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Identifying the greatest team and captain—A complex network approach to cricket matches

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ABSTRACT

We consider all Test matches played between 1877 and 2010 and One Day International (ODI) matches played between 1971 and 2010. We form directed and weighted networks of teams and also of their captains. The success of a team (or captain) is determined by the 'quality' of the wins, not simply by the number of wins. We apply the diffusion-based PageRank algorithm to the networks to assess the importance of the wins, and rank the respective teams and captains. Our analysis identifies *Australia* as the best team in both forms of cricket, Test and ODI. *Steve Waugh* is identified as the best captain in Test cricket and *Ricky Ponting* is the best captain in the ODI format. We also compare our ranking scheme with an existing ranking scheme, the Reliance ICC ranking. Our method does not depend on 'external' criteria in the ranking of teams (captains). The purpose of this paper is to introduce a revised ranking of cricket teams and to quantify the success of the captains.

1. Introduction

The study of social networks, representing interactions between humans or groups, is a subject of broad research interest. In recent years, tools from network analysis have been applied to sports. For example, a network approach was developed to quantify the performance of individual players in soccer [1]. Network analysis tools have been applied to football [2] and Brazilian soccer players [3]. In Ref. [4], the authors studied the head-to-head matchups between Major League Baseball pitchers and batters as a bipartite network [5]. In Ref. [6], a general model-free approach was introduced to elucidate the outcome of a soccer match. Time series analyses have been applied to football [7,8], baseball [9,10], basketball [11–13], and soccer [14,15]. However, the advantage of a network representation of any real system is that it gives the global view of the entire system and the interaction between individuals reflecting self-emergent phenomena.

In this paper, we apply tools of social network analysis to cricket. Cricket is a popular sport around the world, and it is played mostly in the erstwhile English colonies. Its popularity is the highest in the Indian subcontinent. Despite several controversies involving match fixing, spot fixing, and ball tampering, the sport has managed to maintain international attention as well as research interest [16–18]. Currently there are ten countries that have been granted Test status from the International Cricket Council (ICC): Australia (AUS), Bangladesh (BAN), England (ENG), India (IND), New Zealand (NZ), Pakistan (PAK), South Africa (SA), Sri Lanka (SL), West Indies (WI), and Zimbabwe (ZIM). The Reliance ICC Rankings is the official guide used to evaluate the performance of teams as well as of players. Ranking schemes are based on points that are acquired by a team after a tournament. As mentioned in Ref. [17], due to the opacity of the ranking schemes, the methods used by the ICC are still not comprehensible. In cricket, the captain is responsible for the team. Before the game starts, the home captain tosses a coin, and the touring captain calls heads or tails. The captain chooses the batting order, sets up fielding positions, and shoulders the responsibility of on-field decision-making. Thus the outcome of a match depends on

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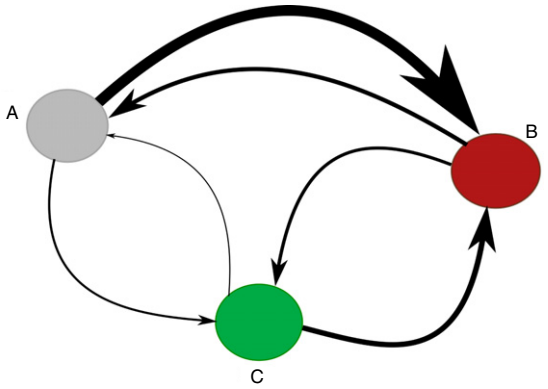

Fig. 1. A network of three competing cricket teams. Three teams (A, B, and C) compete against each other. If A defeats B, a directed link is established from B to A. The thickness of the link is proportional to the fraction of wins between A and B. Thus, if we consider all the competing teams, a weighted and directed network is established.

the captain's decisions. Additionally, the captain is also responsible at all times for ensuring that play is conducted within the spirit of the game as well as within the laws.[1] In this sense, the success of a team depends on the captain. However, currently there exist no ranking schemes to rank cricket captains.

In this paper, we numerically estimate the success of a team as well as the captain by analyzing the network of interaction of competing teams and also the captains. The primary goal of the paper is to elucidate the impact of a network structure on rankings of teams and also on that of the cricket captains. While the number of wins is a natural measure for the success of a team, it does not provide a full picture of the 'quality' of a win. We are thus motivated to study an alternative method to assess the quality of a win. For example, a win against Australia or South Africa carries more importance than a win against a lesser team. This is analogous to citation networks in which the effect of a citation coming from an important paper is greater than that coming from a less popular one. The PageRank algorithm [19], a network-diffusion-based algorithm, has emerged as leading method to rank scientists [20] and papers [21]. More recently, the PageRank algorithm has been applied to rank tennis players [22]. In this paper, we apply the PageRank algorithm to rank cricket teams and also identify the most successful cricket captain. The rest of the paper is organized as follows. In Section 2, we define and characterize the cricket-team network and provide a description of the PageRank algorithm that we employ as a ranking scheme across eras and also in the history of cricket (1877–2010). In Section 3, we discuss the results, and we conclude in Section 4.

