Reaction Paper
Elements of Network Science:

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Paper 1: Complex Network Analysis in Cricket: Community structure, player's role, and performance index by Satyam Mukherjee.

Link to Access: https://ar5iv.labs.arxiv.org/html/1206.4835

Introduction:
Using network analytic tools, the paper gives a comprehensive analysis of batting partnerships in international cricket. The study reveals patterns suggestive of small-world behaviour, providing insights into network dynamics, by building Batting Partnership Networks (BPNs) for various cricket teams and comparing their attributes with known network models. Notably, it highlights that highly connected batsmen are not always the best performers by exposing a discrepancy between batting performance and network centrality. Furthermore, the investigation delves into the community structure of BPNs, clarifying the functions that each player plays on the team. Additionally, the study assesses the relative value and performance of each player, offering useful implications for team management tactics. All in all, it advances knowledge of international cricket team dynamics and performance variables.

Summary:
To investigate team dynamics in cricket, the research uses complex network analysis, concentrating on batting partnerships. To examine interactions between batsmen, it builds a Batting Partnership Network (BPN). It assesses BPN features, such as the shortest path length, average degree, and clustering coefficient, methodologically. The study identifies community structures in BPN and examines the correlation between a batsman's performance and centrality.
This paper is a great choice for my reaction paper because it covers a wide range of topics covered in class, including centrality, clusters, degrees, nodes, links, and the small-world phenomena. This thorough investigation offers a wealth of opportunities for analysis and thought because it closely corresponds with the ideas and theories we went over in class.

Strengths:
- Uses network analysis to present fresh perspectives.
- To evaluate the importance of a player, centrality ratings are proposed.
- Casts doubt on widely held notions about the worth of players.
- Defines player communities to have a better comprehension of team relationships.

Drawbacks:
- Ignores fielders and bowler's contributions.
- The need for accurate data to produce high-quality results.
- Some research has been done on the effects of centrality scores in cricket.
- The process of developing and validating a performance index is unclear.

Future Work:

- Examining teams in Test, ODI, and T20 formats could be helpful to the research to see whether network structures differ. (considering larger datasets)

- It may be possible to identify structural differences by comparing the networks of successful and failed teams.
- Gaining a deeper understanding of the network's evolution during a match or tournament may be possible.
- I also want to see the comparision with the players from different teams around the world.

Paper 2: Network centrality-based team formation: A case study on T-20 cricket by Paramita Dey, Maitreyee Ganguly, Sarbani Roy.
Link to Access: https://www.sciencedirect.com/science/article/pii/S2210832716300977

Introduction:
This research uses the features of small-world networks to present a revolutionary way of team creation in Twenty20 cricket. In the cricket network, players are modeled as nodes and their interactions with one another as edges. The study examines T-20 cricket teams using intra-country networks and finds that they have small-world traits. It's possible that conventional performance indicators are insufficient to fully appreciate a player's contribution. As a result, the study suggests an updated approach based on social networking to measure player effectiveness and team belongingness. Social Network Analysis (SNA) is used to rank players and evaluate performances. Using T-20 cricket data (2014–2016), a bidirectional weighted player network is built for analysis. Teams are selected according on this ranking, and their selection is validated by comparing it to their IPL (Indian Premier League) 2016 results.
This paper consists of many familiar topics that we had came across during our lectures and this research paper has included many drawbacks that we had mentioned for the above paper and this is a better version of network analysis for a small-world networks.

Summary:
The proposed approach for team formation for T-20 cricket in this paper comprises several key steps. Initially, a pool of players is created based on their performance in T-20 international matches from 2014 to 2016, with specific criteria for inclusion as batsmen or bowlers. The methodology then involves forming a network of T-20 cricket, identifying small-world properties, and selecting a pool of players based on high centrality and clustering coefficient measures. From this pool, four teams are chosen based on players' betweenness centrality, closeness centrality, node degree distribution, and clustering coefficient. Each player is ranked within their respective team according to these measures, and these teams are compared with IPL 2016 teams. The network formation involves creating a cricket database from match statistics, generating player vs. player matrices, and constructing team vs. team matrices for all countries. Clustering coefficient, average path length, betweenness centrality, closeness centrality, and node degree distribution are calculated to assess network characteristics and player centrality. The paper utilizes Gephi software for network analysis.

Strengths and Drawbacks:
The strength of this approach is how it uses social network analysis tools to consider team dynamics and individual performance in an integrated manner. Using centrality metrics like betweenness centrality and clustering coefficient, the approach seeks to find players that perform well both on their own and as valuable team members. However, as the complexity of team dynamics in cricket may not be entirely reflected by statistical metrics alone, difficulties may develop in effectively reflecting player interactions. Furthermore, to evaluate team formation's practical efficacy,

additional validation against real-world performance outcomes could be necessary to confirm its validity when based only on network centrality metrics.

Future Work:

To examine how various roles interact within the network and how centrality measures change depending on match conditions, future research in network centrality-based team construction in T-20 cricket may take player roles and match conditions into account. Deeper insights into team dynamics may also be obtained by expanding the analysis to other cricket formats like ODIs and Test matches and verifying it further against real-world performance outcomes. Examining similar methods in other team sports may further broaden the study's focus and provide insightful analysis of team building tactics in various sports.

Connection between two papers:

Centrality was used as a primary evaluation element in both articles; however, whereas the first paper only examined batting performance, the second paper took a wider look at other aspects. The second research used a vast dataset and took into account numerous other characteristics to design an ideal IPL team based on players' performances over the previous 2 years in the format. While the criteria used in both articles to evaluate players' trustworthiness were identical, the second paper had the advantage of a larger dataset and a broader range of factors.