# Predicting Soccer Match Results With Bet Data

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# What is gambling bet?

Premier League

Date | League

| Today - 5th Of Dec | | Home | Draw | Away | |
|---|---|---|---|---|---|
| 20:00 | Middlesbrough v Hull | 4/5 | 12/5 | 4/1 | +127 More Bets |
| **Saturday - 10th Of Dec** | | **Home** | **Draw** | **Away** | |
| 12:30 | Watford v Everton | 2/1 | 9/4 | 7/5 | +59 More Bets |
| 15:00 | Arsenal v Stoke | 4/11 | 4/1 | 15/2 | +60 More Bets |
| 15:00 | Burnley v Bournemouth | 11/5 | 9/4 | 13/10 | +59 More Bets |
| 15:00 | Hull v Crystal Palace | 15/8 | 23/10 | 6/4 | +59 More Bets |
| 15:00 | Swansea v Sunderland | 11/10 | 11/5 | 11/4 | +59 More Bets |
| 17:30 | Leicester v Man City | 7/2 | 11/4 | 3/4 | +59 More Bets |

Source: http://www.paddypower.com/football/football-matches/premier-league

# Data Source

- http://football-data.co.uk/data.php
- 10 betting companies
- 20 seasons
- 16 leagues across Europe
- ~350 matches per league
- 90% training, 10% validation

# A Glimpse of Data

- Features (Gambling bet)
  - $x_i = (h_i, d_i, a_i)$
- Scores
  - $y_i = (HG_i, AG_i)$

# Algorithms

- Naive Guessing
- Polynomial Regression
- Multi-class classification with Integrated Feature
- Support Vector Machine (SVM)

# Data Processing - Score

- Calculate goal difference

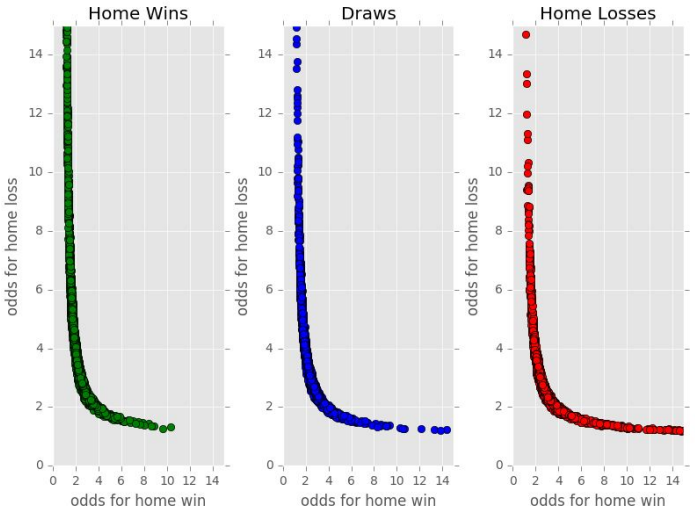
$$yd_i = HG_i - AG_i$$

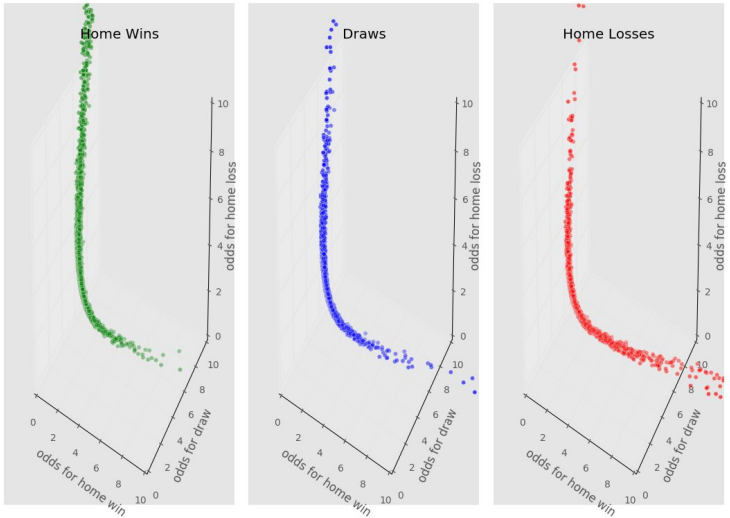
- Convert goal difference to match results

  - If $yd_i > 0$, we define $y_i = 1$, indicating a home win.
  - If $yd_i = 0$, we define $y_i = 0$, indicating a draw.
  - If $yd_i < 0$, we define $y_i = -1$, indicating a home loss.

