

ACA4: Social Network Analysis

Chess World Championship Matchups in the Modern Era

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【Introduction】

Since 1948, the International Chess Federation (FIDE) has hosted the World Chess Championship (WCC). The tournament has been riddled with turmoil throughout history, mostly due to fierce individual rivalries and international politics. Despite such turbulence, the tournament has always been considered to be the most prestigious tournament in the chess world, its throne the ultimate accomplishment for every top grandmaster in history. In this analysis, we will be conducting a social network analysis of all the championship matchups since 1948. The data was sourced from the Wikipedia, under “List of World Chess Championships”. I copy/pasted the data onto an excel spreadsheet, and formatted the data into an edge list before saving it as a csv file. I created the graph and analysis on Gephi.

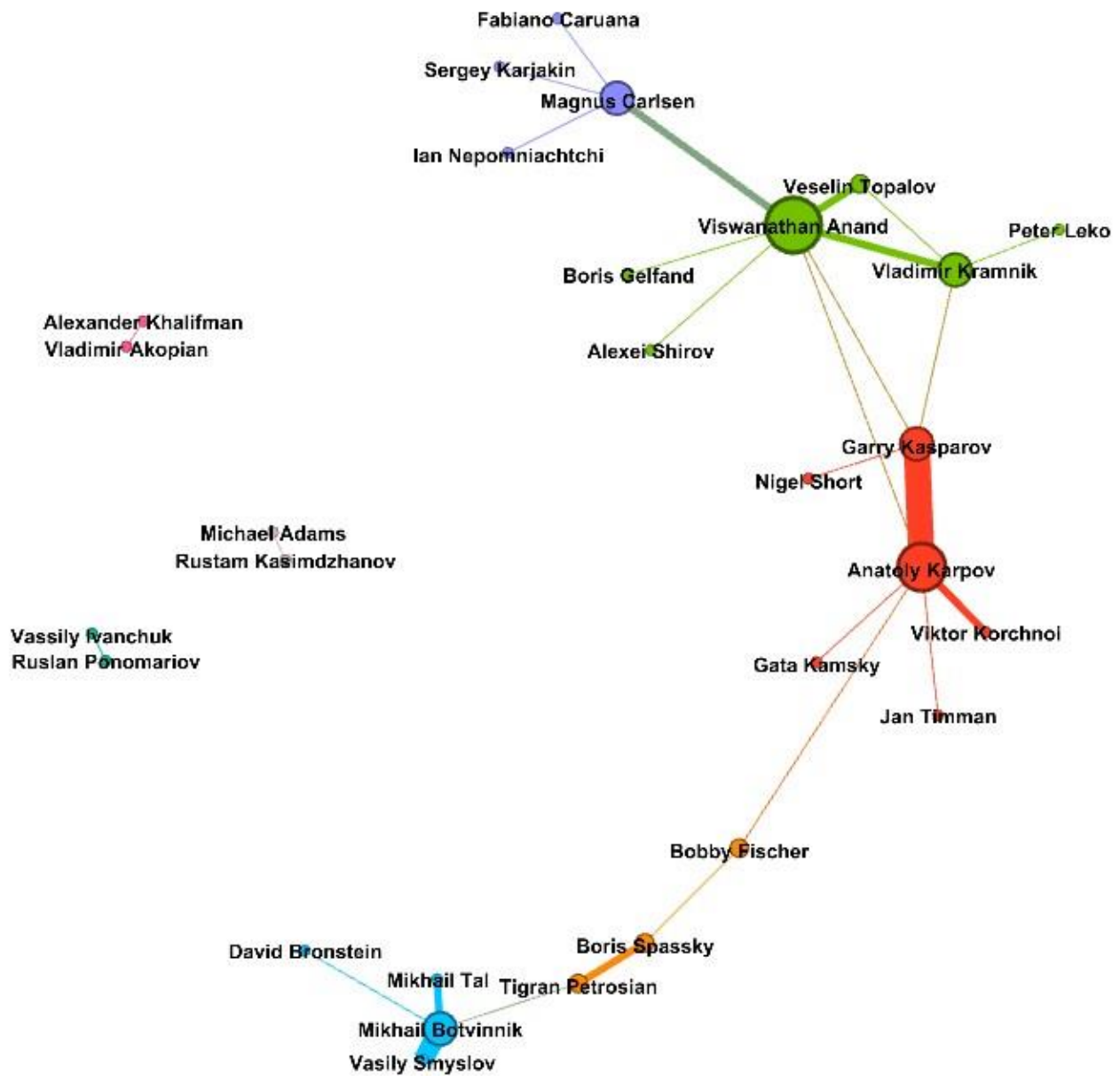
Source:

