

PROBLEM: OPTIMIZING FPL TEAM SELECTION

- **Relevance:**
 - Fantasy Premier League (FPL) attracts millions, demanding strategic player picks to maximize points under budget and squad rules.
- **Impact:**
 - Precise predictions boost user rankings, enhancing engagement in a competitive global game.
- **Novelty:**
 - Uses 5-game rolling metrics, opponent difficulty, and over 44 parameters for predictions; aggregates multi-season data (2021–25); ranks in top 16.6% of FPL users (1364 vs. 1262 avg. points, 25 gameweeks).

EFFORTS: PREDICTIVE MODELING AND OPTIMIZATION

Challenge: Inconsistent player names across the teams and missing position data hindered multi-season data merging.

Solution: Standardized names, mapped players to teams, and derived positions from `players_raw` for robust integration.

Challenge: Forwards' volatile scoring reduced prediction accuracy.

Solution: Used Ridge (GK/DEF/MID), ElasticNet (FWD); filtered players with < 90 minutes.

Challenge: Achieving top-tier performance (top 16.6%, 1364 points) within £100m and FPL constraints.

Solution: Employed Binary Integer Linear Programming (BILP) with CBC branch-and-cut solver via PuLP, ensuring optimal squad selection.

OUTCOMES: KEY RESULTS AND INSIGHTS

- **Accuracy:** The model achieved a Mean Absolute Error (MAE) of 2.19 points per game prediction for the 2024-25 target season. When evaluating average points per player over the season, the MAE was lower at 0.546 points, with an R^2 score of 0.689, indicating a reasonable fit explaining approximately 69% of the variance in average player points.
- **Squad:** The optimized 15-player squad based on predicted points for Gameweek 32 cost £100.0m. Key predicted high-scorers included Salah (5.63 pts) and Bruno Fernandes (4.94 pts). Haaland was not selected in this optimized squad.
- **Models:** Ridge regression was selected via cross-validation as the best model for GK (CV MSE \approx 3.27), DEF (CV MSE \approx 4.16), and MID (CV MSE \approx 9.61). ElasticNet was chosen for FWD (CV MSE \approx 10.21).
- **Strategy:** The selected squad balanced premium players like Salah (£13.8m) and Fernandes (£8.6m) with others across different price points. The bench included players like Watkins (£8.9m) and Raya (£5.5m), not necessarily ultra-budget options.

