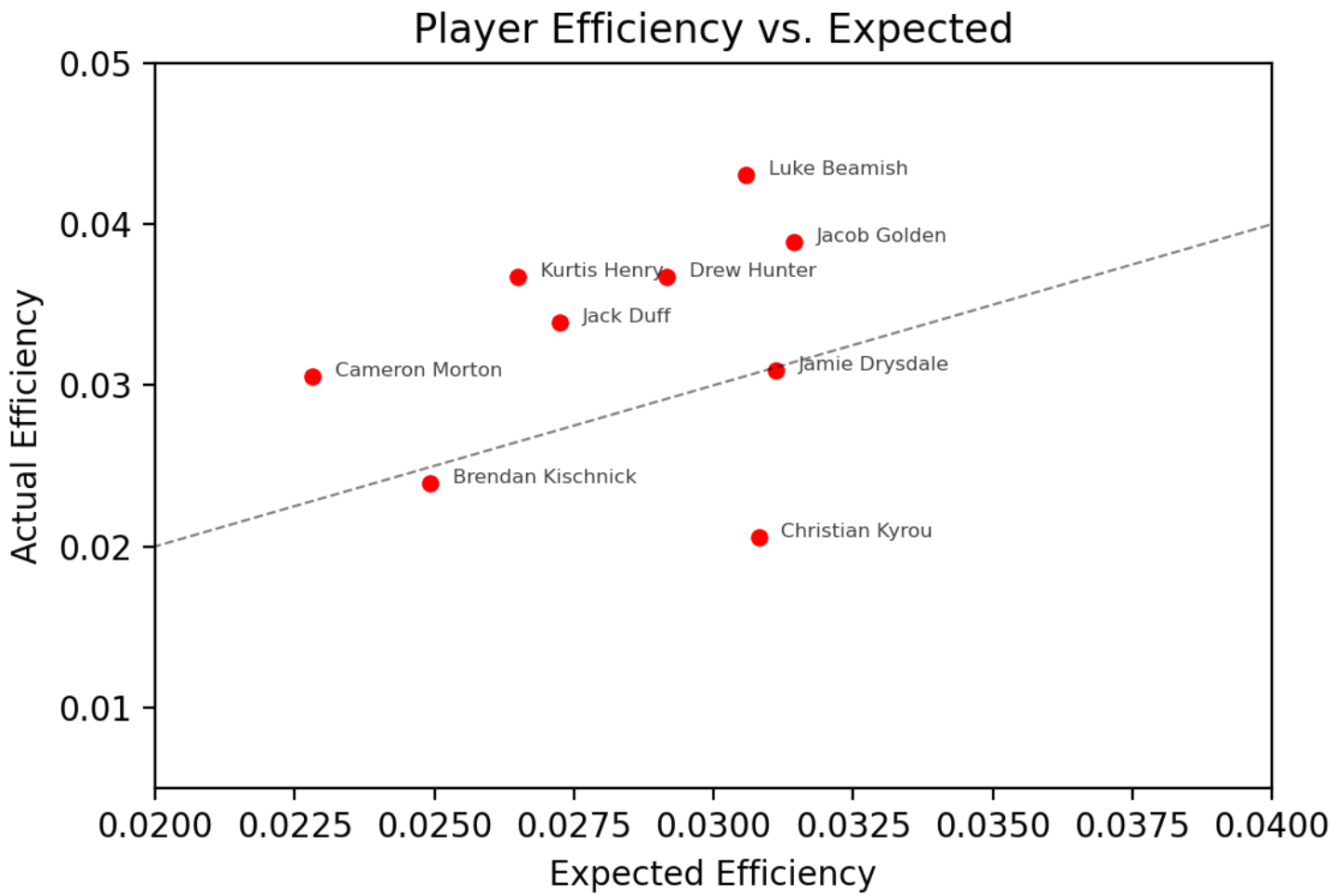

Application: Erie Otters