

Can AI outperform the wisdom of the crowd in Fantasy Football?



Ferenc Fodor (s220356)
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1. Introduction

Fantasy Premier League (FPL) is an annual competition based on the English Premier League. It is one of the most competitive fantasy leagues in football, with an average 8 million users per season, competing for weekly prizes and more. The users, or in FPL-slang: managers, must select a squad of 15 out of more than 600 players and manage that squad throughout the season. A secondary objective of the game is to select the best possible combination of 11 players for each week to maximize the points scored by the team. In FPL, points are awarded to the football players based on their real-life performances, thus owning in-form players is in general a good idea. Squads are constrained by the rules of FPL.



2. Team Selection in FPL

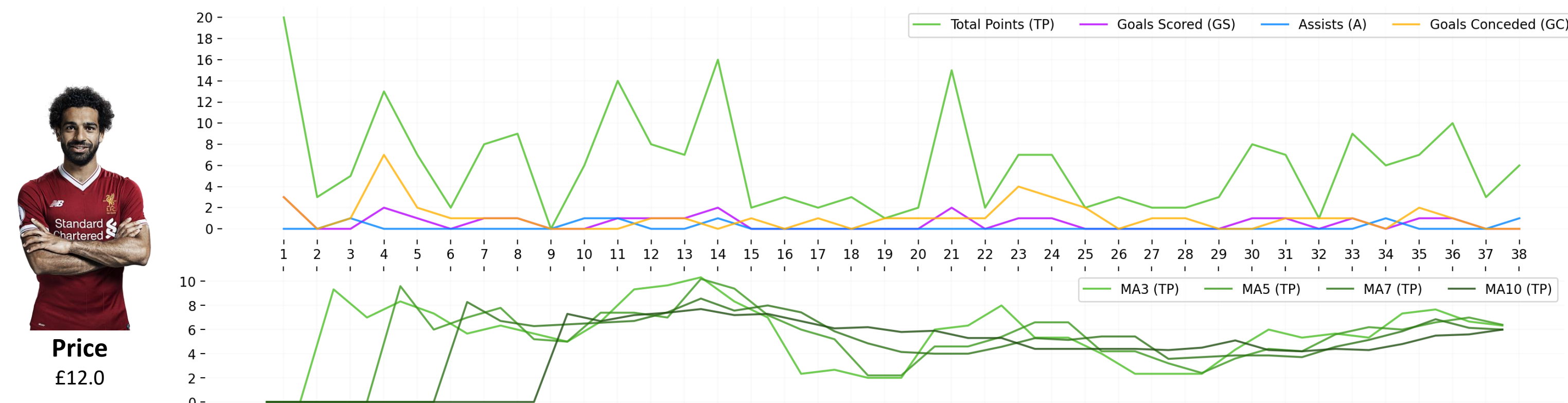
The rules of FPL regarding team selection [2]:

- Squad Size**
To join the game select a fantasy football squad of 15 players, consisting of:
 - 2 Goalkeepers
 - 5 Defenders
 - 5 Midfielders
 - 3 Forwards
- Budget**
The total value of your initial squad must not exceed £100 million.
- Players Per Team**
You can select up to 3 players from a single Premier League team.

$$\begin{aligned} & \text{Maximize } \sum X_i \times \text{Criteria } i \\ & \text{Under constraints:} \\ & (1) \sum X_i \times \text{Cost } i \leq 100\text{€M} \\ & (2) \sum X_i \times \text{Position } i = \text{Limit } i \\ & (3) \sum X_i \times \text{Team } i \leq 3 \end{aligned}$$

