SOCIAL NETWORK ANALYSIS

Network Analysis in PSL

Report

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Abstract

The applications of network methods for understanding interactions among PSL members are described in this report. We analyze the interaction of players in PSL matches. The research involved extracting batting and bowling records from scoreboard and developing a batting partnership records and bowling-wricket taking record for analysis.

DIfferent analysis was done on the records focused on bringing some important insights for the game. We generate a batting partnership network (BPN) for different teams and determine the exact values of the degree centrality, page rank, and eigenvector.

We observe that the networks display small-world behavior. We find that the most connected batsman is not necessarily the most central player, and the most central players are not necessarily the ones with high batting averages.

We also built a bowling network based on wickets for players. Also attempted to determine which bowler was influential in the network. We extend our analysis to quantify the performance, relative importance,, and effect of removing a player from the team, based on different centrality scores. We tracked the Pakistan Super League (PSL), a premier T20 cricket tournament conducted at the start of the year, for the last 6 years, i.e., since 2016.

Introduction

Analytics is playing a vital role in the sports industry. Nearly all teams have special personnel analyzing every bit of data coming in. There is good data available on most sports and tournaments, though little on cricket and almost none on Pakistan's cricket. We are targeting the Pakistan Super League (PSL), a premier T20 cricket tournament conducted at the start of the year for the last 6 years, i.e., since 2016. The paper intends to find important batting partnerships through social network tools to improve the outcome of the game.

In short, we will apply network analysis to capture the importance of partnerships in the team. The game of cricket is based on a series of interactions between batsmen when they bat in a partnership or when a batsman is facing a bowler. Thus, a connected network among batsmen arises from these interactions.

We have researched similar papers to see different ideas for analyzing the game of cricket. Most relied on the batting partnerships, and we have also focused on the partnership as they are the key to winning matches.

Our research will explore different networks in batting partnerships. We scrapped scoreboards, converted them into partnership records, and used the NetworkX library on python for visualizing data. The results are interesting and can be used to plan who comes next in batting so as to create winning combinations on the cricket pitch.

Related Work

There have been several social network analysis studies conducted in the domain of sports. We studied four of these papers to understand the kind of approach that was taken for different problems.

In a 2018 study, batsmen's interactions were analyzed in the context of international cricket to build batting partnership networks for various teams and compare them to Erdos-Renyi random network models. Another article from 2017 used small-world network analysis to investigate how IPL teams are constructed utilizing individuals that perform at their highest levels and feel most at home with their teammates.

In order to comprehend a general approach to social network research in sports, we also looked at works outside of cricket. The process of using graph theory and network analysis to analyse the advanced statistics of the NBA and identify the best and most crucial players was described in a study that was published in the late 2010s. Another 2011 article examined the interconnectedness of the MLB opening day rosters and contrasted the findings with the individual performances of the players.

Model

There were multiple areas that the game of cricket can be analyzed through networks, mainly,

1. Analyzing player performance: Graphs can be used to represent the relationships between different players and how they interact with each other on the field. This can be used to identify patterns in player performance and understand how different players contribute to the team's success.
2. Predicting match outcomes: Graphs can be used to model the relationships between different teams and how they are likely to perform against each other. This can be used to make predictions about the outcome of matches and identify potential weaknesses in a team's strategy.
3. Analyzing team dynamics: Graphs can be used to understand how different teams work together and how their strategies evolve over time. This can be used to identify strengths and weaknesses in a team's approach and suggest ways to improve performance.
4. Analyzing player movement: Graphs can be used to track the movement of players on the field and understand how they are interacting with each other and the ball. This can be used to identify patterns in player behavior and understand how different strategies are being implemented.

Overall, graph network theories can be a powerful tool for analyzing and understanding the game of cricket. They can help teams improve their performance by identifying strengths and weaknesses and suggesting ways to optimize their strategies. In this paper, we have focused on Batting and Bowling Partnerships to achieve the above

We have generated a batting partnership network (BPN) for different teams and determined the exact values of the average degree, and average shortest path length of the networks along with different centrality measures.