2. Network of cricket teams

Data were collected from the website of cricinfo (http://www.espncricinfo.com/). We downloaded the information of results and also the names of the captains who led their respective teams from the scorecards. For each match, the scorecard keeps track of information about the teams, the runs scored by the batsmen, the number of wickets taken by the bowlers, the names of the captains who led their respective teams, and the result of the match. We collected the data for Test matches (1877–2010) and One Day International (ODI) cricket (1971–2010). In our analysis we have excluded matches with no results and matches which were abandoned.

We analyze the network of cricket teams by analyzing the head-to-head encounter of competing teams. A single match is represented by a link between two opponents. Thus, if team i wins against team j, a directed link is drawn from j to i (Fig. 1). A weighted representation of the directed network is obtained by assigning a weight w_{ji} to the link, where w_{ji} is equal to the fraction of times team j wins against team i. We quantify the relevance of matches with the use of a complex network approach equivalent to the one used for the computation of the PageRank score. Mathematically, the process is described by the following set of equations:

$$p_i = (1-q)\sum_j p_j \frac{w_{ji}}{s_j^{\text{out}}} + \frac{q}{N} + \frac{1-q}{N}\sum_j \delta\left(s_j^{\text{out}}\right), \tag{1}$$

where w_{ji} is the weight of a link and $s_j^{\text{out}} = \Sigma_i w_{ji}$ is the out-strength of a link. p_i is the PageRank score assigned to team i, and it represents the fraction of the overall "influence" sitting in the steady state of the diffusion process on vertex i [22]. It should be noted that Eq. (1) is a system of coupled equations, and it is applied to all nodes of the network. In Eq. (1), $q \in [0, 1]$ is a control parameter that accounts for the importance of the various terms contributing to the score of the nodes, and N is the total number of teams in the network. The term $(1-q)\ \sum_j p_j \frac{w_{ji}}{s_j^{\text{out}}}$ represents the portion of the score received by

[1] http://www.lords.org/laws-and-spirit/laws-of-cricket/preamble-to-the-laws,475,ar.html

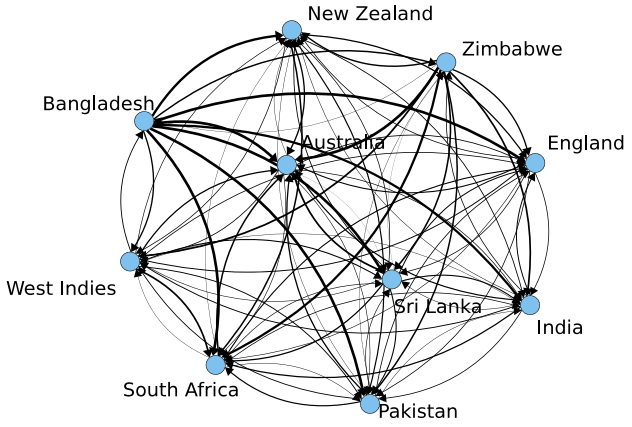

Fig. 2. The network of teams in the history of Test cricket (1877–2010).

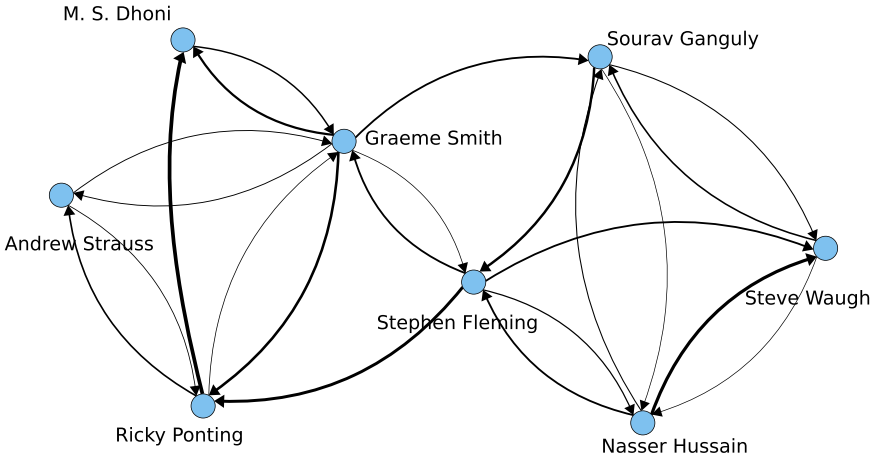

Fig. 3. Subgraph of the network of the most successful captains in the history of Test cricket (1877–2010).