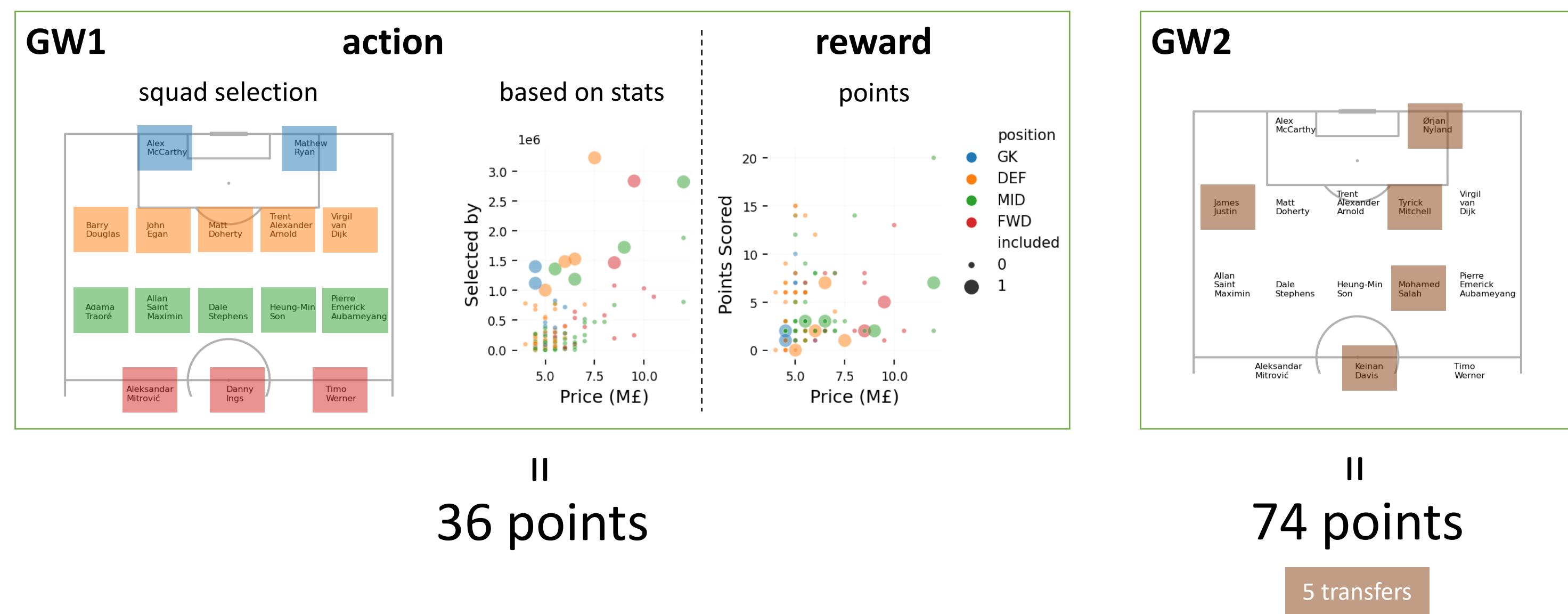
Becomes an integer programming problem [3]

Using *form* as a predictor of expected points:

