Can GAs Generate Optimal Fantasy Football Lineups?

Using a Genetic Algorithm to Optimize Fantasy Football Predictions

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Motivation

- There are over a trillion different lineup combinations to choose from
- It's virtually impossible to evaluate them all
- Most people use real money to play DraftKings Fantasy; we aim to help them
- A Genetic Algorithm allows for evaluation with no bias
- Mutation was vital to explore a satisfactory number of potential lineups and converge on the optimal ones
- Limited knowledge about fantasy football is needed to take advantage of this program

Lineup Requirements

- Salary Cap of $47,000
- Salary Floor of $45,000
- 8-Player Offensive Lineup
  - QB, RB, RB, WR, WR, WR, TE, FLEX

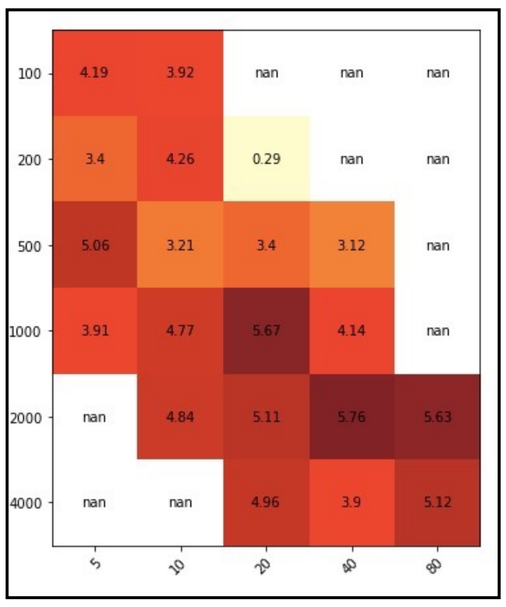
What We Need

- Fantasy Data
- Population Generation
- Fitness Function
- Selection Process
- Mutation

Generation & Evaluation Process

Step	Details
Generate Initial Random Population	To initiate our methodology, we establish a population using the determined parameter to generate a diver set of lineups that meet the required criteria.
↓ Evaluate Fitness of Population	We determine fitness by the inspecting each player's performance last year and the previous weeks of the current year. We then take these ratings and get the sum of each lineup to have a "team rating" that serves as its fitness and potential for performance next week.
↓ Tournament Selection	Next, we implement tournament selection to choose the fittest lineups from the population for further breeding. The amount selected is a set parameter we have decided upon.
↓ Mutation	To further refine the generated lineups, we apply the mutation process, where we potentially alter some of the players. We optimize this process by fine-tuning the mutation rate to find the appropriate balance.
↓ Replace Population	After completing the mutation process, we replace the previous population with the newly generated set of mutated lineups to assess their fitness again and refine the candidates.
↓ Repeat Iterations	We repeat this process of evaluation, mutation, and replacement for a predefined number of iterations to converge on an optimal solution.

Results

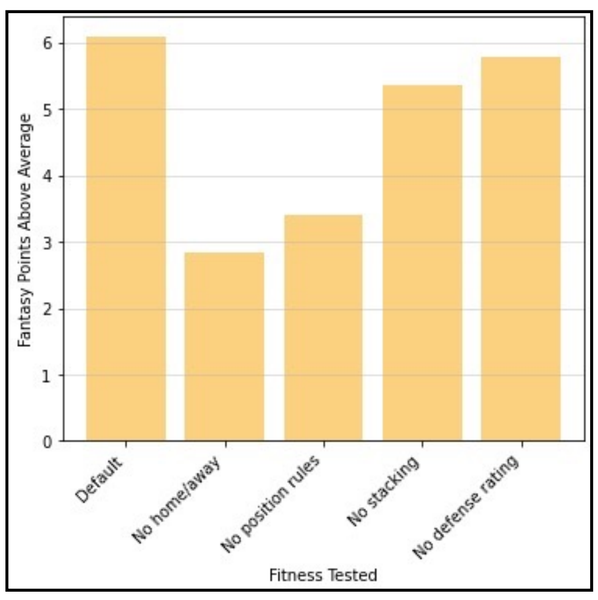


Population Size vs. Iteration Number

- Comparing the impact population size and iteration number have on performance
- Using week 9 results for 50 runs with our "default" fitness function
- **Reveals that these parameters have little impact in comparison to the fitness function**
- Best performance in a range of 1000-2000 population size and 20-80 iterations
- Minor difference between these highest performing parameters, where the random nature can tip the scales

Testing Fitness Function Factors

- This graph is to depict the impact each coefficient has on the performance when it is removed completely
- The "Default" is our baseline, using all factors of the fitness function
- **Most Impactful:** Home/Away & Position Rules
- **Least Impactful:** Stacking & Defense Rating
- Further optimization can be done with adjusting the weighting of these factors



Conclusion

So, can you use genetic algorithms to optimize fantasy football?

- **The answer is a resounding yes**
- It mostly depends upon the fitness function
- Regardless of limited data and info, we managed to take a random population of lineups and produce positive results consistently
- By further adjusting the fitness function and acquiring more detailed data, we can further improve the performance

Most Impactful Coefficient in Fitness Function?

Based upon the data received, the most impactful factors of the fitness function is between **Home/Away Games** and **Position Rules**.

How Much Of An Improvement Was Seen Using GAs?

When using "optimized" values, **we see an average improvement of ~6 Fantasy Points** over the initial values

How Could This Be Improved?

- More Detailed Statistics & Information
- Optimizing Fitness Function
- Further Fine-Tuning of Parameters

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Data Retrieved From:
https://www.lineups.com
http://rotoguru1.com/cgi-bin/fyday.pl?game=dk