The information was processed after being scraped from the cricket websites. Since we were unable to obtain data on partnerships, we developed our own logic to generate this information from the scraped raw data. For each team, we developed a network based on the year. The graph is directed. The player with the higher partnership run total is indicated by the arrowhead.

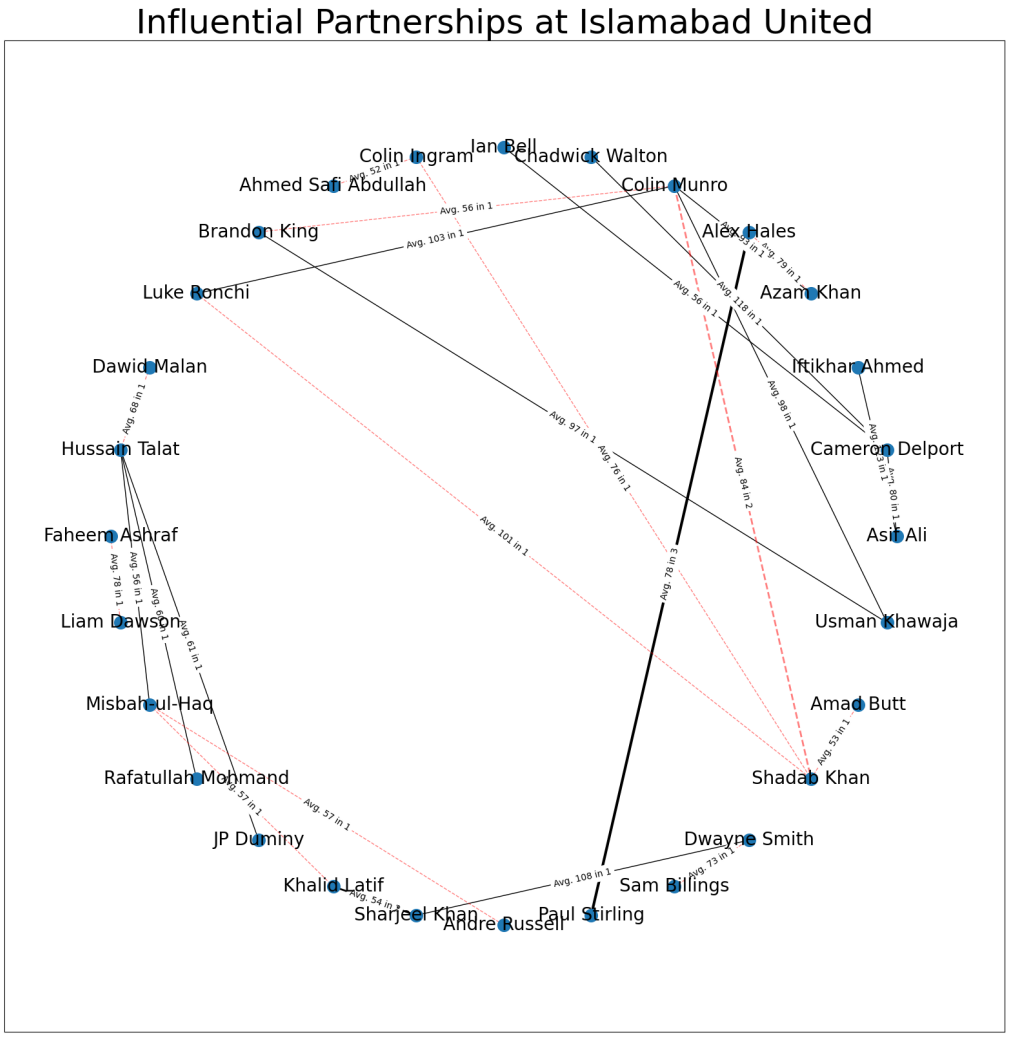
Using the reasoning that the arrowhead will point in the direction of the player who has taken the wicket, we implemented the directed graph for bowling. The batter and the bowler are seen in this graph.

The degree centrality, closeness centrality, betweenness centrality, eigenvector centrality, and page rank were all determined using the Python module NetworkX. The bowling graph followed the same procedure.

