Analysing Trends and Strategies in Brazilian Jiu-Jitsu Competitions

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Abstract

This paper presents an in-depth analysis of trends and strategies in Brazilian Jiu-Jitsu (BJJ) competitions, employing data analytics to uncover patterns and insights from competition data. The study aims to explore various aspects such as competition frequency, team performance, and the influence of athletes' physical attributes on match outcomes. The research highlights the scarcity of comprehensive datasets in BJJ and describes the creation of a specialized dataset through data scraping and preprocessing. The analysis focuses on identifying dominant winning techniques, exploring the frequency and distribution of these techniques, and examining athlete performance metrics across competitions. The study reveals significant insights into the strategic approaches in BJJ, suggesting potential shifts in training and competitive strategies. The findings also raise questions about the influence of contextual and cultural factors on the choice of techniques and highlight the limitations in data scope and representation. The paper concludes by suggesting future research directions to deepen the understanding of strategic complexities in BJJ, emphasizing the need for more comprehensive data for in-depth analysis. This research contributes to a better understanding of BJJ competitions, offering insights that can inform athletes, coaches, and the broader BJJ community.

**Keywords:** Brazilian Jiu-Jitsu, Competition, Sports.

# 1. Introduction

The realm of martial arts, particularly Brazilian Jiu-Jitsu (BJJ), presents a rich field for data-driven analysis due to the strategic and competitive nature of the sport. This study aims to uncover patterns and insights from BJJ competitions, analyzing various aspects such as competition frequency, team performance, and the influence of physical attributes on match outcomes. By leveraging data analytics techniques, the project provides a deeper understanding of the sport, highlighting key trends and strategies that could influence training and competitive approaches.

# 2. State of the art

The field of sports analytics, when applied to martial arts like Brazilian Jiu-Jitsu (BJJ), encounters a notable challenge: the lack of comprehensive and readily available datasets. While sports analytics has revolutionized many sports through performance enhancement, strategic planning, and injury prevention, its impact on BJJ has been comparatively minimal.

The bulk of BJJ-related research has centered around injury analysis. These studies, focusing on injury types, causation, and prevention, which is undoubtedly valuable for athlete safety and training. However, they leave a significant gap in understanding BJJ's strategic and technical dimensions. This gap stems mainly from a lack of detailed, large-scale data necessary for deeper analytical pursuits.

This project confronts the issue of data scarcity head-on by creating a specialized dataset. The process involved scraping information from a BJJ competition website and undertaking data cleaning and preprocessing to ensure the dataset's reliability and relevance.

Consequently, the study's emphasis diverges from the usual injury-centric narrative to a more comprehensive analysis of competition data. By examining match outcomes, team dynamics, and the effects of athletes' physical attributes on performance, the research aims to bridge a critical gap in existing BJJ literature. This shift extends the use of data analytics in BJJ from a predominantly health and safety perspective to one that encompasses competitive and strategic elements.

This methodological approach not only contributes to the sports analytics field within martial arts but also emphasizes the value of data-centric strategies in sports disciplines where data is scarce. The methods and conclusions of this research highlight the significance of creative data gathering and analysis methods in enhancing our understanding and development of BJJ.

# 3. My Work

## Initial Data Search

The project began with an exploration of available datasets on platforms like Kaggle. However, the datasets discovered, such as one specific BJJ dataset, were limited in size (only 1000 rows), rendering them inadequate for a comprehensive analysis. This initial setback highlighted the scarcity of readily available data in the domain of BJJ.

## Research Paper Analysis

The next phase involved an extensive review of existing research papers on BJJ. This exercise revealed a strong focus on injury and prevention within the existing literature but also underscored the lack of publicly available datasets on broader aspects of BJJ competitions. Attempts to acquire datasets from researchers proved unsuccessful, further emphasizing the data availability challenge in this field.

## Data Acquisition from GitHub

The breakthrough in data collection came from discovering a GitHub project that had performed data scraping from the BJJ Heroes website. BJJ Heroes is renowned for its detailed records of BJJ competitions, athlete profiles, and match statistics. The scraped dataset from this source offered a rich and comprehensive collection of data points crucial for the analysis.

## Data Cleaning and Preprocessing

With the dataset sourced, the next critical step was data cleaning and preprocessing. This phase involved standardizing data formats, addressing missing or inconsistent data, and structuring the data for effective analysis. The meticulous nature of this process was essential to ensure the integrity and usability of the dataset.