node i in the diffusion process obeying the hypothesis that nodes redistribute their entire credit to neighboring nodes. The term $\frac{q}{N}$ stands for a uniform redistribution of credit among all nodes. The term $\frac{1-q}{N}\ \sum_j\ p_j\ \delta\left(s_j^{\text{out}}\right)$ serves as a correction in the case of the existence of nodes with null out-degree, which otherwise would behave as sinks in the diffusion process. In the context of cricket (or any other sport) the dangling nodes correspond to undefeated teams.

To implement Eq. (1) for the directed and weighted network, we start with a uniform probability density equal to $\frac{1}{N}$ at each node of the network. Next we iterate through Eq. (1) and obtain a steady-state set of PageRank scores for each node of the network. Finally, the PageRank score values are sorted to determine the rank of each node.

3. Results

Traditionally, the choice of q is set at 0.15 [19]. Moreover, as mentioned in Ref. [20], the value $q = 0.15$ ensures a relatively high score for the winner of any tournament. Hence, we set $q = 0.15$ and ran the ranking scheme on networks of cricket teams (see Fig. 2) and also on their captains (see Fig. 3). In Table 1, we report the results obtained from analysis of the network of cricket teams for Test cricket. We identify *Australia* as the most successful team in the history of Test cricket. Even though *South Africa* was banned from playing international cricket from 1970 to 1991, it emerges as the second best team, followed by *England, West Indies, Pakistan, India, Sri Lanka, New Zealand, Zimbabwe*, and *Bangladesh*. Table 2 shows the ranking of teams in the history of ODI cricket (1971–2010). Again, *Australia* emerges as the best ODI team ever, followed by *South Africa, West Indies, England, Pakistan, India, New Zealand, Sri Lanka, Zimbabwe*, and *Bangladesh*. The success of *Australia* could be justified by the dominance of *Australia* in International cricket for a long period of time. *Australia* won test series in all the countries and also won four ICC World cups, in 1987, 1999, 2003, and 2007.

We also report the results obtained from the analysis of the network of competing captains (see Table 3). *Steve Waugh* heads the top 20 list of the most successful captains in Test cricket. The success of *Steve Waugh* could be *a posteriori* justified by the fact that he led *Australia* in 15 of their world-record 16 successive Test victories. Overall, *Steve Waugh* won 72% of the Test matches he captained. It is interesting to note that 8 of the top 20 captains are from *Australia*. South Africa's *Graeme*

Table 1
Most successful teams in the history of Test cricket (1877–2010). The teams are ranked according to the PageRank score of each team.

PageRank score	Rank	Team
0.170	1	Australia
0.141	2	South Africa
0.134	3	England
0.118	4	West Indies
0.104	5	Pakistan
0.103	6	India
0.093	7	Sri Lanka
0.076	8	New Zealand
0.030	9	Zimbabwe
0.027	10	Bangladesh

Table 2
Most successful teams in the history of ODI cricket (1971–2010). The teams are ranked according to the PageRank score of each team.

PageRank score	Rank	Team
0.1145	1	Australia
0.1108	2	South Africa
0.1105	3	West Indies
0.0993	4	England
0.0964	5	Pakistan
0.0955	6	India
0.0911	7	New Zealand
0.0890	8	Sri Lanka
0.0411	9	Zimbabwe
0.0331	10	Bangladesh

Table 3
Top 20 captains in Test cricket (1877–2010). We also provide the nationality of the captain. The captains are ranked according to the PageRank score of each captain.