https://en.wikipedia.org/wiki/List_of_World_Chess_Championships

【Graph Definitions】

Each node represents a player that competed in the finals of the WCC since 1948. Each edge represents a matchup between the two players (nodes). The thickness of the edges indicates the number of times the matchup occurred.

【The Graph】



【Graph Statistics/Interpretations】

Number of nodes: 29

-This tells us that there were 29 individuals who have reached the WCC finals since 1948.

Number of edges: 28

-This is as expected; we should always have $n-1$ matchups than the number of nodes.

Density: 0.0069

Diameter: 8

Ranking by Degree (Top six players):

Name	Degree
Viswanathan Anand	7
Anatoly Karpov	6
Garry Kasparov	4
Magnus Carlsen	4
Vladimir Kramnik	4
Mikhail Botvinnik	4

-The degree can be interpreted as the number of times each player made it to the finals in the WCC. Unsurprisingly, players who are widely considered to be among the greatest of all time make this list.

Ranking by Betweenness:

Name	Betweenness
Anatoly Karpov	144
Viswanathan Anand	128
Bobby Fischer	96
Boris Spassky	85
Tigran Petrosian	72
Magnus Carlsen	60
Mikhail Botvinnik	60

-It can be said that players with high betweenness are likely to have won the championship, as the usual tradition in the WCC is for the reigning champion to face the incoming challenger. In other words, a high betweenness indicates that the championship title was passed down through that player. However, as the challenger system was not implemented throughout 1996 and 2008 (the incumbent champion did not automatically qualify for the final), a high betweenness is not a necessary condition for a championship.

Ranking by Closeness:

Name	Closeness
Alexander Khalifman	1
Vladimir Akopian	1
Ruslan Ponomarev	1
Vassily Ivanchuk	1
Rustam Kasimdzhanov	1
Michael Adams	1
Anatoly Karpov	0.407407
Viswanathan Anand	0.4
Garry Kasparov	0.360656
Bobby Fischer	0.349206
Magnus Carlsen	0.314286

-The first six players in this ranking are players who only ever competed within the above explained 1996-2008 era of the WCC; they constitute isolated graphs, and therefore have a closeness of 1.

-The following five players are, similarly to the discussion in betweenness centrality, were prominent players of the era. While players with higher closeness centrality are likely to be dominant players, the quantitative amount of the variable is not particularly useful.

【Communities/Discussion】

Modularity was used to create each community, as represented by each color.

Each community can be interpreted as different chapters in modern chess history; the central players in each community were the defining players of that chapter. For example, Magnus Carlsen, the current world champion, is undisputedly the best player since 2010; rivalries such as Karpov-Kasparov and Anand-Kramnik were the eye of the typhoon in the chess world at the time.

Another nice feature of this graph is that it gives us a general timeline of modern chess history; particularly in the eras where the challenger system was implemented, we can see how the championship trophy was handed down along the top players of the time, such as Botvinnik, Fischer, Karpov, Kasparov, Kramnik, Anand, and Carlsen (in chronological order).

【Conclusion】

A social network analysis of the WCC players gives us a visual representation of modern chess history. Not only are we able to recognize the dominance of each individual player

and the rivalries between them, the incumbent-challenger system of the WCC allows us to visualize the transitions between the chapters of modern classical chess.