Fantasy Premier League

MMA 861 Analytic Decision Making

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CONTENTS

Introduction

- Fantasy Premier League (FPL) is an elite league which in which various firms compete to win a reward of €3 Million

- FPL is co-owned by 20 Club Members which provide pool of players who can be purchased by each competing organization

- Competing organizations need to create a 15-squad team within a budget of €100 Million while abiding the league rule book

- Playing Squad should score the maximum points to help its organization win the overall tournament

- Players can score points in different ways as defined in the rule book such as Scoring a goal, penalty save, etc.

Executive Summary

- We want to help one of the competing organization identify the best mix of players who can help win the overall Tournament to win the reward

- Historical data from the league's website has been utilized for our analysis

- We have identified trading restriction and game rules through the league's website as constraints

- We've used an integer programing optimization model which helps us identify the best mix of players while abiding the constraints defined in the league rule book

- Player combination identified as per the optimization model helps the competing organization score the maximum possible score of 2,332 points thereby winning the overall tournament

FPL Player Statistics 🏃

- We extracted individual player data for the FPL 2020-21 season from FPL's statistics website: *https://fantasy.premierleague.com/statistics*

Metrics of Interest

Performance	Contribution	Value	Position
This measures the skill and quality of a player. It is indicative of a player's productivity.	Amount of time a player plays and contributes to his team throughout the season.	The cost of adding the player to our team. This amount will be deducted from our budget.	The role of a player in the team. We could have a better striker available and still go for a defender.

Key Parameters and Limitations

Parameter	Indicates
Points	Performance
Minutes played as Starter	Contribution
Minutes played as Bencher	Contribution
Position	Position (Player Role)
Cost	Value

Limitations

Cannot account for player availability throughout the season

Information about player transfers not available

Schedule of the matches for season not available

Approach and Assumptions

Optimize season performance by maximizing player points from last season.

Select the best combination of a 15-member squad given constraints.

Gain insights into how game rules impact optimal player selection.

Model uncertainties around starting lineup, bencher and order of substitution.

Assumptions

- Performance from last season is an indication of current performance.

- The end cost from last season remains the same.

- Last year's player contribution is leveraged for the current season's contribution.

- Benchers are selected in order of last season points.

- Team formation may change upon substitution.

Model Selection & Decision Variable

Optimization Model	Total number of Players available from selection: 462
	Whether or not select Player as starter team
	Whether or not select Player as bench
	Whether or not select Player as Captain
	To meet our objective as maximizing total game points

Constraints

Cost Constraint

- Total Budget: €100 Million

Team Players Constraints

- Number of players for starter team: 11
- Number of players for bench: 4
- Among the selected team, number of Captain: 1
- Total number of players selected from each Club: at most 3
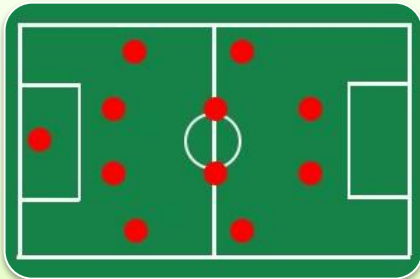
Team Formation Constraints

- Build up for the 15-players squad: 5 Defenders, 3 Forwards, 2 Goalkeepers, and 5 Midfielders
- Build up for the 11-players start team:
  - Defenders: 3-5;   Forwards: 1-3;   Goalkeeper:1;   Midfielders: 3-5

Team Selection

Starter

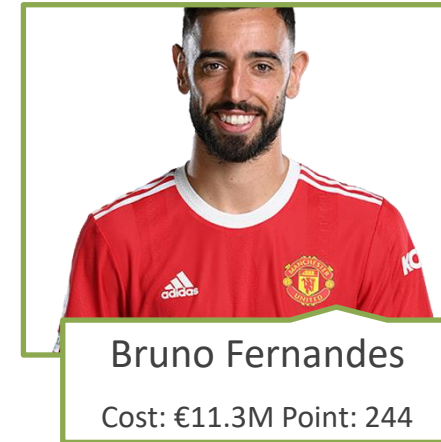| Position	Player	Club
Goalkeeper	Emiliano Martínez	Aston Villa
Defender	Andrew Robertson	Liverpool
Defender	Aaron Cresswell	West Ham
Defender	Matt Targett	Newcastle
Midfielder	Bruno Fernandes (*)	Man Utd
Midfielder	Son Heung-Min	Spurs
Midfielder	Stuart Dallas	Leeds
Midfielder	James Ward-Prowse	Southampton
Forward	Harry Kane	Spurs
Forward	Patrick Bamford	Leeds
Forward	Ollie Watkins	Aston Villa