PageRank score	Rank	Captain	Country
0.02238	1	Steve Waugh	Australia
0.02105	2	Graeme Smith	South Africa
0.02002	3	Ricky Ponting	Australia
0.01995	4	Greg Chappell	Australia
0.01869	5	Richie Benaud	Australia
0.01587	6	Clive Lloyd	West Indies
0.01533	7	Ian Chappell	Australia
0.01474	8	Allan Border	Australia
0.01466	9	M. S. Dhoni	India
0.01394	10	Nasser Hussain	England
0.01352	11	Peter May	England
0.01303	12	Bill Woodfull	Australia
0.01224	13	Sir Vivian Richards	West Indies
0.01205	14	Sir Frank Worell	West Indies
0.01200	15	Sourav Ganguly	India
0.01153	16	Kim Hughes	Australia
0.01130	17	Ray Illingworth	England
0.01064	18	Geoff Howarth	New Zealand
0.01050	19	Andrew Strauss	England
0.01048	20	Stephen Fleming	New Zealand

Smith emerges as the second best captain, with *Ricky Ponting* occupying the third position. From the Indian subcontinent, only India's *M. S. Dhoni* and *Sourav Ganguly* find a place in the top 20 list. We also performed a similar analysis for ODI cricket (See Table 4). This time, *Ricky Ponting* emerges as the best captain in ODI history, followed by *Graeme Smith* (South Africa) in second place and *Imran Khan* (Pakistan) in third. *Ricky Ponting*'s success as a captain in the ODI format is marked by two successive World Cup wins, in 2003 and 2007, with a world record of 34 consecutive undefeated World Cup games. Under his captaincy, *Australia* also won the Champions trophy in 2006 and successfully defended the title in 2009. In contrast to the list in Test cricket, several of the successful captains in the ODI format are from the Indian subcontinent.

We also performed a different kind of analysis by constructing networks of teams and their captains in different eras. In Tables A.1 and A.2 we report the ranking of teams in different eras of Test cricket. We compare our ranking with

Table 4
Top 20 captains in ODI cricket (1971–2010). We also provide the nationality of the captain. The captains are ranked according to the PageRank score of each captain.

PageRank score	Rank	Captain	Country
0.02695	1	Ricky Ponting	Australia
0.02646	2	Graeme Smith	South Africa
0.02368	3	Imran Khan	Pakistan
0.01973	4	Hansie Cronje	South Africa
0.01798	5	Arjuna Ranatunga	Sri Lanka
0.01781	6	Stephen Fleming	New Zealand
0.01722	7	Clive Lloyd	West Indies
0.01700	8	M. S. Dhoni	India
0.01699	9	Sir Vivian Richards	West Indies
0.01664	10	Kapil Dev	India
0.01576	11	Allan Border	Australia
0.01532	12	Mahela Jayawardene	Sri Lanka
0.01519	13	Brian Lara	West Indies
0.01487	14	Daniel Vettori	New Zealand
0.01470	15	Paul Collingwood	England
0.01393	16	Sourav Ganguly	India
0.01366	17	Mohammad Azharuddin	India
0.01350	18	Rahul Dravid	India
0.01267	19	Javed Miandad	Pakistan
0.01241	20	Wasim Akram	Pakistan

Table A.1
Ranking of teams in different eras in Test history. We have shown the ranking from 1877 to 1980. There exist no ICC rankings during 1877–1950.

Era	PageRank	Reliance ICC ranking
1877–1950	Australia England West Indies South Africa New Zealand India	-NA-
1951–1960	Australia England Pakistan West Indies South Africa India New Zealand	Australia England West Indies South Africa Pakistan India New Zealand
1961–1970	England West Indies Australia New Zealand South Africa India Pakistan	West Indies Australia England South Africa India Pakistan New Zealand
1971–1980	Australia India West Indies England Pakistan New Zealand	Australia England Pakistan West Indies India New Zealand

that in the Reliance ICC Team Rankings.[2] The table of historical ranking of teams, available at ICC's website(http://icc-cricket.yahoo.net/match_zone/historical_ranking.php), begins in 1951 for Test cricket and in 1981 for ODI cricket. We rank the teams according to the average of the points scored by any team.

During the period 1877–1951, *Australia* emerges as the most successful team. Between 1952 and 1960, *Australia* is the most successful team according to the PageRank algorithm and also ICC's ranking scheme. During 1961–1970, *West Indies* is the best team according to the ICC ranking. Even though the early 1960s were poor periods for *England*, during the late 1960s *England* defeated stronger opponents such as *West Indies* and *Australia*. Hence, judging by the quality of wins, according to PageRank during 1961–1970 *England* is the most successful team. A similar effect is also observed during the 1971–1980 era,

[2] The Reliance ICC Team Rankings were launched for ODI cricket in 2002 and for Test cricket in 2003.

Table A.2
Ranking of teams in different eras in Test history. We have shown the ranking from 1981 to 2010.