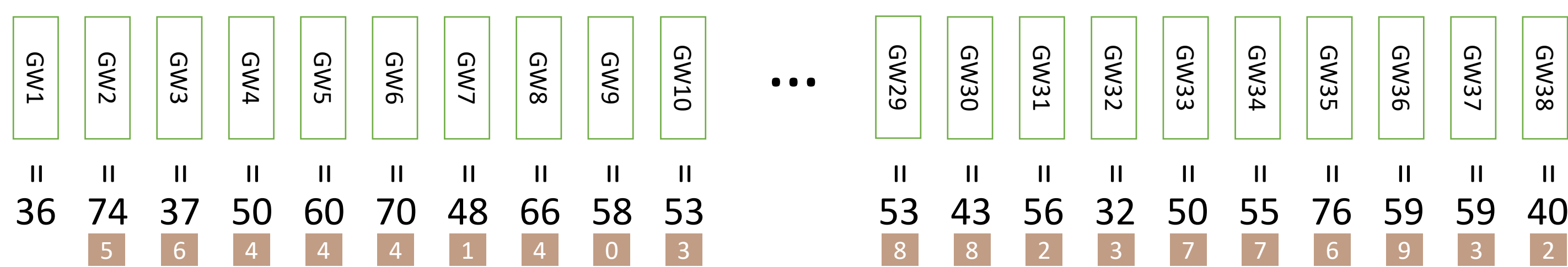


3. The FPL Environment for Q-learning

3.2 Modeling the Gameweeks as States



3.3 Modeling the Season as an Episode

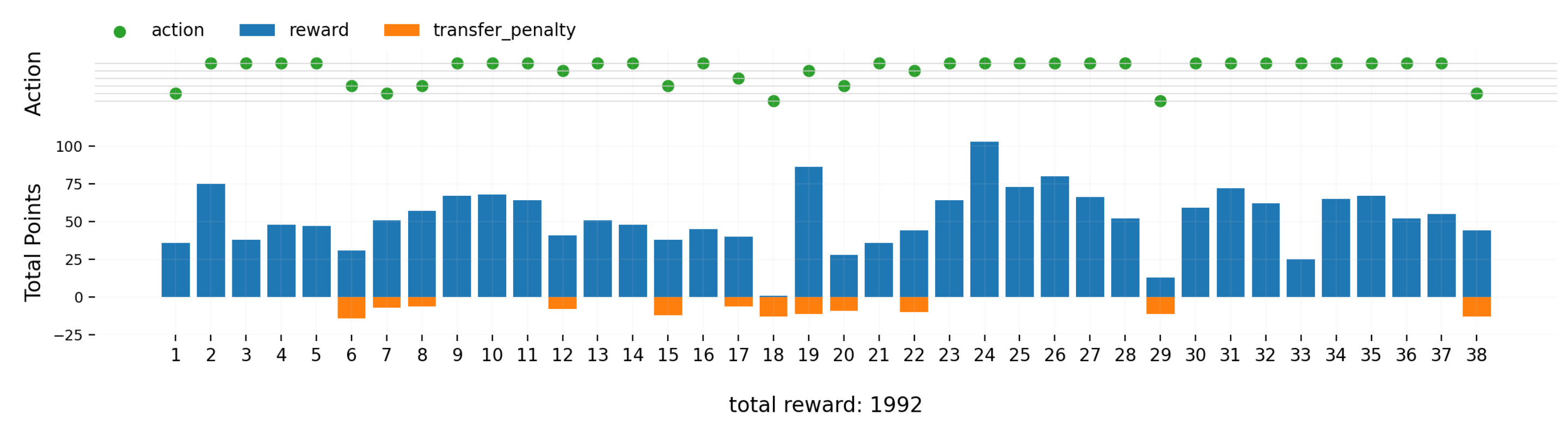
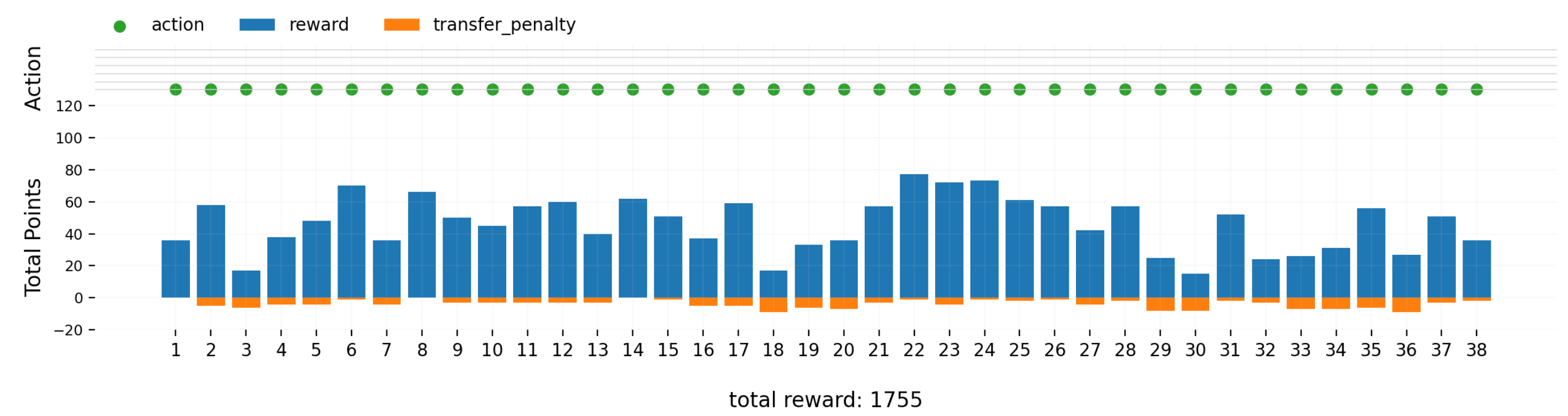