# Data Processing - Odds

- Downward sloping distribution
- 2D vs. 3D



# Data Processing - Odds

- Combined feature for single company:

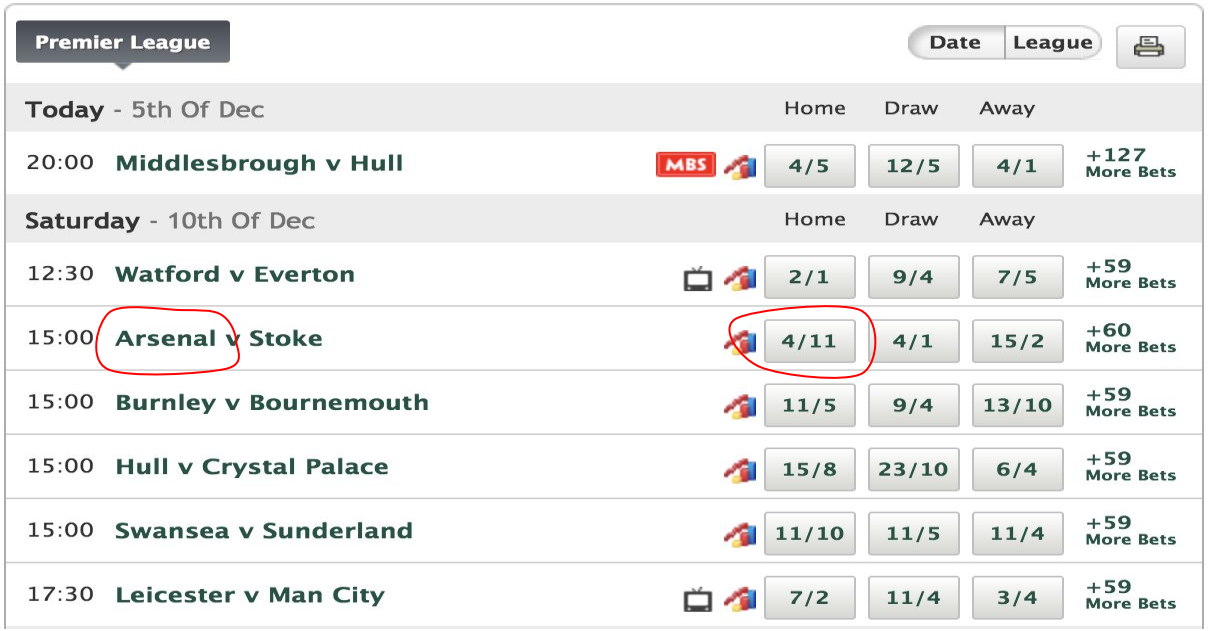
$$x_i = \log(\frac{1}{3}(\frac{h_i}{a_i} + \frac{h_i}{d_i} + \frac{d_i}{a_i}))$$

- Combined feature for multiple companies:

$$x_i = \log(\frac{1}{3}(\frac{E(h_i)}{E(a_i)} + \frac{E(h_i)}{E(d_i)} + \frac{E(d_i)}{E(a_i)}))$$