Era	PageRank	Reliance ICC ranking
1981–1990	West Indies	West Indies
	Pakistan	Pakistan
	Australia	New Zealand
	New Zealand	Australia
	England	India
	India	England
	Sri Lanka	Sri Lanka
	Zimbabwe	Zimbabwe
1991–2000	Australia	Australia
	South Africa	South Africa
	India	West Indies
	West Indies	Pakistan
	Pakistan	India
	England	England
	New Zealand	Sri Lanka
	Sri Lanka	New Zealand
	Zimbabwe	Zimbabwe
	Bangladesh	Bangladesh
2001–2010	Australia	Australia
	India	South Africa
	South Africa	India
	England	England
	Sri Lanka	Sri Lanka
	Pakistan	Pakistan
	New Zealand	New Zealand
	West Indies	West Indies
	Zimbabwe	Zimbabwe
	Bangladesh	Bangladesh

where *India* occupies the second position according to PageRank. During the same period, *India* defeated stronger opponents such as *West Indies* and *England*.

Both ranking schemes show that *West Indies* was the best team between 1981 and 1990. Their best period was between February 1981 and December 1989: in 69 Tests in that span, they had a 40–7 win–loss record, with victories against *Australia, England, New Zealand*, and *India*. During the same span, *Pakistan* was victorious against quality opposition such as *Australia, England*, and *India*. We observe that both ranking schemes give *Australia* as the best team since then. The dominance of *Australia* in both decades is also reflected in the fact that, between October 1999 and November 2007, they played 93 Tests, and won 72 of them with a 72–10 win–loss record. The ranking of other teams according to PageRank does not correspond to the ICC ranking. During 1991–2000, *India* occupies the third position according to the PageRank score, instead of *West Indies*. Similarly, between 2001 and 2010, *India* occupies the second position according to PageRank, whereas according to the ICC ranking *South Africa* occupies the second spot.

We report a similar ranking of teams in ODI cricket in different eras in Table A.3. We observe that *West Indies* is the best team throughout the 1970s and 1980s. The PageRank score shows that *South Africa* is the best team in the 1990s and *Australia* is the best team from 2000 to 2010. According to the ICC ranking, *Australia* is the most successful team during the 1990s and also from 2000 to 2010. We observe strong correlation between the PageRank score and the Reliance ICC ranking and fraction of victories (in-strength rank). We compare the overall ranking of teams playing Test cricket (1952–2010) and ODI cricket (1981–2010). Fig. 4(a) shows that between 1952 and 2010 *South Africa* is the best team according to the PageRank score, whereas *Australia* is the best team according to the Reliance ICC ranking. We observe strong correlation between the ranking schemes for ODI cricket (1981–2010) (as shown in Fig. 4(b)). According to the PageRank score and in-strength rank, the top three positions in Test cricket (1877–2010) are occupied by *Australia, South Africa*, and *England*, respectively (see Fig. 4(c)). In ODI cricket (1971–2010), *Australia* emerges as the best team according to the PageRank score as well as the in-strength rank. In Fig. 5, we show the correlation between different ranking schemes as a function of time. We observe that the ICC rank and PageRank are anti-correlated in certain years for both Test cricket (during the 1960s and 1980s) and ODI cricket (1980 and 1998). This is due to the fact that the PageRank algorithm assigns a rank only to those teams that are competing against each other. On the other hand, ICC's historical ranking scheme assigns points to all the teams even if some teams did not participate in any tournament in that year, thus indicating a flaw in their ranking procedure.

We provide a ranking of captains in Test cricket (Table A.4) and ODI cricket (Table A.5) in different eras. Between 1877 and 1951, *Bill Woodfull* (Australia) is the most successful captain, with *Sir Don Bradman* occupying the second position. *Richie Benaud* (Australia) leads the list twice, during 1952–1960 and 1961–1970. During the period 1971–1980, *Ian Chappell* occupies the top position as captain, with *Clive Lloyd* occupying the second position. In the period 1981–1990, West Indies is the most successful team and *Sir Vivian Richards* is the most successful captain. *Mark Taylor* (Australia) is the best captain

