Predicting NHL Head Injuries

By: Marissa Bush

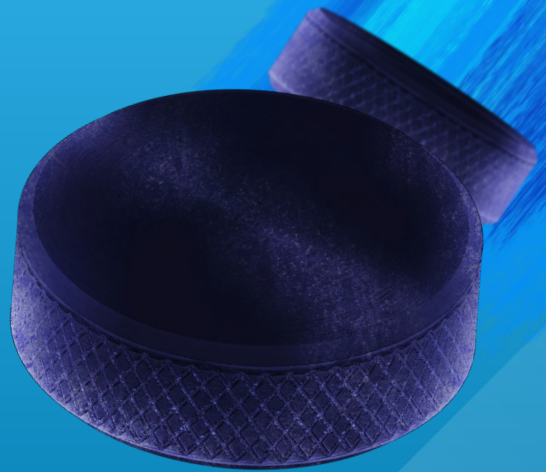
Outline

- Business Problem
- Data
- Methods
- Findings
- Conclusion
- Future Work

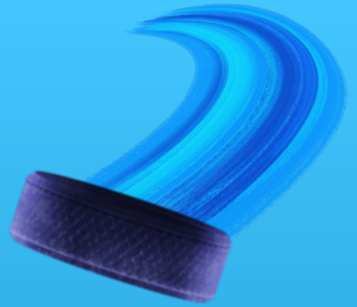
Business Problem

- This project aims to use data analysis to predict which NHL players may be at a higher risk of sustaining head injuries.

- Reasons this is a concern:
  1. Player Safety
  2. Performance Optimization
  3. Financial Implications



Data

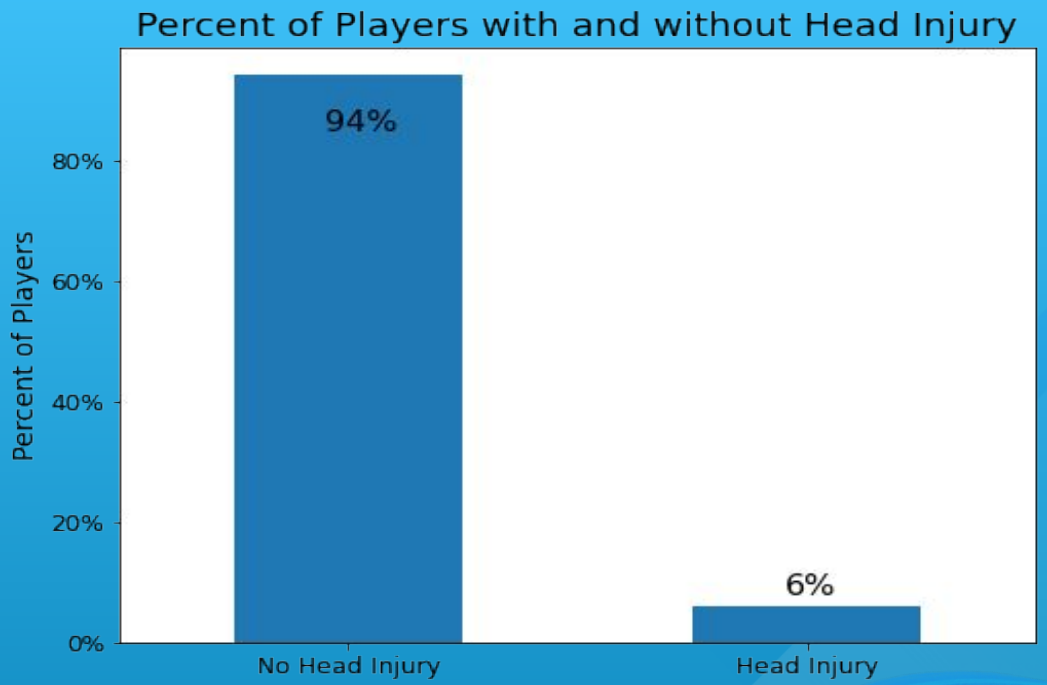


- Eliteprospects.com for NHL player data
  - Data include: Goals, Assists, Total Points, +/-, Penalty Minutes, Position, Team played on, etc.
- CSV file from NHL injury data
- Final dataset:

