AMERICAN FOOTBALL
NFL Fantasy Analysis

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Project Overview

Target Audience

Anyone who plays Fantasy Football can utilize our app to help guide them in their decision making process through data analysis.

Motiviations

To create a model that accurately predicts the performance of chosen NFL players based on past performance, weather conditions, stadium, years playing, and average yearly fantasy league points scored.

Tools Used:

SKlearn(Linear Regression), Flask, Javascript, Pandas, CSS

Data Overview

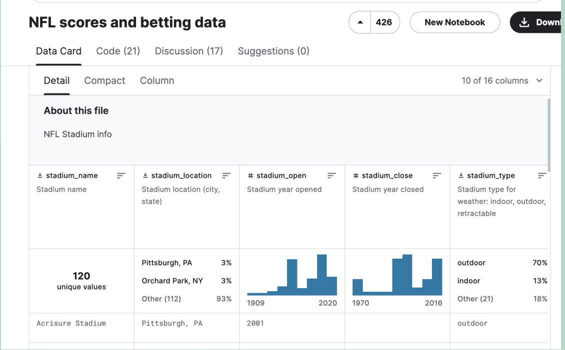
Primary Data Source:

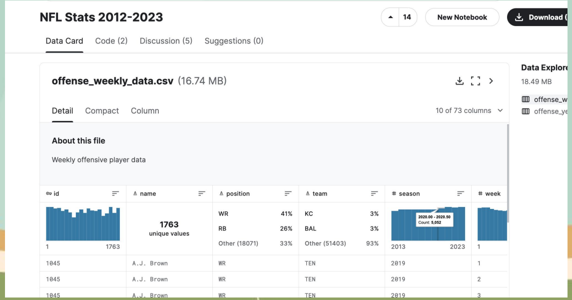
[NFL scores and betting data]

[NFL Stats 2012-2023]

- 73 different columns that reference player stats
- 5453 rows
- Stadium, weather, & field type data

Site Home Pages





Processing Pipeline

Goal

- Ensure data for prior seasons are available, accurate, and consistent across players and seasons including changing team names, stadium names, games per season, etc.
- Create a merged dataset from multiple CSV’s and spreadsheets

kaggle

Process

- Downloaded required data from kaggle and updated fields for consistency
- Merged stadium and player data
- Output new CSV’s for model building

Linear Regression Model

- Used many NFL offensive stats to help predict fantasy scores (None that near perfect correlation to fantasy scores)
- Back tested model with 2023 model predictions and actual 2023 fantasy results
- Predicted 2024 fantasy football scores for upcoming season

```
[10]: lr_model = LinearRegression()

[11]: lr_model.fit(X_train, y_train)

[11]: ▾ LinearRegression
      LinearRegression()
```

```
25]: no_2023_lr_model = LinearRegression()

26]: # Training model without 2023 season data
     no_2023_lr_model.fit(X_no_2023, y_no_2023)

26]: ▾ LinearRegression
     LinearRegression()
```

	position	games	targets	rec_ypg	ypr	receiving_fumbles	target_share	air_yards_share	carries	rush_ypg	...	overall	stadium_name	stadium_weather_type	stadium_surface
4	WR	17	158	85.65	13.74	2.0	0.30	0.42	0	0.00	...	51.0	Lincoln Financial Field	cold	Grass

30 40 50 40 30

Model Optimization

```
# We'll start with a copy of the all_season_data and add additional dimensions/features
opt_model_all_seasons_data = all_seasons_data.copy()
opt_model_all_seasons_data['target_per_game'] = round((opt_model_all_seasons_data['targets']/opt_model_all_seasons_data['ga
opt_model_all_seasons_data['carries_per_game'] = round((opt_model_all_seasons_data['carries']/opt_model_all_seasons_data['g
opt_model_all_seasons_data['team_off_snaps_per_game'] = round((opt_model_all_seasons_data['teams_offense_snaps']/opt_model_
opt_model_all_seasons_data['off_snaps_per_game'] = round((opt_model_all_seasons_data['offense_snaps']/opt_model_all_seasons
opt_model_all_seasons_data['attempts_per_game'] = round((opt_model_all_seasons_data['attempts']/opt_model_all_seasons_data[
```

- Added new columns that helped increase performance of model
- RMSE increased by 18.59%
- R2 increased by 1.37%