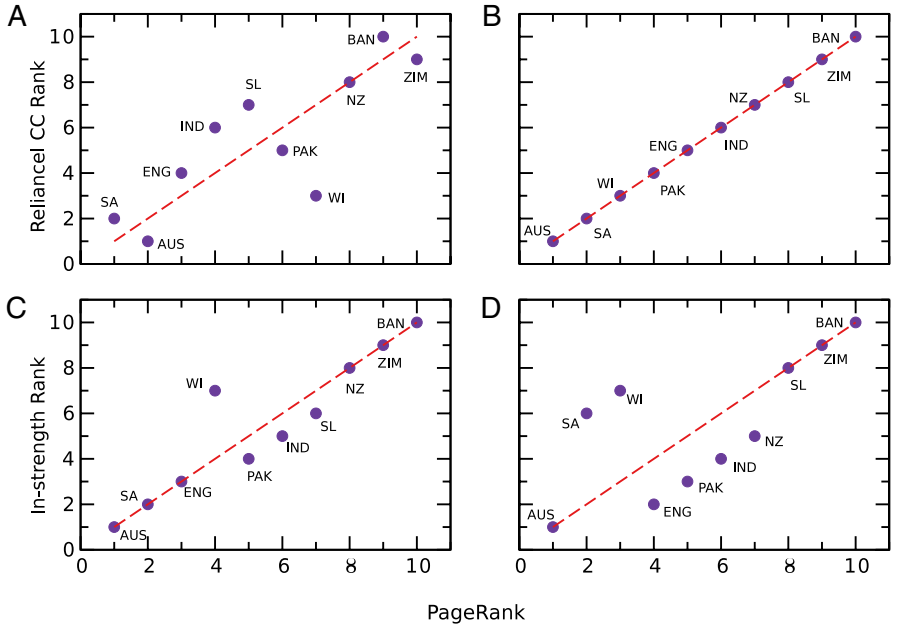

Fig. 4. Relation between different ranking schemes. (A) Scatter plot between the rank positions obtained according to the Reliance ICC ranking and those obtained with PageRank for Test cricket (1952–2010); Kendall $\tau = 0.644$, Spearman correlation $\rho = 0.818$. (B) Scatter plot between the rank positions obtained according to the Reliance ICC ranking and those obtained with PageRank for ODI cricket (1981–2010); $\tau = 1.0$, $\rho = 1.0$. (C) Scatter plot between the rank positions obtained according to the in-strength rank and those obtained with PageRank for Test cricket (1877–2010); $\tau = 0.867$, $\rho = 0.927$. (D) Scatter plot between the rank positions obtained according to the in-strength rank and those obtained with PageRank for ODI cricket (1971–2010); $\tau = 0.644$, $\rho = 0.709$.

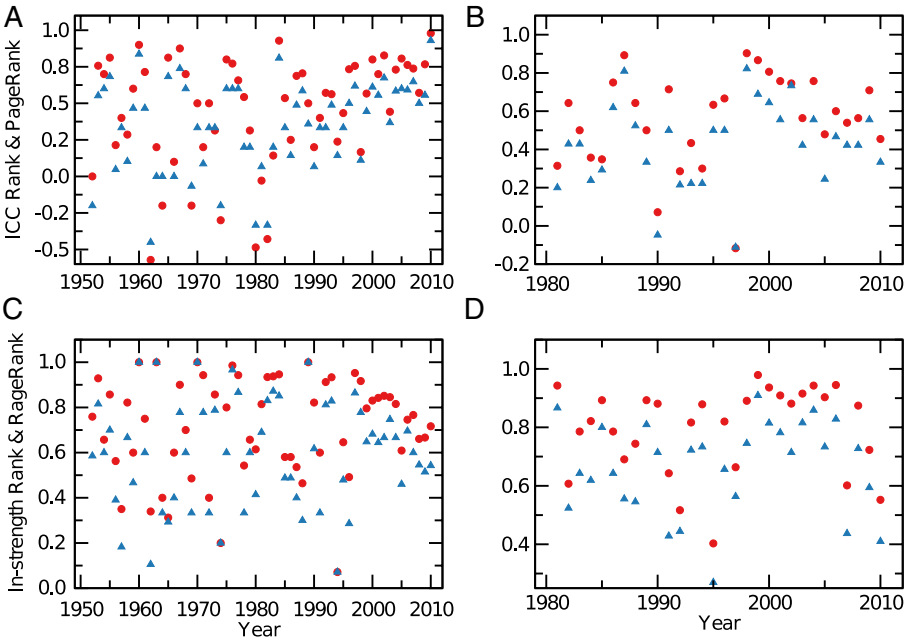

Fig. 5. Correlation between different ranking schemes. (A) Spearman correlation coefficient (red circle) and Kendall τ (blue triangle), between the ranking based on PageRank and that based on the Reliance ICC ranking, as a function of time, for Test matches (1952–2010). (B) The correlation coefficients are calculated between the ranking based on PageRank and that based on the Reliance ICC ranking for ODI matches (1981–2010). (C) The correlation coefficients are calculated between the ranking based on PageRank and that based on the in-strength rank for Test matches (1952–2010). (D) The correlation coefficients are calculated between the ranking based on PageRank and that based on the in-strength rank for ODI matches (1981–2010).