- Average Cost: €7.3M
- Average Points: 186

Captain

Bruno Fernandes

Cost: €11.3M Point: 244

Bencher

Position	Player	Club
Goalkeeper	John Stones	Man City
Defender	Antonio Rüdiger	Chelsea
Defender	Martin Dúbravka	Newcastle
Midfielder	Hélder Costa	Leeds

- Average Cost: €4.9M
- Average Points: 68

Conclusion and Recommendation

Summary

- The team costs exactly 100 million euros

- The new team that can potentially score 2,332 points

- Players are selected from 10 different clubs

Next Steps

- Real-time input data to keep the team optimization up to date

- Increase budget by trading players

- Keep up with players' conditions

- Build a model to predict player's performance

Q&A

THANK YOU

Appendix

Optimization Model

first_name	second_name	team	position	end_cost	Total Mins	Total_Game_Mins	Starter_Min	Bench_Min	total_points	starter	bencher	captain	costs	points
Bruno Miguel	Borges Fernandes	Man Utd	Midfielder	113	3,101	450	408	42	244	1	0	1	113	442
Harry	Kane	Spurs	Forward	119	3,083	450	406	44	242	1	0	0	119	218
Mohamed	Salah	Liverpool	Midfielder	129	3,077	450	405	45	231	0	0	0	0	-
Heung-Min	Son	Spurs	Midfielder	96	3,119	450	410	40	228	1	0	0	96	208
Patrick	Bamford	Leeds	Forward	66	3,052	450	402	48	194	1	0	0	66	173

				limit			team	starter	bencher	squad	limit
		total points	2,332				Arsenal	0	0	0	3
		total costs	1000	1000			Aston Villa	2	0	2	3
		total captain	1	1			Brentford	0	0	0	3
							Brighton	0	0	0	3
	starter	bencher	squad	min starters	max starters	squad	Burnley	0	0	0	3
Defender	3	2	5	3	5	5	Chelsea	0	1	1	3
Forward	3	0	3	1	3	3	Crystal Palace	0	0	0	3
Goalkeeper	1	1	2	1	1	2	Everton	0	0	0	3
Midfielder	4	1	5	3	5	5	Leeds	2	1	3	3
total	11	4	15				Leicester	0	0	0	3
Limit	11		15				Liverpool	1	0	1	3
							Man City	0	1	1	3
							Man Utd	1	0	1	3
							Newcastle	1	1	2	3
							Norwich	0	0	0	3
							Southampton	1	0	1	3
							Spurs	2	0	2	3
							Watford	0	0	0	3
							West Ham	1	0	1	3
							Wolves	0	0	0	3

Output Summary

All players STATS

Position	Average points	Max points	Average cost	Max cost
Defender	55	161	47	78
Forward	67	242	62	119
Goalkeeper	51	186	46	61
Midfielder	63	244	56	129

Selected players

Line_Up	id_player	first_name	second_name	team	position	end_cost	total_points
Starter	277	Bruno Miguel	Borges Fernandes	Man Utd	Midfielder	113	244
Starter	357	Harry	Kane	Spurs	Forward	119	242
Starter	359	Heung-Min	Son	Spurs	Midfielder	96	228
Starter	189	Patrick	Bamford	Leeds	Forward	66	194
Starter	30	Emiliano	Mart√≠nez	Aston Villa	Goalkeeper	53	186
Starter	188	Stuart	Dallas	Leeds	Midfielder	55	171
Starter	40	Ollie	Watkins	Aston Villa	Forward	63	168
Starter	234	Andrew	Robertson	Liverpool	Defender	73	161
Starter	341	James	Ward-Prowse	Southampton	Midfielder	59	156
Starter	411	Aaron	Cresswell	West Ham	Defender	57	153
Starter	39	Matt	Targett	Newcastle	Defender	50	138
Bencher	252	John	Stones	Man City	Defender	51	128
Bencher	127	Antonio	R√ºdiger	Chelsea	Defender	47	93
Bencher	192	H√©lder Wander	Sousa de Azevedo e Costa	Leeds	Midfielder	50	63
Bencher	295	Martin	Dubravka	Newcastle	Goalkeeper	48	48
Min						47	48
Max						119	244
Average						67	158
Total						1000	2373