Trading QBs

In 2012, Dallas Cowboys went 8-8 with Tony Romo as Quarterback

Can we do better?

Tony Romo

Pass Stats

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Att | Pass % | Pass Yds | Yds/Game | Int |
| 648 | 65.5% | 4,903 | 306.4 | 19 |

Rush Stats

|  |  |  |
| --- | --- | --- |
| Att | Rush Yds | Rush Tds |
| 30 | 49 | 1 |

Matthew Stafford

Pass Stats

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Att | Pass % | Pass Yds | Yds/Game | Int |
| 727 | 59.8% | 4,967 | 310.4 | 17 |

Rush Stats

|  |  |  |
| --- | --- | --- |
| Att | Rush Yds | Rush Tds |
| 35 | 126 | 4 |

Andrew Luck

Pass Stats

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Att | Pass % | Pass Yds | Yds/Game | Int |
| 627 | 54.1% | 4,374 | 273.4 | 18 |

Rush Stats

|  |  |  |
| --- | --- | --- |
| Att | Rush Yds | Rush Tds |
| 62 | 255 | 5 |

Robert Griffin III

Pass Stats

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Att | Pass % | Pass Yds | Yds/Game | Int |
| 383 | 65.6% | 3200 | 213.3 | 5 |

Rush Stats

|  |  |  |
| --- | --- | --- |
| Att | Rush Yds | Rush Tds |
| 120 | 815 | 7 |

Told to trade Romo for Stafford or Luck, but not RG3, why? Does it make sense?

This test was solely on trading QBs while the other team remained the same.

Luck and Stafford are similar QBs to Romo with a slightly better scramble game.

This may show that the Cowboys would benefit from a more mobile Quarterback.

But why not have RG3 then? He is great rushing quarterback. The algorithm not picking RG3 is to be expected. A team is built around its QB and thus changing the QB drastically would actually hurt the team. Interpreting the Results

* Shows a team their weakpoint
  + For the Quarterback position, it can show the need for a better pocket passer or scrambler
* Allows a team to trade for a player who fills that weakpoint
* Allows a team see what group of players works better with each other
  + For the wide receiver position, it shows what set of receivers work well with the team. More than just a single receiver.
* Allows a team to know what type of player to draft for instead of trading
* Allows a player to see what team he would fit better into if he were trying to be traded

Shouldn’t This Be Able to Create a Pro Bowl Team?

Proof of Concept with Wide Receivers (2012)

New England: No Standout WRs

Dallas Cowboys: Dez Bryant

Arizona Cardinals: Larry Fitzgerald

Baltimore Ravens: Jacoby Jones

Denver Broncos: Wes Welker

The algorithm results in New England trading for Bryant, Jones, and Welker.

This makes sense that the algorithm would choose the best receivers of each team.

However, there are two more solutions for the best set of receivers for New England. This shows that although some receivers may have better stats than the other, they won’t necessarily be chosen. More on this in the machine learning.

Search Time

**Implementation**

Initially implemented the search as a DFS. The backend is composed of python and R. Algorithm trades players, recomputes features, and predicting the number of wins.

Each query to the database, recomputation, and algorithm to get a value takes 1 second.

**Example**

Only having 5 teams with 5 players has 11,400 swaps.

This will take 7.91 days

Way too long!

Can’t perform anything near intensive.

**Reason for Long Computation Time**

Our database consists of over 6000 players and around 1000 games.

The features that allow the prediction of the number of games won must be recomputed each time a trade occurs.

That’s a lot of data for the computation!

**Solution: Beam Search**

With a beam search of width 3, this same query only has approximately 490 swaps. That’s a 96% decrease! That’s only 8.17 minutes!

**Integrity of Results**

When comparing the results against both searches, the beam search always finds a solution contained in the full search!

\* There can be more than one optimal solution.