  18,723 rows

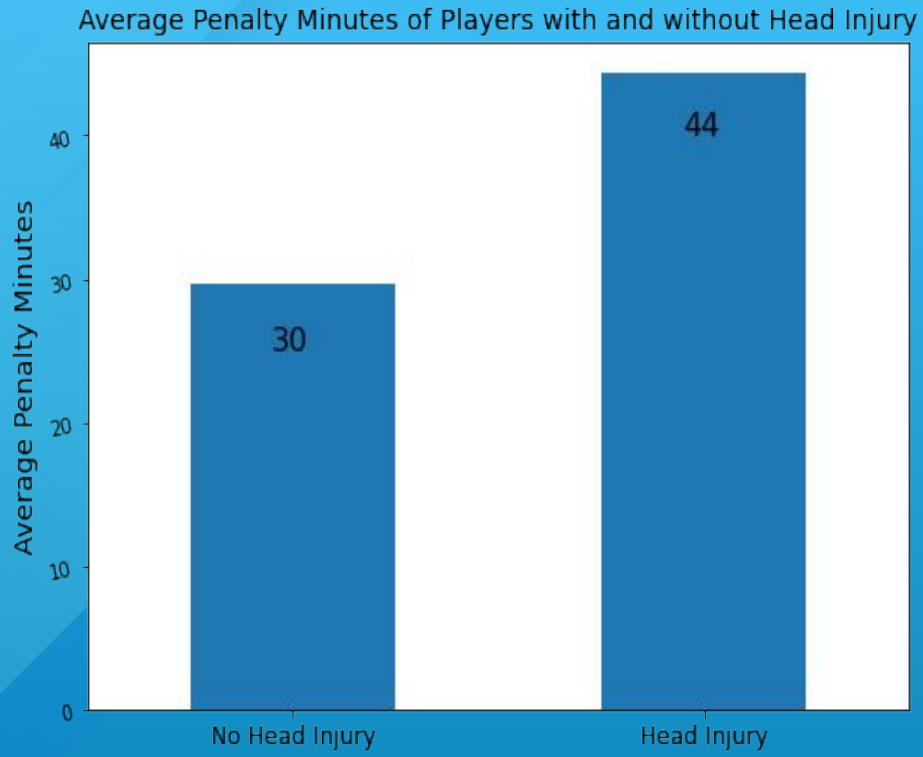
  47 features

Data: Target Variable Class imbalance :Only 6% of players had a head injury



Methods

- OSEMN method for data analysis
- Iterative modeling
- Function called model_helper to run through five machine learning models:
  1. Logistic Regression
  2. Decision Tree Classifier
  3. Random Forest Classifier
  4. Support Vector Machine (SVM)
  5. Gradient boosting

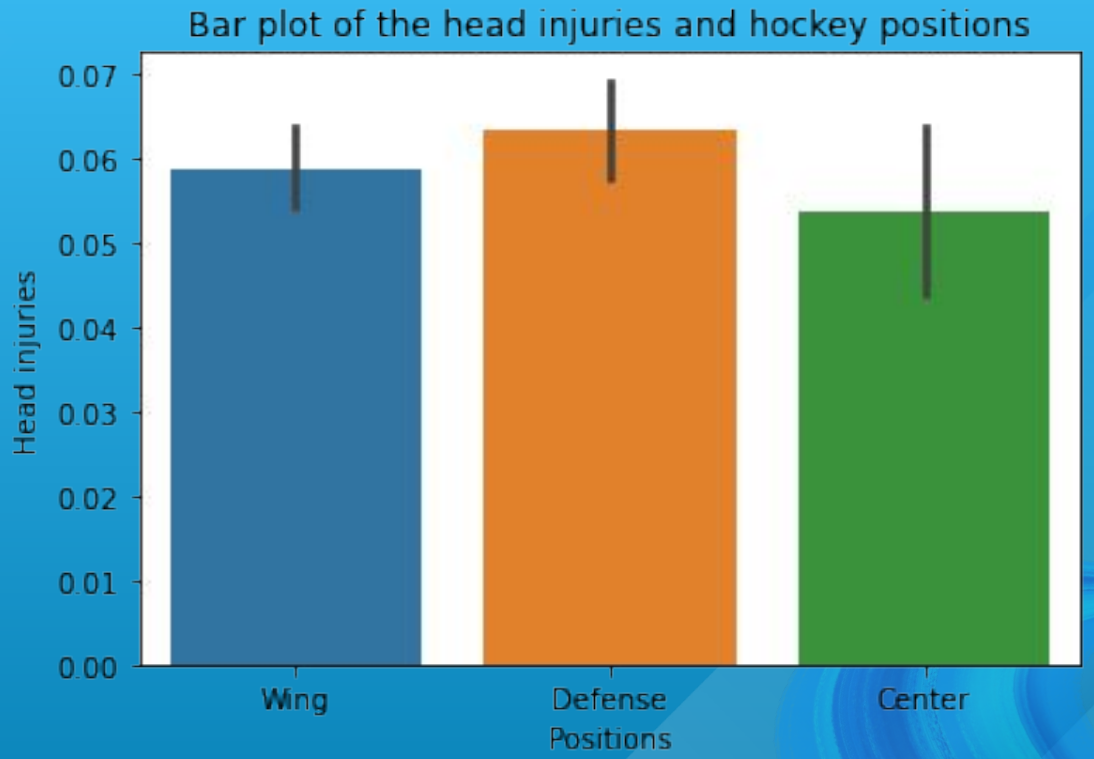


Findings:

Players with head injuries on average have more penalty minutes.

Findings:

Defense have the most head injuries followed by wings, and centers have the least.



