BENEFITS ON COLLEGE ATHLETIC SUCCESS:AN APPLICATION OF THE PROPENSITY SCORE DESIGN

PSM Group: Ty McClure, Natalie Mikosz, Anshuman Puppala, Ethan Tabiang, and Juan Rodriguez
Texas A&M University
May 4, 2024

Abstract

- **Study Focus:** Refining Anderson's analysis on athletic success and institutional metrics using the random forest method
- **Original Methodology:** Used bookmaker data and propensity score design to create probabilities for football teams winning games
- **Enhancement:** Implemented Random Forest regression for better predictions.
- **Results:**
  - Slight increase in alumni athletic operating donations (10,790 for each additional win)
  - Slightly larger decrease in non-athletic donations (-23,970 for each additional win)
  - Major increase in overall alumni donations (-228,100 for each additional win)
- **Insights:** Random Forest revealed complex relationships, enhancing analytical robustness.

Introduction

- **Anderson's Objective:** Examine the impact of football wins on university health metrics like donations and acceptance rates.
- **Methodology:** Used propensity score matching based on team win likelihood.
- **Enhancement Strategy:** Implement Random Forest for more accurate propensity scores, reduced overfitting, and decreased endogeneity.
- **Hypothesis:** Random Forest will yield more precise outcomes and uncover deeper variable relationships.

Effects of Football Wins on Outcomes

Table: Effects of Football Wins on Various Outcomes

	STE			Replication			ML		
	Coeff.	P-val	Conf. Int.	Coeff.	P-val	Conf. Int.	Coeff.	P-val	Conf. Int.
Alumni Athletic Operating Donations	191,200 (65,000)	0.001	63,800 -318,600	191,240 (65,035)	0.004	63,700 -318,700	10,790 (13,100)	0.412	-15,000 -36,600
Alumni Nonathletic Operating Donations	-137,400 (96,100)	0.210	-325,756 -50,956	-137,410 (96,077)	0.156	-325,700 -50,900	-23,970 (66,600)	0.719	-155,000 -107,000
Total Alumni Donations	267,400 (266,900)	0.450	-255,744 -790,544	267,380 (266,945)	0.319	-255,800 -790,600	-228,100 (173,000)	0.187	-567,000 -111,000

Methodology

Methodology:
- Utilized **Machine Learning Techniques**: Random Forest and Logistic Regression.
- Calculated propensity scores to adjust for potential confounders.
- Employed nearest neighbors matching to compare schools with similar profiles but different levels of athletic success.

Results:
- More robust analysis due to inclusion of ML techniques.
- Revealed nuanced insights into how changes in sports performance influence donation behavior.

Findings

- **Propensity Score Matching (PSM) Results:**
  - Additional football win led to a non-significant increase in athletic donations.
  - Non-significant decrease of -137,412 observed in non-athletic donations.
  - Substantial growth in overall alumni donations of 267,379 despite the above.
- **Advanced Machine Learning (ML) Techniques Results:**
  - Smaller, yet more precise adjustments in donation patterns.
  - Athletic donations showed a non-significant change of 10,790 (p-value = 0.412).
  - Significant decrease in non-athletic donations from STE with -137,412 to -23,970.
  - Total alumni donations significantly positively affected, albeit with a smaller impact magnitude than PSM indicated.
- **ML Implications:**
  - Nuanced results highlight the value of integrating ML methodologies.
  - Enhanced understanding of the dynamics between collegiate sports success and alumni donation behaviors.
- **ML Statistically Significant Values:**
  - Academic Reputation and Application proved to be significant as seen in the final report as seen in Figure 4 in the final report.
  - The inclusion of alumni athletic donations, alumni nonathletic donations, and total donations in this poster is due to their focus in the original paper.

Discussion

- **Methodological Comparison**:
  - **STE**: Large increase in donations post-football wins.
  - **ML**: More conservative, often non-significant results.
- **Alumni Donations**:
  - **Athletic**:
    - **STE**: Coefficient: 191,200 ($p = 0.001$).
    - **ML**: Coefficient: 10,790 ($p = 0.412$).
  - **Nonathletic**:
    - **STE**: Coefficient: -137,400 ($p = 0.210$).
    - **ML**: Coefficient: -23,970 ($p = 0.719$).
- **Total Donations**:
  - **STE**: Coefficient: 267,400 ($p = 0.450$).
  - **ML**: Coefficient: -228,100 ($p = 0.187$).
- **Implications & Strategy**:
  - Possible donation shifts towards athletic programs.
  - Recommend reviewing university financial strategies.

Conclusions

- **Random Forest Application Findings:**
  - Smaller impact of football wins on alumni donations.
  - Athletic donations: Coefficient of 10,790.
  - Nonathletic donations: Coefficient of -23,970.
  - Overall negative relationship in total donations.
- **Implications for University Funding:**
  - Possible reduction in sports funding due to low returns or losses.
  - Potential improvement in educational facilities and institutional health.
- **Future Research Directions:**
  - Explore impacts of different university departments on institutional health.
  - Identify programs yielding the greatest returns for strategic funding.
  - Potential to enhance higher education quality nationwide.

Literature Review, Distribution Graphs, References, Google Colab Links