Experimental Results/Discussion

We used measures like degree centrality, closeness centrality, betweenness centrality, and eigenvector centrality to measure the connectedness of the players in their teams, then correlated our findings with the players' performances. For batsmen, the obvious performance metric was the number of runs they scored in partnerships. Some very interesting insights can be drawn from the graph below. The below graphs show partnership records with over 50 runs. The black lines show that the result of the match was a win for the team, while the red lines resulted in a loss. The thickness of the line shows the number of times the matches were played.

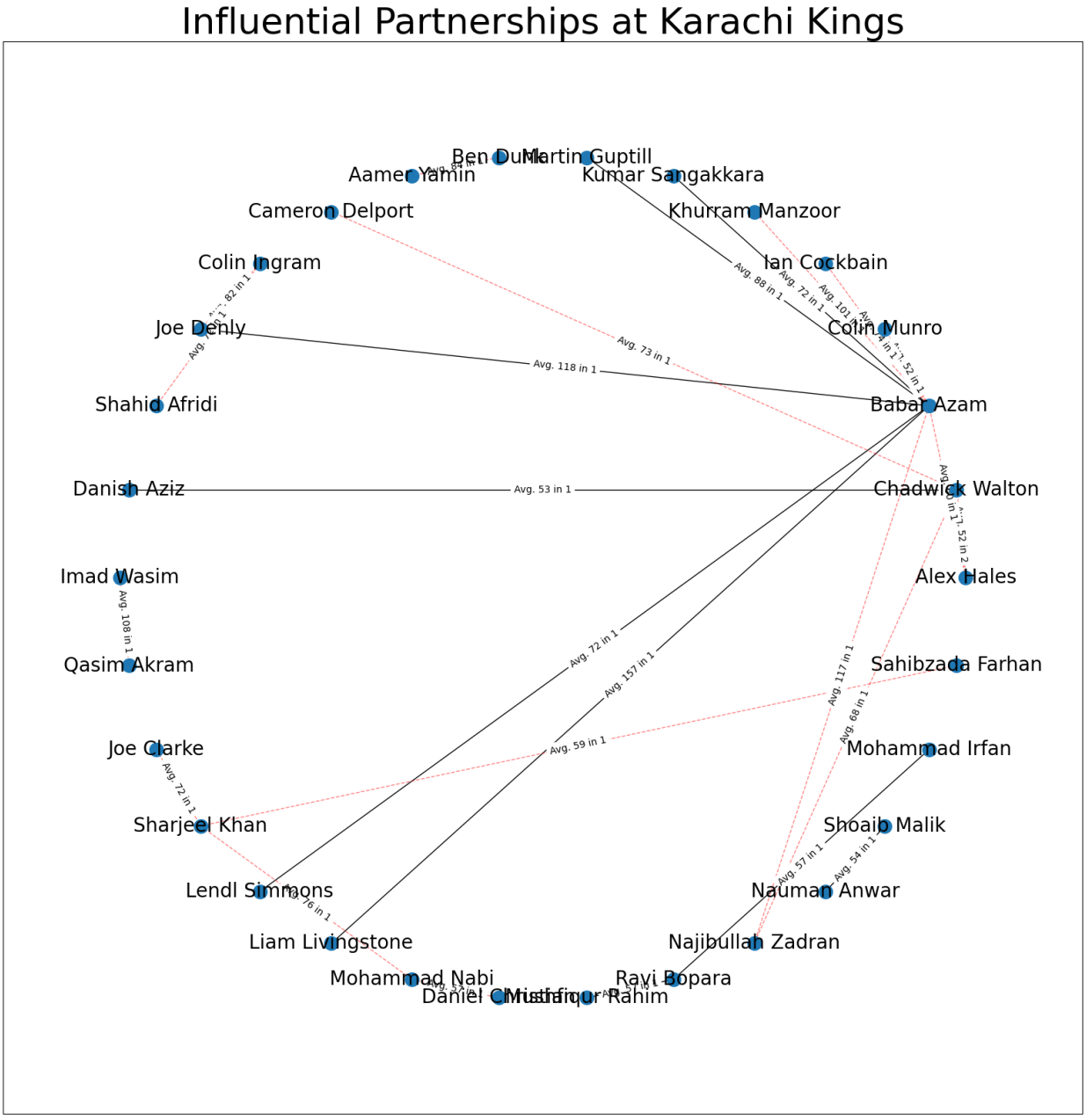
The graph shows that the players' or the partnerships' combinations proved winning for the team, as also as the consistency of the players' relationships with each other. Babar Azam, for example, does not share special relationships with anyone on the team though he is a good player as the number of times the partnership has crossed 50 amounts to the top. Muhammad Rizwan, on the other hand, has a lot of winning combinations with the other players, this clearly shows that he is a team player, while Babar is not.



