A new Machine Learning based Deep Performance Index for Ranking IPL T20 Cricketers

C. Deep Prakash
Deptt. Of Electrical Engg.
Dayalbagh Educational Institute
Agra-282005, India

C. Patvardhan
Deptt. Of Electrical Engg.
Dayalbagh Educational Institute
Agrs-282005,India

Sushobhit Singh
Deptt. Of Electrical Engg.
Dayalbagh Educational Institute
Agra-282005,India

ABSTRACT
T20 cricket has brought about a revolution in cricket. The Indian Premier League (IPL) tournament organized every year by the Board of Cricket Control of India has become very popular with a huge fan following. It is based on franchises bidding for acquiring players to play for their side. Huge amounts of money are involved in the auction. Ranking of players in IPL according to their performance is an important step that would allow franchises and team managers to take better informed decisions in choosing their sides. In this paper, a machine learning based approach is used to create a new index, named as Deep Performance Index (DPI), that reflects the performance of the batsmen and bowlers on a deeper analysis of the requirements of T20 cricket. The Recursive Feature elimination algorithm based on machine learning is used for extracting meaningful features and their relative importance towards designing the DPI. It is shown that DPI is able to better capture performance related data for both batsmen and bowlers when compared to some other well-known ranking schemes for T20 cricket.

General Terms
Machine Learning, Cricket, Player Ranking, Algorithms

Keywords
IPL, Cricket, T20, Performance Index, Player Evaluation

1. INTRODUCTION
Cricket is a popular game these days. It is played in more than 50 countries at various levels. T20 is a 20 overs a side match which is usually over in 4 hours.

The game of cricket got a new dimension when the Indian Premier League (IPL), a T20 tournament was started in 2008 by Board of Control of Cricket in India (BCCI) [1]. Eight franchises were created and assigned to eight of the largest cities in India. The teams were franchisee driven. The players were selected through competitive bidding from a pool of available players. The BCCI has been organizing the IPL T20 cricket tournament every year. There have been 8 IPL tournaments till date and the 9th edition in scheduled to be held beginning in April, 2016.

Cricket is a sport in which statistics feature heavily and these statistics give clear picture of each and every facet of cricket. Followers of the game, especially in India, are keen followers of its statistics also. Some studies related to cricket reported in the literature are as follows. Optimal batting strategies using dynamic programming model were developed by Clarke [2]. Alternative batting averages when the batsman remains not-out in one-day cricket was proposed by Kimber and Hansford [3] and Damodaran [4]. Barr and Kantor [5] proposed a method based on batting averages and strike rates. Borooah and Mangan [6] explored batting performance for test matches. Norman and Clark [7] and Ovens and Bukeit [8] applied mathematical modeling approach to optimize the batting order of a team. Lewis [9] analyzed player performance using Duckworth/Lewis percentage values. Van Staden [10] used a graphical method to analyze batting and bowling performance in cricket. Lakkaraju and Sethi [11] described a Sabermetrics style principle to analyze batting performance in cricket. Lemmer [12-14] considered performance analysis using averages and strike rates for bowling and batting. Saikia et al. [15] evaluated the performance of all-rounders in IPL. Several efforts have been reported in the literature related to players performance in IPL and their valuation in auction [16 – 18] recently.

In this paper, a machine learning based approach is used to create a new index, named as Deep Performance Index (DPI), that reflects the performance of the batsmen and bowlers in T20 cricket based on a deeper analysis of the requirements of T20 cricket. The Recursive Feature elimination algorithm in machine learning is used for extracting the meaningful features and their relative importance towards designing the DPI. It is shown that the DPI is better able to capture the performance related data for both batsmen and bowlers when compared to some other well-known ranking schemes for T20 cricket.

In this work, IPL performance data upto IPL 7 and the overall T20 career data upto the end of IPL 8 has been collected for all the players participating in IPL [8]. Only those batsmen who have scored more than 500 runs in T20 internationals with Strike Rate more than 100 and played in at least 25 matches are considered for ranking based on batting. A total of 89 batsmen satisfy these criteria and are included in this effort. Similarly, only those bowlers who played in IPL 8 and have bowled more than 30 overs in their T20 international careers are considered for ranking as bowlers. Thus, a total of 120 bowlers are considered.

The rest of the paper is organized as follows. Some prevailing metrics for evaluating players' performance in cricket are reviewed in section 2 along with their limitations and strengths. The special features of T20 cricket and the metrics considered in this work specifically for T20 are presented in section 3. The Random Forests approach and the new metrics evolved using this machine learning approach are presented in section 4. Some results and discussion are presented in section 5. The conclusions of the work and some pointers to future work are presented in section 6.

2. POPULAR INDICES FOR T20 PLAYERS EVALUATION
The popularity of T20 has motivated several efforts to identify meaningful indices for evaluating performance of batsmen and bowlers. In this section the main reported attempts are described. The notation used to describe the indices is as given in Table 1.

