# Fantasy Football Recommendation System

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# Learning Procedure

- Weekly player data scraped from fftoday.com
- Construct 3 matricies

$$Y: \ n_{teams} \times n_{plyrs}$$

$$A: \ n_{teams} \times \alpha$$

$$B: \ n_{plyrs} \times \alpha$$

- Cost Function Minimized

$$J = \mathrm{Tr}\left[(AB^\intercal - Y)^\intercal (AB^\intercal - Y)\right] + \frac{\lambda}{2}\mathrm{Tr}\left[A^\intercal A\right] + \frac{\lambda}{2}\mathrm{Tr}\left[B^\intercal B\right]$$

- Regularization term and alpha are allowed to vary in cross validation
- Bootstrapping performed

# Week 10 QB Predictions

| player | team | opp | fantasy_points ▲ | variance |
|---|---|---|---|---|
| Aaron_Rodge… | GB | TEN | 21.7 | 2.46 |
| Matt_Ryan | ATL | PHI | 17.6 | 3.96 |
| Ben_Roethli… | PIT | DAL | 16.2 | 3.18 |
| Dak_Prescott | DAL | PIT | 15.7 | 2.1 |
| Eli_Manning | NYG | CIN | 15 | 3.17 |
| Tom_Brady | NE | SEA | 14.9 | 2.45 |
| Joe_Flacco | BAL | CLE | 14.4 | 1.14 |
| Drew_Brees | NO | DEN | 13.8 | 1.56 |
| Cam_Newton | CAR | KC | 13.1 | 3.73 |
| Marcus_Mari… | TEN | GB | 13 | 3.59 |
| Case_Keenum | LAR | NYJ | 12.7 | 3.78 |
| Blaine_Gabb… | SF | ARI | 12.3 | 3.08 |
| Carson_Palm… | ARI | SF | 12.2 | 2.38 |

# Accuracy (Playing Quarterbacks)

$$m = \sqrt{\frac{1}{N_{qb}} \sum_{qb} (S_p - S_a)^2}$$

| prediction method | $m$ | $VAR(S_p - S_a)$ |
|---|---|---|
| ESPN | 6.46 | 40.633 |
| My pred | 7.26 | 35.789 |

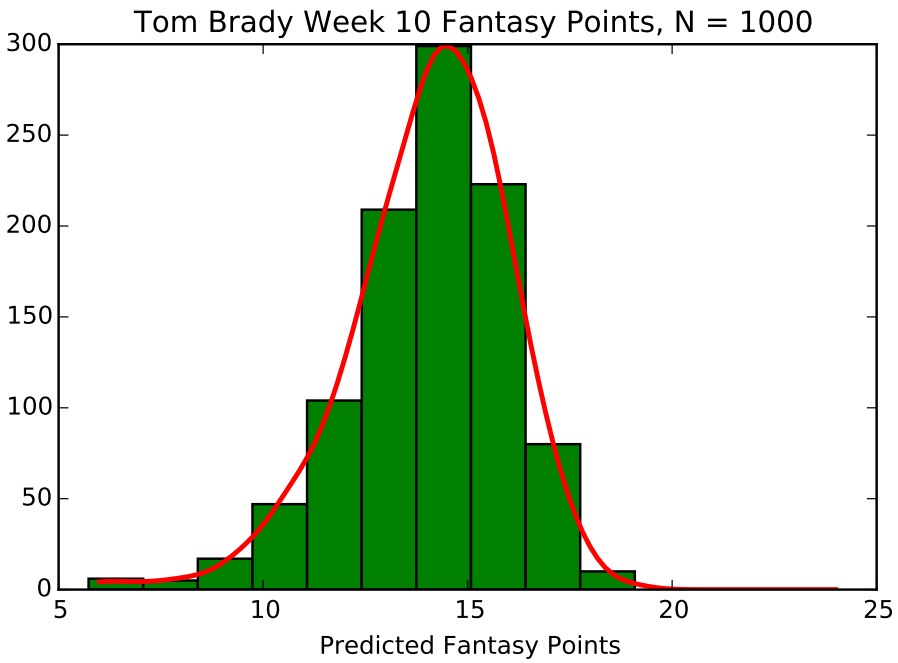
# Systematic Error in Pred

- Historically, predicted scores have been lower than actual scores across the board
- In QB case this shift is about 4 fantasy points

| prediction method | $m$ | $VAR(S_p - S_a)$ |
|---|---|---|
| ESPN | 6.46 | 40.633 |
| My pred | 7.26 | 35.789 |
| with correction | 5.87 | 35.789 |

# Probability of Winning Matchup

- Prediction gives distribution of possible scores
- Monte Carlo Simulation
- See how scores of correlated players distort the score probability distributions
  - Not enough data to treat individual player combination



# Improvements

- Add weighting to cost function to emphasize recent games.
- Handle Injured Players/replacements