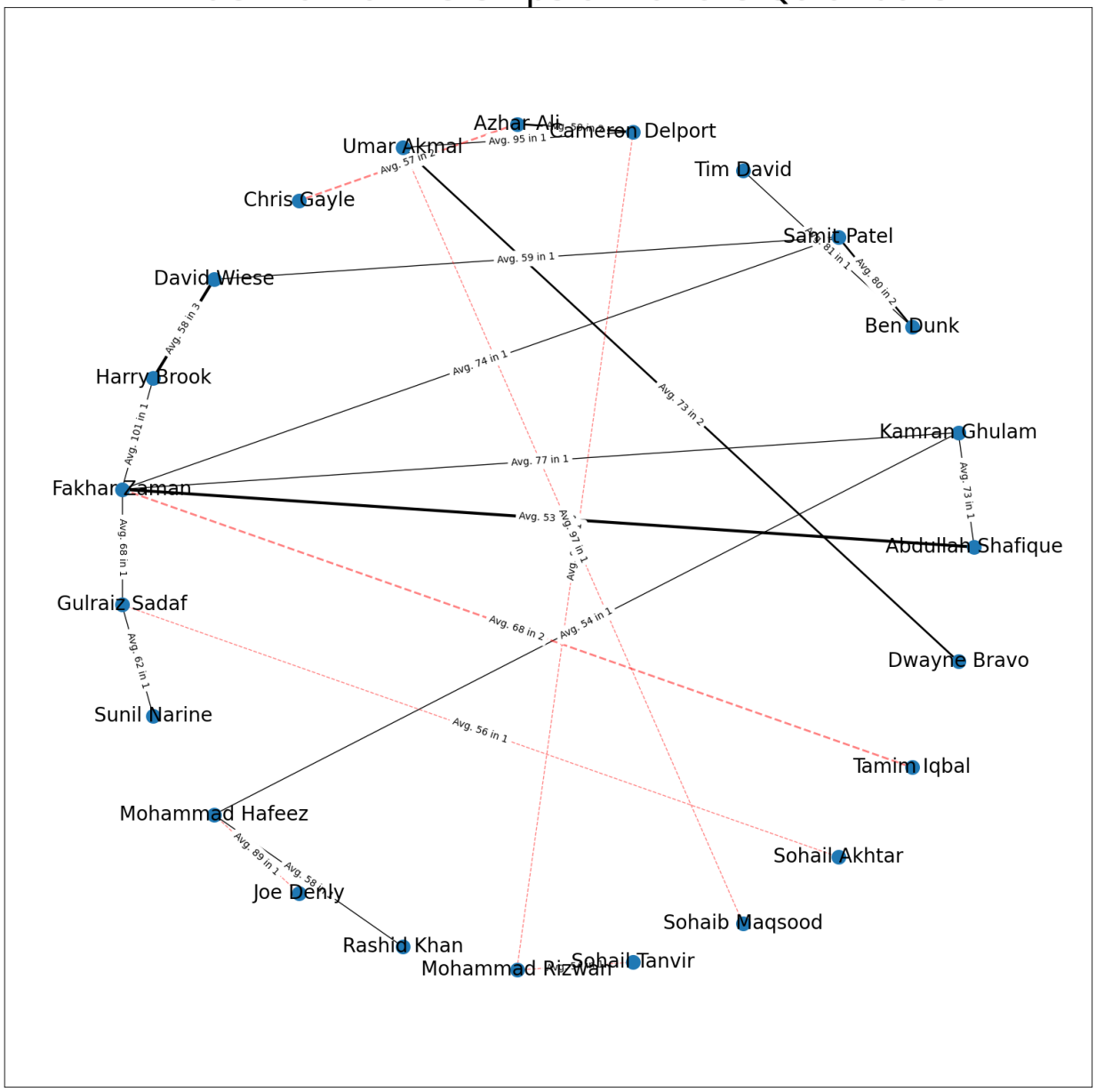
We can anlayse the batting partnership, Multan Sultan have performed much better,