Findings

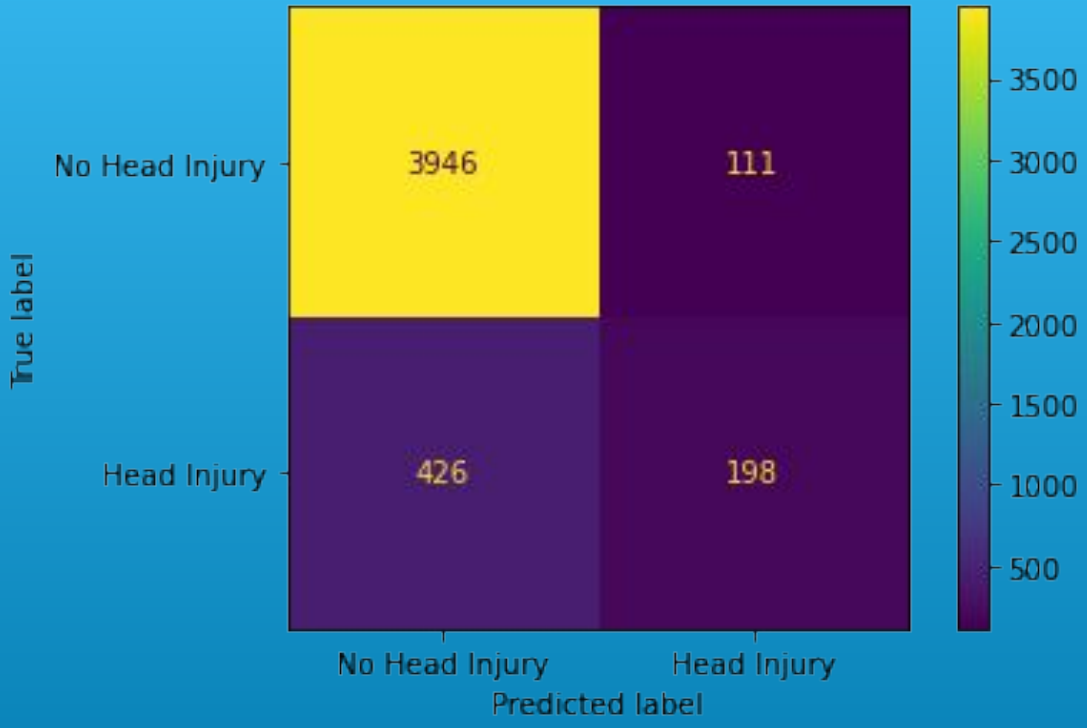
Model	F1 Score
Dummy Classifier	0.00
Logistic Regression	0.03
Decision Tree	0.16
Random Forest	**0.17**
Support Vector Machine (SVM)	0.13
Gradient Boosting	0.10

Findings

Model	F1 Score
Dummy Classifier	0.00
Logistic Regression	0.03
Decision Tree	0.16
Random Forest	0.17
Support Vector Machine (SVM)	0.13
Gradient Boosting	0.10
Random Forest (3 years)	**0.25**

Confusion Matrix

- 3,946 True Negatives
- 198 True Positives
- 426 False Negatives
- 111 False Positives



Top 10 Current NHL Players with highest risk of head injury

Player	Probability of Head Injury
Brandon Montour	91%
Jeff Petry	89%
Cam Fowler	89%
Shea Weber	87%
Erik Gudbranson	87%
Steven Santini	87%
Shayne Gostisbehere	87%
Brett Kulak	86%
Erik Gustafsson	86%
Steven Kampfer	86%

Recommendation: 1

- **Penalty Minutes:** Players that have more penalty minutes get more head injuries.
- **Actionable Step**: NHL coaches and managers make a greater consequence for players who are given penalties.

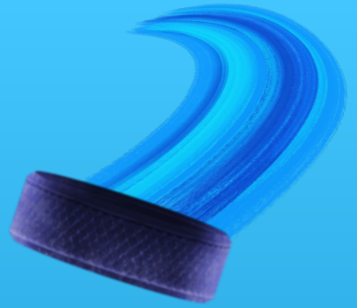
Recommendation 2:

- **Current NHL Players:** We now have a list of players that have a high probability of head injury.
- **Actionable Step**: NHL coaches and managers can have team personnel monitoring for a head injury.

Conclusion

Using machine learning, we are able to predict whether someone has a head injury at a higher rate, than by random guessing.

However, due to the randomness of head injuries, this is still a challenging problem.



Future Work

- More feature engineering
- Validating the target variable with another nhl injury dataset (injury data is not always accurately reported)

Thank you!

Marissabush.02@gmail.com

https://github.com/Marissa841/phase_5_project

Resources

NHL Injury Data

- https://nhlinjuryviz.blogspot.com/2015/11/nhl-injury-database.html

Eliteprospect-scraper

- https://pypi.org/project/eliteprospect-scraper/