3.3 Populating the Action Space

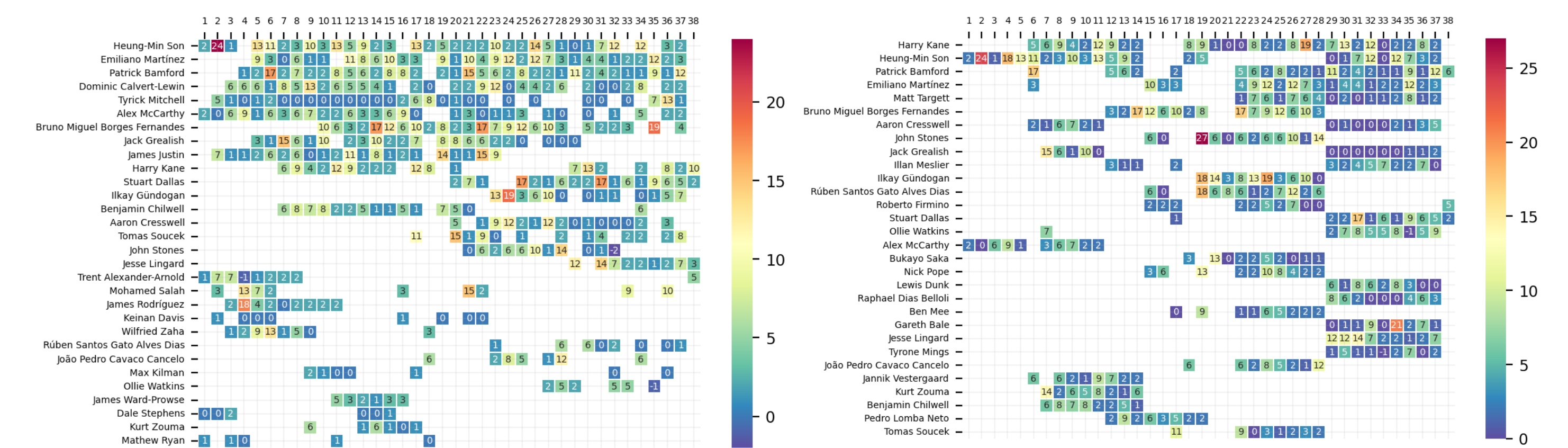
- action 0:** the *wisdom of the crowd* squad – top selected
- action 1:** squad in excellent recent form – MA3
- action 2:** squad in great recent form – MA5
- action 3:** squad in form – MA7
- action 4:** squad having great seasons – MA10
- action 5:** keep *current squad* for the next week

4. Results

2020-21 season; baseline: 1755 points



Top 30 Players Selected



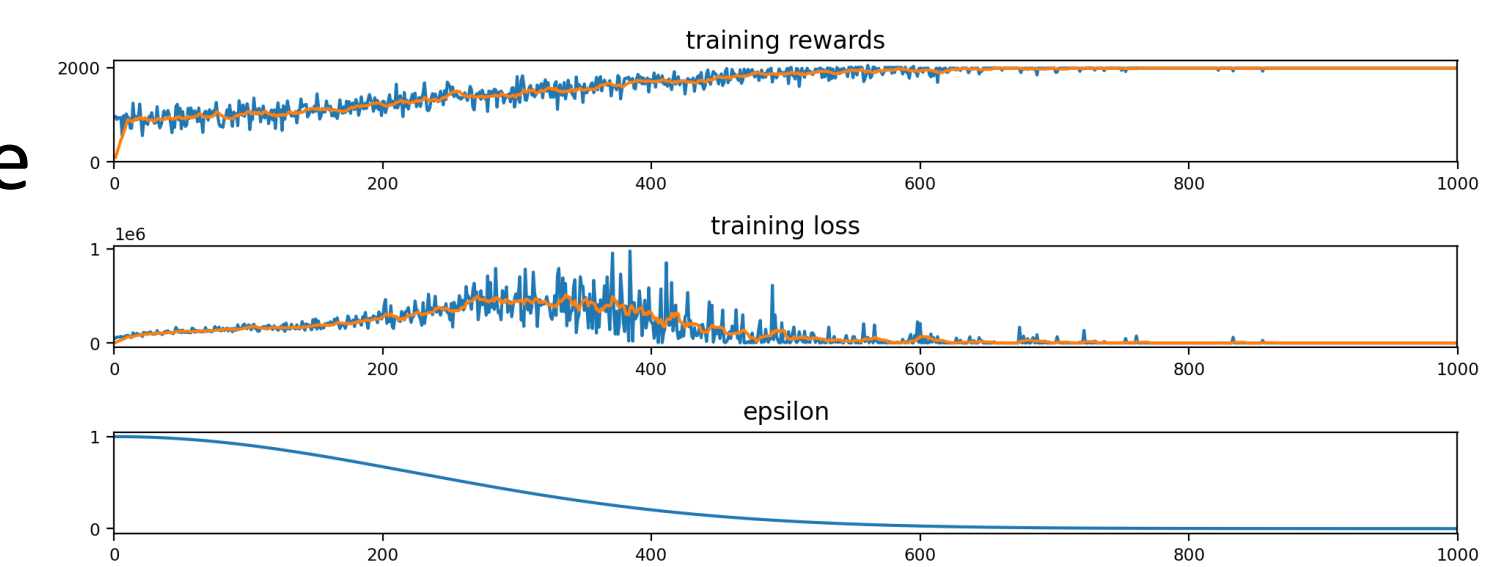
5. Conclusion and Outlook

Positives:

- The Q-learning model outperformed the wisdom of the crowd
- The environment is working, and the network shows promising choices
- Integer programming optimization for team selection
- Intuitive feel to avoid transfer punishments?

Outlook

- Limiting the squad size to 11 players → can be done by the optimizer
- Adding captain picks – double the points of 1 player every week
- Expand the action space by generating much more teams for every round
- Calculate expected points



Typical training curves