Rank	Team	Batsman	weighted degree centrality
1	MS	Mohammad Rizwan	15
2	MS	Shan Masood	12
3	MS	Rilee Rossouw	10
4	PZ	Kamran Akmal	9
5	LQ	Fakhar Zaman	7

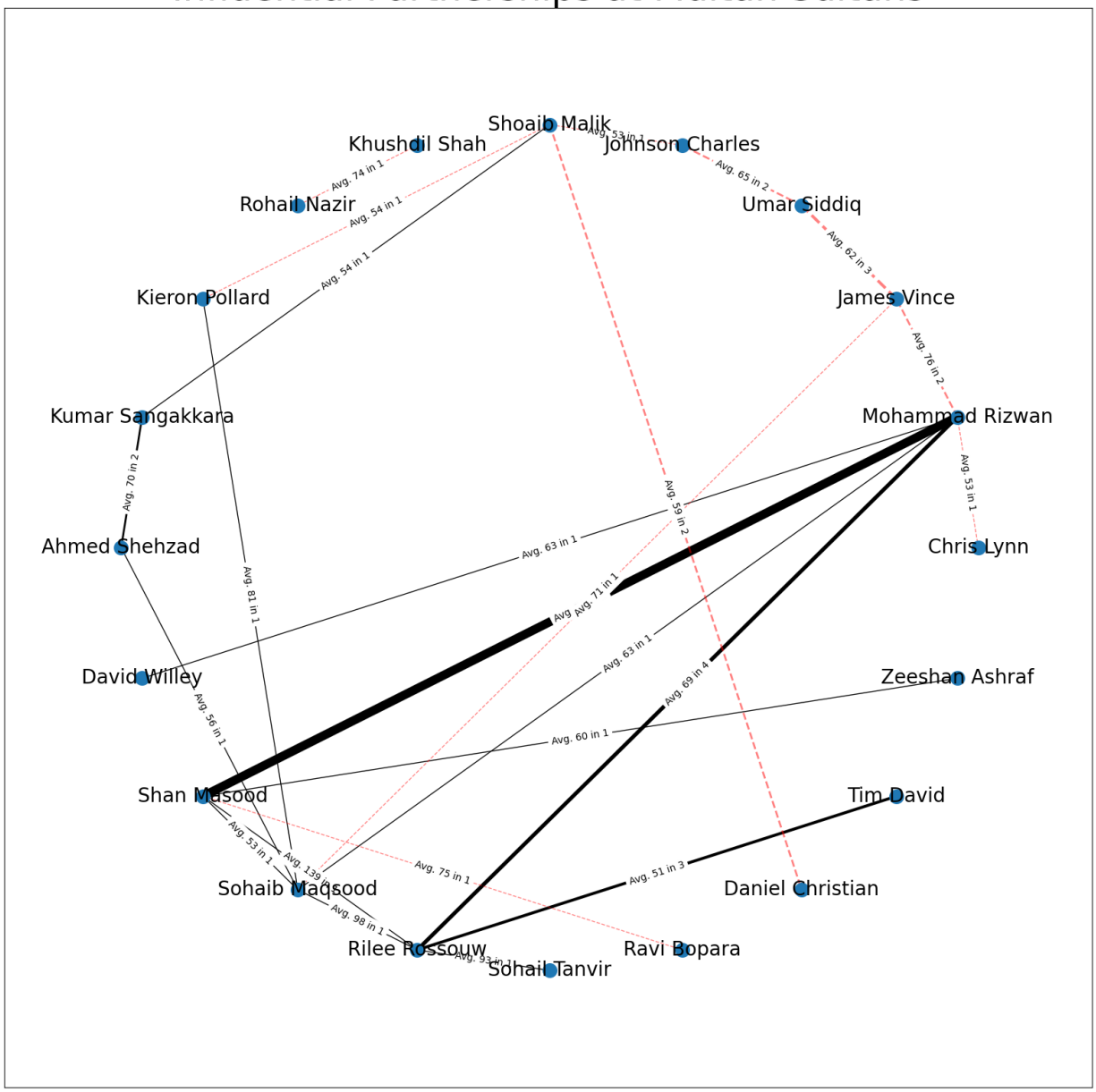
their three batsman occupy the top spots in partnership.