Table A.3
Ranking of teams in different eras in ODI history. We constructed a network of teams for each era. The teams are then ranked according to the PageRank score and compared with the Reliance ICC ranking of teams. During the period 1981–1990, Zimbabwe and Bangladesh received no points in the Reliance ICC ranking, and hence their ranks are not listed.

Era	PageRank	Reliance ICC ranking
1971–1980	West Indies Australia England New Zealand Pakistan India Sri Lanka	-NA-
1981–1990	West Indies Australia England Pakistan India New Zealand Sri Lanka Zimbabwe Bangladesh	West Indies Australia England Pakistan India New Zealand Sri Lanka – –
1991–2000	South Africa Australia Pakistan England Sri Lanka West Indies India New Zealand Zimbabwe Bangladesh	Australia South Africa Pakistan West Indies England India Sri Lanka New Zealand Zimbabwe Bangladesh
2001–2010	Australia South Africa India Sri Lanka Pakistan New Zealand England West Indies Bangladesh Zimbabwe	Australia South Africa Sri Lanka Pakistan India New Zealand England West Indies Zimbabwe Bangladesh

between 1991 and 2000 and *Graeme Smith* (South Africa) emerges as the best captain during 2001–2010. In ODI cricket, Australia's *Greg Chappell* emerges as the most successful captain between 1971 and 1980. *Clive Lloyd* occupies the second position during that period. Pakistan's *Imran Khan* leads the list during the 1981–1990 era. South Africa's *Hansie Cronje* is the most successful captain from 1991 to 2000. During the period 2000–2010, *Ricky Ponting* is the most successful captain, followed by South Africa's *Graeme Smith* and India's *M. S. Dhoni*. In Fig. 6, we show the correlation between the two ranking schemes for captains.

4. Conclusion

Our work demonstrates the strength of social network analysis methods in quantifying the success of cricket teams and their captains. Here, we have created a directed and weighted network of contacts (i.e., teams and captains). The correct assessment of a team's success (or captain's success) needs the consideration of the entire network of interaction. The PageRank algorithm takes into account the quality of matches won. For example, a win against a strong team is more important than a win against a weak team. Similarly, teams that lose against strong opponents will not be as adversely affected as teams that lose to mediocre opponents. Also, a captain is as good as the team. In this sense, a win against *Clive Lloyd*, *Steve Waugh*, or *Graeme Smith* is more relevant than a win against a lesser captain. Our analysis shows that the PageRank algorithm is effective in finding the most successful team and captain in the history of cricket.

It should be noted that the success of a team or a captain depends on various factors such as home advantage, and the success of batsmen and bowlers. For example, Australia's dominance in both forms of the game is a manifestation of the fact that they are able to adjust to all kinds of pitches around the world, whereas Indian subcontinent teams always played well under subcontinent conditions but were not able to repeat their performance abroad on a consistent basis. Again, *Steve Waugh* and *Ricky Ponting* had players such as *Shane Warne*, *Adam Gilchrist*, and *Glen McGrath* who were star performers for their country. Our analysis does not require these 'external' factors which are usually taken into account in the ICC rankings.

Table A.4
Ranking of captains in different eras in Test history. We have shown the ranking of the top five captains between 1877 and 2010 as well as their nationality. A network of competing captains was generated for each era. We ran the ranking procedure and ranked the captains according to their PageRank score.

Era	Top five captains	Country
1877–1950	Bill Woodfull	Australia
	Sir Donald Bradman	Australia
	John Goddard	West Indies
	Sir Gubby Allen	England
	Normal Yardley	England
1951–1960	Richie Benaud	Australia
	Gulabrai Ramchand	India
	Peter May	England
	Abdul Kardar	Pakistan
	Lindsay Hassett	Australia
1961–1970	Richie Benaud	Australia
	Sir Frank Worrell	West Indies
	Bob Simpson	Australia
	Ted Dexter	England
	Sir Garry Sobers	West Indies
1971–1980	Ian Chappell	Australia
	Clive Lloyd	West Indies
	Greg Chappell	Australia
	Ray Illingworth	England
	Mike Denness	England
1981–1990	Sir Vivian Richards	West Indies
	Allan Border	Australia
	Greg Chappell	Australia
	Clive Lloyd	West Indies
	Geoff Howarth	New Zealand
1991–2000	Mark Taylor	Australia
	Hansie Cronje	South Africa
	Allan Border	Australia
	Mike Atherton	England
	Steve Waugh	Australia
2001–2010	Graeme Smith	South Africa
	Ricky Ponting	Australia
	Steve Waugh	Australia
	M. S. Dhoni	India
	Sourav Ganguly	India

Table A.5
Ranking of captains in different eras in ODI history. A network of teams was generated for each era. We then ran the PageRank algorithm on each network, which gave the PageRank score. The teams were then ranked according to their PageRank score. We have shown the ranking of the top five captains between 1971 and 2010 as well as their nationality.