PRE-Optimization

```
[32]: import math
      mse_2023 = mean_squared_error(fa
      rmse_2023 = math.sqrt(mse_2023)
      rmse_2023

[32]: 17.481317677683556

[33]: r2_2023 = r2_score(fantasy_2023_
      r2_2023

[33]: 0.9607669583952572
```

POST-Optimization

```
[37]: # Calculating RMSE for model bas
      mse_2023 = mean_squared_error(fa
      rmse_2023 = math.sqrt(mse_2023)
      rmse_2023

[37]: 14.229830865136156

[38]: # Calculating R2 for model based

      r2_2023 = r2_score(fantasy_2023_
      r2_2023

[38]: 0.974004203717691
```

RMSE: 17.48 → -3.25 → **RMSE: 14.23**

R2: 96.08 → +1.32 → **R2: 97.40**

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Model Results

- RMSE of 71.00 for 2022 vs 2023 actual fantasy scores proved that our model was not just assuming a players last year performance but including their whole career performance
- RMSE => Predictions for 2024 should be expected to be +-14.23 points different on average
- R2 => 97.40% of the variation in predicted fantasy football scores can be explained by the included features or statistics

Official 2024 Season Predictions (Top 10 Players)

	name	team	position	fantasy_2024_score_prediction	fantasy_2024_per_week_score_prediction
0	Josh Allen	BUF	QB	318.60	18.74
1	Puka Nacua	LA	WR	318.36	18.73
2	Justin Herbert	LAC	QB	308.04	18.12
3	Justin Jefferson	MIN	WR	297.64	17.51
4	Lamar Jackson	BAL	QB	293.24	17.25
5	Patrick Mahomes	KC	QB	290.89	17.11
6	Trevor Lawrence	JAX	QB	284.14	16.71
7	CeeDee Lamb	DAL	WR	277.58	16.33
8	Alvin Kamara	NO	RB	274.51	16.15
9	Tyreek Hill	MIA	WR	273.10	16.06

2022 VS 2023 Actual

```
mse_assume = mean_squared_error(fa
rmse_assume = math.sqrt(mse_assume
rmse_assume

71.00374769451727
```

Final Model Evaluation

```
[37]: # Calculating RMSE for model bas
      mse_2023 = mean_squared_error(fa
      rmse_2023 = math.sqrt(mse_2023)
      rmse_2023

[37]: 14.229830865136156
```

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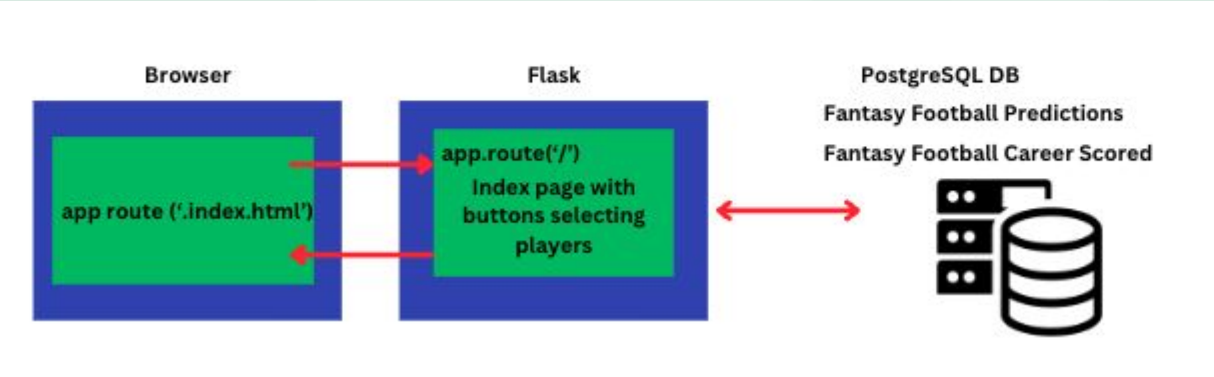
Application Architecture



Demo

Challenges & Next Steps

Challenges

- Weekly data did not match yearly data.
- The weather data was not numerical, instead it was categorical.

Next Steps

- Integrate with the ESPN API to create a live application that accounts for player injuries.
- Develop a model to predict week-over-week outcomes.
- Add in respective data for a WRs/TEs/RBs - QB stats and vice versa.
- Add a chart that shows the point trends over the years.

THANK YOU!