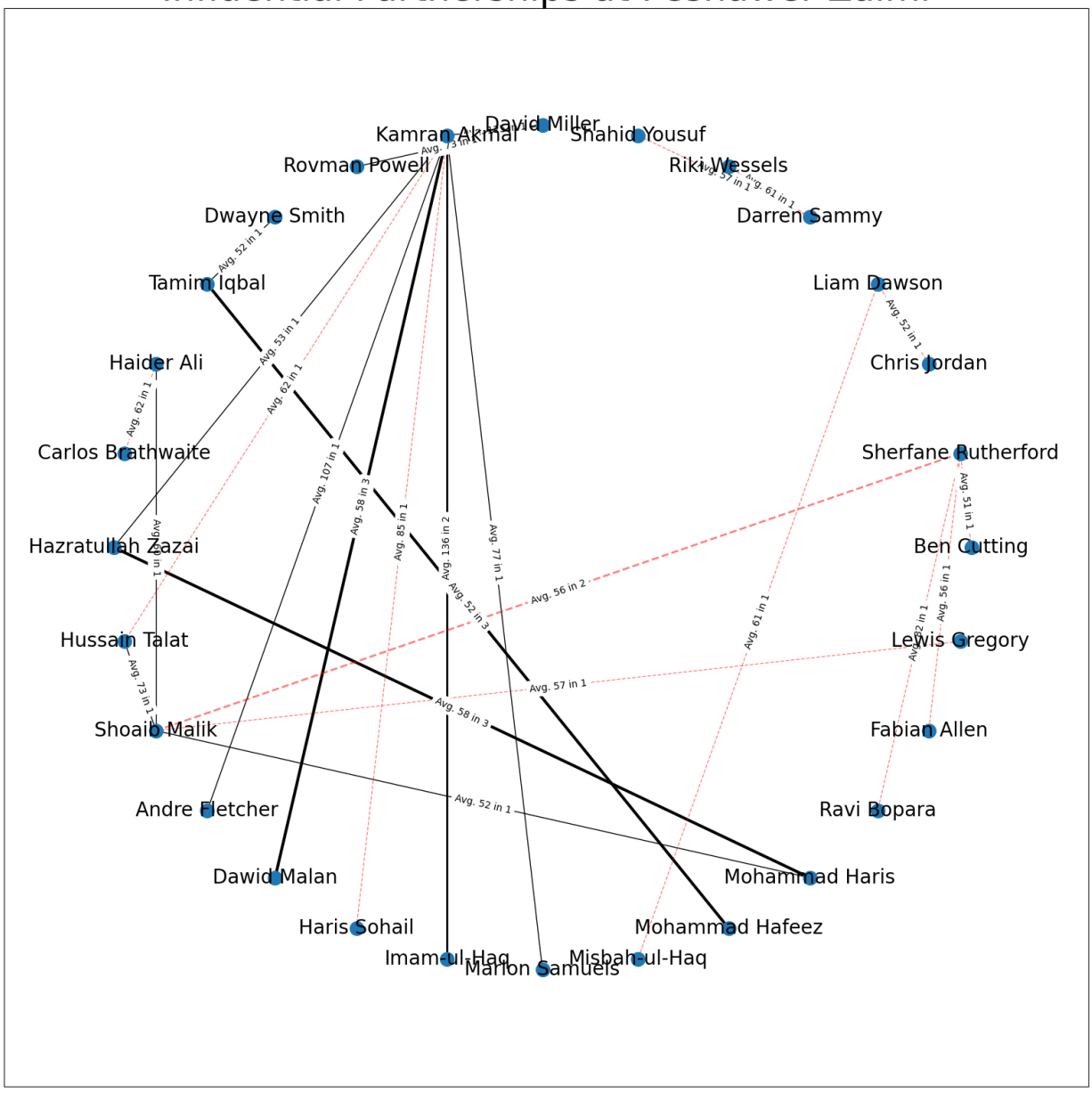
Influential Partnerships at Lahore Qalandars



