

# GamePlan – Football Player Efficiency Analysis

SWENG 861 Individual Course Project Overview

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## Project Motivation and Goals

Raw performance stats in football—like total yards or touchdowns—don't always tell the full story. GamePlan aims to dig deeper by analyzing player efficiency: how well athletes perform relative to their opportunities. By normalizing stats across touches, targets, and snaps, this project reveals which players truly maximize their impact on the field.

Goals:

- Evaluate football players using advanced efficiency metrics
- Visualize performance trends across seasons and positions
- Build a foundation for predictive modeling of breakout players

This project falls under the **Data Analytics** category and leverages real-world sports data to demonstrate practical analysis, visualization, and modeling skills.

## Technical Approach and Methodologies

GamePlan is structured in two phases:

### Phase 1: Efficiency Analysis

- Collect player-level data from sources like nflfastR or Pro-Football-Reference
- Clean and preprocess data using Pandas and NumPy
- Engineer new metrics (e.g., yards per attempt, catch rate, TDs per touch)
- Visualize trends using Matplotlib, Seaborn, and Plotly
- Compare players across seasons and positions to identify hidden standouts

### Phase 2: Breakout Predictor (Future Extension)

- Use regression or classification models to predict next-season performance
- Train models using efficiency metrics, age, experience, and team context
- Evaluate predictions using  $R^2$  score, confusion matrix, and cross-validation

## Architecture & Design

### Project Structure:

```
GamePlan/  
├── data/           # Raw and cleaned football datasets  
├── notebooks/      # Jupyter notebooks for analysis and modeling  
├── src/            # Python scripts for data processing  
├── reports/        # PDF/Word summary and visualizations  
└── README.md      # Project overview and instructions
```

### Workflow:

1. Import and clean player data
2. Calculate efficiency metrics
3. Visualize performance trends
4. (Optional) Train predictive models for breakout analysis

## Tech Stack

Component	Technology Used
Language	Python
Libraries	Pandas, NumPy, Matplotlib, Seaborn, Plotly, Scikit-learn
IDE	Jupyter Notebook / VS Code
Data Source	nflfastR, Pro-Football-Reference, Kaggle
Animations	Lottie or custom drawable animations
Version Control	Git + GitHub

## Future Work and Potential Extensions

- **Breakout Predictor:** Use ML to forecast next-season performance
- **Interactive Dashboard:** Build a Streamlit app for real-time analysis

- **Fantasy Football Assistant:** Recommend high-efficiency players
- **Clustering Models:** Group players by style or performance patterns
- **Cross-Season Trends:** Analyze how efficiency evolves over time