# Naive Guessing

- Choose the smallest bet of the three
- No training
- Accuracy: **23.78%**



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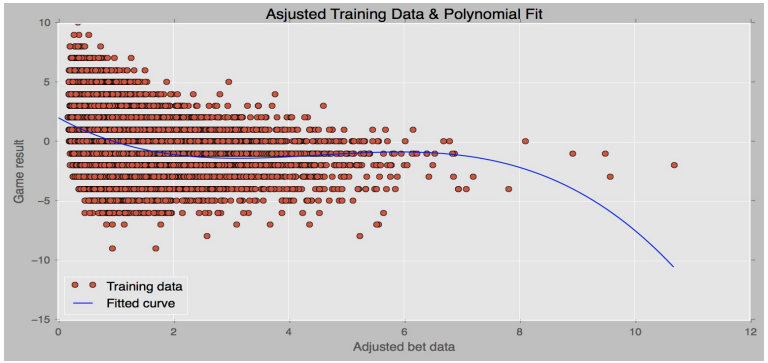
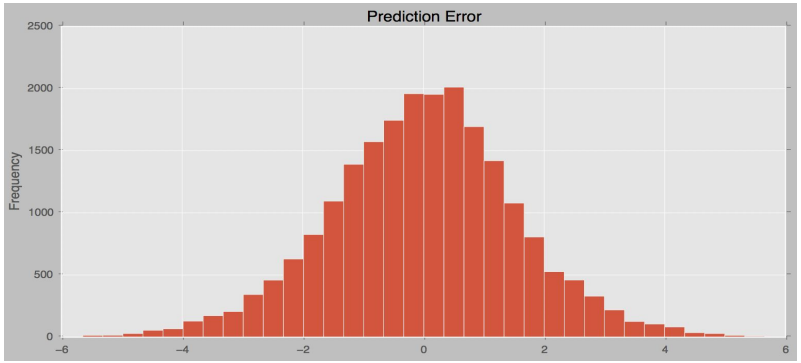
# Polynomial Regression

- Use score difference instead of match result as $y_i$
- $y = -0.048x^3 + 0.653x^2 - 2.668x + 2.081$
- Convert back to match result w/ threshold of 0.5
- Accuracy: **44.43%**



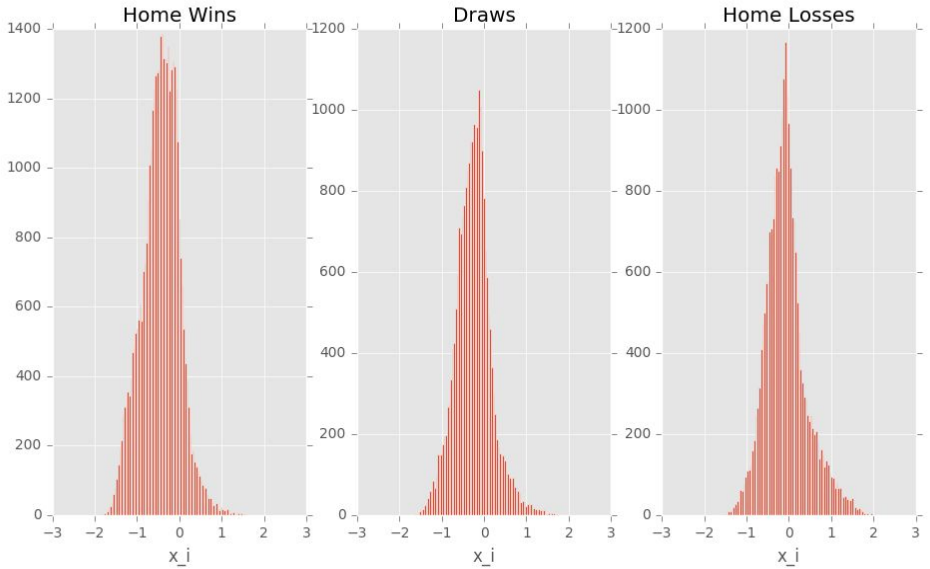
# Multi-class Classification

- Recall the combined feature for multiple companies:

$$x_i = \log(\frac{1}{3}(\frac{E(h_i)}{E(a_i)} + \frac{E(h_i)}{E(d_i)} + \frac{E(d_i)}{E(a_i)}))$$

# Multi-class Classification

- Generate $\mathcal{N}(\mathbb{E}_k[x], \mathbb{V}_k[x])$
- Calculate pdf for each distribution
- Accuracy: **48.14%**



# Support Vector Machine

- RBF Kernel (Radial Basis Kernel)
- Three features
  - $x_1 = h_i^2$
  - $x_2 = \sqrt{d_i}$
  - $x_3 = a_i$
- Accuracy: **49.17%**

# Discussion

| Algorithms | Accuracy |
| --- | --- |
| Polynomial Regression | 44.43% |
| Classification with Integrated Feature (Gaussian) | 48.14% |
| Classification with Integrated Feature (Laplace) | 47.54% |
| Support Vector Machine | 49.17% |

- Classification algorithms are more applicable
- Support vector machine algorithm has the best prediction accuracy
- Classification with a single integrated feature has the best performance

# Next Steps

- Expand on existing algorithms
- Extend features
  - Country
  - Competitiveness
- Parallel data processing

# Questions