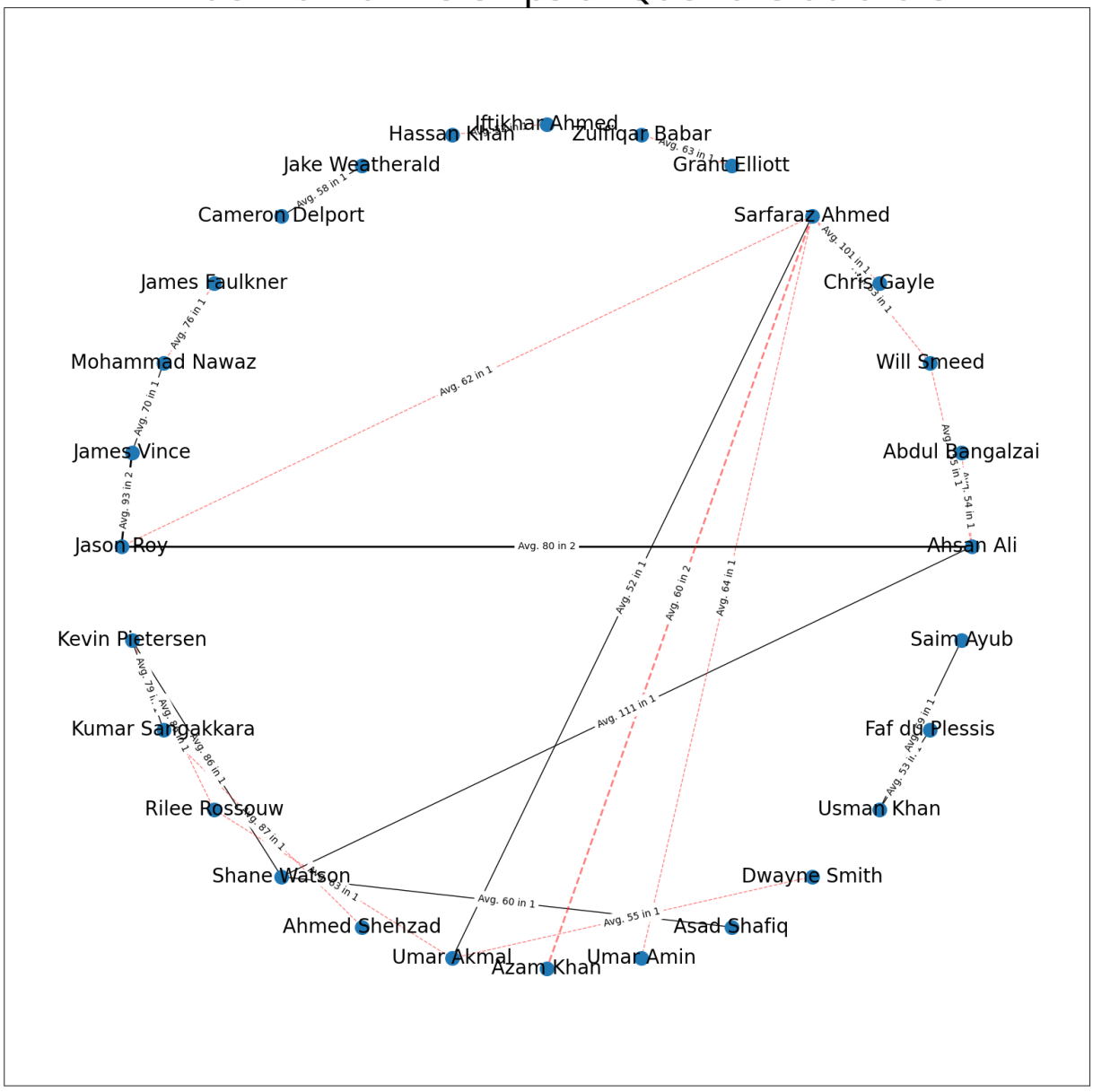
Influential Partnerships at Multan Sultans