## Exploratory Data Analysis and Statistical Testing

The study then progressed to an exploratory data analysis (EDA), which helped in understanding the distribution of various variables and identifying preliminary patterns. Following the EDA, the project employed statistical methods such as linear regression and chi-squared tests to analyze relationships and correlations within the data.

## Focus of the Study

The primary aim was to delve beyond the commonly explored themes of injury in BJJ and instead focus on competition dynamics, strategies, and athlete performance metrics. The analysis included examining trends in competition frequency, assessing team and individual performance, and exploring the impact of athletes’ physical attributes on their competition outcomes.

# 4. Results

## Dominant Winning Techniques

The dataset provided insights into the most used techniques in BJJ matches. The top techniques were:

* 'Choke from back' and 'Rear Naked Choke (RNC): Found to be the most frequent winning technique. This suggests a strategic focus on back control and submission among competitors.
* 'Armbar': This technique follows closely, indicating its popularity and effectiveness in BJJ competitions.

## Frequency and Distribution of Techniques

The analysis revealed not just the dominant techniques but also their frequency of occurrence. This sheds light on the evolving trends in competition strategies and the possible shifts in training focus over the years.

## Athlete Performance Metrics

The data included extensive records of individual athletes' performances, such as win/loss ratios, preferred submission techniques, and outcomes across different competitions and years. This allowed for a thorough understanding of both the consistency and variability in individual athletes' performances.

## Competition Trends Over Time

The dataset enabled an analysis of trends over several years, highlighting any changes in competition frequencies, popular techniques, and overall strategic approaches in BJJ competitions. Diversity in Winning Methods: Beyond the most common techniques, the data also showed a variety in winning methods, illustrating the richness and complexity of strategies employed in BJJ.

# 5. Discussion

The analysis of the BJJ competition data offers several insightful observations about the sport's competitive landscape and raises questions for further exploration:

## Strategic Implications of Dominant Techniques

The prominence of techniques like 'Choke from back' and 'Armbar' in competition victories suggests a strategic leaning toward these techniques among BJJ practitioners. This could be attributed to:

* Their effectiveness in securing submissions.
* Possible alignment with the scoring systems and rules in BJJ competitions, which might favor these techniques.
* The evolution of training methodologies that prioritize these techniques due to their success rates in competitions.

## Training and Coaching Adaptations

The findings highlight the importance of these dominant techniques in competitive success. This suggests a potential shift in training paradigms, where coaches and athletes might focus more on these techniques. Additionally, understanding these trends could help in developing counterstrategies to prepare for common submission attempts more effectively.

## Contextual and Cultural Factors

The data reveals trends but lacks the context behind the choice of techniques. Cultural and regional differences in BJJ styles, teaching methodologies, and competition strategies could play a significant role in these trends. Further research could explore how these contextual factors influence the choice and success of certain techniques.

## Limitations in Data Scope and Representation

The dataset's focus primarily on competition outcomes means it lacks granular details about the circumstances of each match, such as the flow of the fight, defensive strategies, and the impact of referees' decisions. Moreover, the dataset might underrepresent local or regional competitions, which could have different strategic dynamics compared to higher-tier events.

## Implications for Athlete Development

The findings could influence how new athletes are introduced to BJJ, potentially leading to a standardized 'curriculum' that emphasizes these successful techniques. However, this could also lead to a homogenization of styles, which might impact the creative and varied nature of BJJ.

## Future Research Directions

To build on these findings, future research could focus on:

* Analyzing the impact of weight classes, athlete experience, and belt level on match outcomes.
* Investigating regional variations in BJJ competition strategies.
* Expanding the dataset to include more detailed biographical data on athletes, such as training background, physical attributes, and career progression.

In conclusion, while the current analysis provides valuable insights into BJJ competition trends, it also opens several avenues for future research to deepen our understanding of the strategic complexities of the sport.

# 6. Conclusion

This study has provided an analytical overview of winning strategies in Brazilian Jiu-Jitsu (BJJ) competitions, revealing patterns in techniques and athlete performance. The findings offer insights into prevalent trends within the sport, which can inform training and coaching approaches.

The project highlights the challenges of data collection in specialized sports like BJJ, emphasizing the need for more comprehensive datasets for in-depth analysis. While the study contributes to a basic understanding of competition dynamics, it also opens up possibilities for future research. Expanding the scope of data and exploring various aspects of BJJ, such as weight classes and athlete development, could yield further valuable insights.

In essence, this research serves as a stepping stone towards a more data-informed perspective in understanding BJJ competitions, with potential implications for athletes, coaches, and the broader BJJ community.

# 7. References

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