Era	Top five captains	Country
1971–1980	Greg Chappell	Australia
	Clive Lloyd	West Indies
	Geoff Howarth	New Zealand
	Mike Brearley	England
	Sunil Gavaskar	India
1981–1990	Imran Khan	Pakistan
	Sir Vivian Richards	West Indies
	Kapil Dev	India
	Allan Border	Australia
	Javded Miandad	Pakistan
1991–2000	Hansie Cronje	South Africa
	Arjuna Ranatunga	Sri Lanka
	Mohammad Azharuddin	India
	Wasim Akram	Pakistan
	Richie Richardson	West Indies
2001–2010	Ricky Ponting	Australia
	Graeme Smith	South Africa
	M. S. Dhoni	India
	Stephen Fleming	New Zealand
	Mahela Jayawardene	Sri Lanka

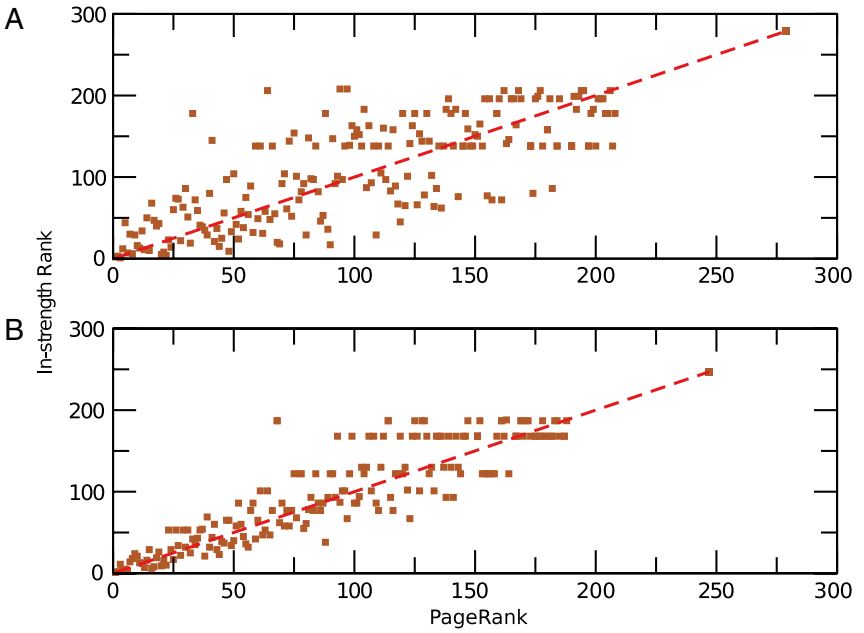

Fig. 6. Relation between PageRank and in-strength rank for captains. (A) Scatter plot between the rank positions obtained according to the in-strength rank and those obtained with PageRank for Test cricket (1952–2010); Kendall $\tau = 0.734$, Spearman correlation $\rho = 0.892$. (B) Scatter plot between the rank positions obtained according to the in-strength rank and those obtained with PageRank for ODI cricket (1981–2010); $\tau = 0.836$, $\rho = 0.948$.

However, we would like to mention that our method does not aim to replace the ICC ranking. It suggests a novel approach to refine the existing ranking scheme.

We would like to state that cricket is a team game. The success or failure of a team depends on the overall quality and collective performance of all team members. Simple statistics such as runs scored by batsmen, wickets taken by bowlers, or exceptional fielding do not provide a reliable measure of a player's contribution to the team's cause. Quantifying the impact of player's individual performance in sports has been a topic of interest in soccer [1] and baseball [4]. However, in cricket, the rules of the game are different, and therefore it would be interesting to apply tools of network analysis on the interaction between players. For example, a contact network of batsman versus bowler could give an estimate of the greatest batsman (bowler) ever. Potentially, a quantitative approach to a player's performance could be used to estimate the Man of the Match (Series) award after a tournament. The importance of star performers such as *Jeff Thomson*, *Sir Garfield Sobers*, *Ian Botham*, *Dennis Lilley*, or *Sachin Tendulkar* and its impact on the PageRank score is also a subject of future research. Additionally, in future we aim to include the effect of winning the toss and home ground advantage in the PageRank algorithm.

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Appendix

See Tables A.1–A.5.

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