Influential Partnerships at Peshawer Zalmi



Influential Partnerships at Quetta Gladiators



It is also important to analyse the partnerships that resulted in a loss. The result shows that the last two Pakistani captains occupying the 1st and the 3rd Spot. Though it is important to

Rank	Team	Batsman	weighted degree centrality
1	QG	Sarfaraz Ahmed	6
1	MS	James Vince	6
1	KK	Babar Azam	6
4	PZ	Sherfane Rutherford	5
4	IU	Shadab Khan	5

consider the position the player play at, as score high runs late in the innings means that your team was already in trouble. The chances of winning from there was already slim.

For bowlers, we chose to use the number of wickets they took as a measure of their performance, but there are several other metrics that also represent their performance, like the number of runs the bowler gave the other team in an over. However, these metrics are not easily quantifiable, so we went with the number of wickets.

We also chose to run a PageRank algorithm in the network just to see if certain players had an impact on other players' performances simply by being present in the same team. We expected to find inconclusive, random results from PageRank but found a small but real correlation between PageRank scores and players' performances.

The overall analysis on batting and bowling partnerships using different measures give interesting result. We also used traditiona cricket measures to see if the network based measures justifies the result. In batting, we see that Shoaib Malick is one of the key players in PSL. Shoaib Malik tops the charts in the results for batsmen overall, as shown in the table below.

Batsman	Batting Avg
Shoaib Malik	29.85
Asif Ali	17.41
Imad Wasim	10.96
Babar Azam	37.42
Kamran	32.84

Batsman	Page Rank
Shoaib Malik	0.027
Asif Ali	0.020
Imad Wasim	0.018
Babar Azam	0.017
Kamran	0.017

Batsman	Degree
Shoaib Malik	0.156
Babar Azam	0.141
Iftikhar	0.121
Imad Wasim	0.121
Sohail Tanvir	0.117

Batsman	Eigen Vector
Asif Ali	0.261
Shoaib Malik	0.223
Babar Azam	0.221
Shadab	0.204
Iftikhar	0.186

Batsman Table 1

Shaheen Shah Afridi is in first place in the table above, which displays the results for all bowlers.

Bowler	Wickets
Shaheen Afridi	53
Sohail Tanvir	30
Riaz	60
Hasan Ali	49
Waqas Maqsood	23

Bowler	Page Rank
Shaheen Afridi	0.057
Sohail Tanvir	0.048
Riaz	0.037
Hasan Ali	0.029
Waqas Maqsood	0.024

Bowler	Degree
Shaheen Afridi	0.190
Faheem Ashraf	0.183
Hasan Ali	0.176
Riaz	0.165
M Nawaz	0.158

Bowler	Eigen Vector
Riaz	0.409
Shaheen Afridi	0.344
Sohail Tanvir	0.278
Hasan Ali	0.292
Faheem Ashraf	0.218

Bowler	Close-ness
Shaheen Afridi	0.365
Riaz	0.359
Sohail Tanvir	0.343
Faheem Ashraf	0.328
Hasan Ali	0.326

Bowler Table 1

Conclusion

We found a strong correlation between the partnership ranking and the performance of the batsmen in the PSL. According to our results, using social network analysis to form teams and batting partnerships would result in optimized performance from the entire team.

With the data on the best bowlers, batting partnerships can be further optimized for the right batting partners to face the right bowlers.

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