Table 1: Notation for describing metrics for performance evaluation of T20 players

#	Acronym	Expansion	Formula
1	PRS	Runs Scored by Player	
	TRS	Runs scored in Tournament	
2	PBA	Player Batting Average	PRS / Number of times out
3	TBA	Tournament Batting Average	TRS / Total wickets fallen
4	PBSR	Player Batting Strike Rate	PRS / Balls Faced by Player
5	TBSR	Tournament Batting Strike Rate	TRS / Balls Faced in Tournament
6	PWT	Player Wickets Taken	
7	TWT	Tournament Wickets Taken	
8	PBB	Number of Balls Bowled	
9	TBB	Tournament Balls Bowled	
10	PRC	Player Runs Conceded	
11	TRC	Tournament Runs conceded	
12	PBWA	Player Bowling Average	PBB/PWT
13	TBWA	Tournament Bowling Average	TBB/TWT
14	PBWER	Player Bowling Economy Rate	(PRC*6)/PBB
15	TBWER	Tournament Bowling Economy Rate	(TRC*6)/TBB
16	PBWSR	Player Bowling Strike Rate	PRC/PWT
17	TBWSR	Tournament Bowler Strike Rate	TRC/TWT
18	Fours	Number of fours scored	
19	Sixes	Number of sixes scored	
20	HF	Sum total of number of centuries and half centuries scored	

In this work, both overall T20 career data of the players (http://www.espncricinfo.com) [16] as well as their IPL career data (www.iplT20.com) [17] are taken into consideration. The often quoted index in the case of IPL is the Most Valuable Player Index (MVPI) popularized by Rediff Cricket [16]. MVPI for batsmen and bowlers is defined as follows.

Batting = [(PBA/TBA)*PRS + (PBSR / TBSR)] * PRS

Bowling = [(TBWA/PBWA) + (TBWER/PBWER)*^{2}] * PWT

The MVPI for a player is the sum of his batting points and bowling points. Fielding points are not considered in the present work. Amit Kumar and Sindhu [19] use a variety of detailed metrics to analyze batting performance in IPL. The metrics are designed to reflect individual match situations and the impact of the player's performance on the match outcome. However, detailed data that is necessary to calculate the values is not available easily. Dey and Ghosh [20] employ an MCDM approach for evaluating Bowlers performance in IPL. They propose the following composite index for comparing Bowlers performance

MCDM = 0.0522 * Matches + 0.0651 * (PBB/6) + 0.149 * PWT + 0.2575 * PBWA + 0.2107 * PBWSR + 0.2655 * PBWER.

Almost 25% weightage is given to indices (matches, overs and wickets) that are a function of how long the player has been in international cricket. Rastogi and Deodhar [21] utilize an extended list of parameters in evaluating Player pricing and attributes in the Twenty20 scenario. Manage and Scariano [22] utilize Principal Components Analysis to determine composite indices for evaluating the performance of batsmen and bowlers in IPL 2012. The indices are as follows:

PCA (batsmen) = 0.458 * PRS + 0.398 * PBA + 0.325 * PBSR + 0.406 * Fours + 0.417 * Sixes + 0.432 * HF

Higher values indicate better performance. PCA Index for batsmen assigns almost equal weightages to total number of runs scored through the career, average, strike rate, fours, sixes and centuries or half centuries. The range of weights is quite small and so relative impact of the indices is not very prominent. However, the absolute values of the metrics are widely different i.e. a player could have scored many boundaries whereas the number of centuries and half centuries would be relatively very small.

PCA (bowlers) = -0.428 * PWT + 0.591 * PBWA + 0.383 * PBWER + 0.566 * PBWSR

In case of bowlers, smaller values indicate better performance in the PCA as shown. However, in this paper the –ve of this index is taken for easier comparison and so larger values indicate better performance. PCA Index for bowlers assigns almost equal weightages to number of wickets taken through the career and the average, economy and strike rate indices. In the PCA indices the absolute values of some parameters i.e. wickets and strike rate would be much larger than the others e.g. economy. Michael Hussey [23] defined a very simple index to rate a batsman's performance in Twenty20.

Hussey's Batting Score or Hussey Index = PBSR+ PBA

Any value above 160 is considered by Hussey as good.

The above metrics provide an overall picture of the performance but are typically biased towards players who have played more. MVPI is calculated considering the complete career data of T20 using the formula given by Rediff Cricket for the batsmen shortlisted according to the above criteria. The list of top ten Batsman according to MVPI Ranking is shown in Table 2. Chris Gayle, as per popular belief, is way ahead of the others in this ranking.

Table 2: Top 10 Batsmen according to MVPI ranking

Player	MVPI
Chris Gayle	24974.16
Kieron Pollard	15218.57
Brendon Mccullum	15036.85
David Warner	14594.05
Suresh Raina	13819.02
Rohit Sharma	12064.45
Ryan ten Doeschate	11989.73
Virat Kohli	11427.18
JP Duminy	11320.57
MS Dhoni	11151.54

MVPI ranking is computed for all the bowlers shortlisted as above. The top ten Bowlers according to MVPI Ranking are as shown in Table 3.

Table 3: Top 10 Bowlers according to MVPI ranking

Player	MVPI
Dwayne Bravo	9325.68
Lasith Malinga	8909.277
Azhar Mahmood	7469.081
Kieron Pollard	7137.99
Albie Morkel	6137.999
Shakib Al Hasan	4997.408
Sunil Naraine	4980.51
Amit Mishra	4972.211
James Faulkner	4486.795
Morne Morkel	4400.002

The main limitation with MVPI is that, in MVPI, the runs scored by a batsman and the wickets taken by a bowler dominate its value. There are other parameters also which have to be taken care of otherwise only the top order batsman will come out top in the list because the number of balls they get to play is usually much more than the finishers and so they get to score more runs. Those who accomplish great finishes will never get a chance to top the MVPI list. Similar is the case with bowlers who have bowled economically throughout the tournament but did not get many wickets they will never get a chance to top the MVPI list. However, these could be the bowlers who made the batsman to go after the other bowlers and made them loose their wickets and so their efforts cannot be undermined. These points highlight the need for developing other metrics that are more relevant to T20 cricket in particular.

3. METRICS PROPOSED AND UTILIZED IN THIS WORK

T20 cricket has altered the game of cricket completely. Most of the points of difference do stem from the fact that the T20 version is a shortened version of the game of cricket. But a deeper analysis and understanding is necessary to really appreciate the level of impact that this change brings into the game. Some of the important points in this respect are as follows.

(i) Since the number of balls available is less it is important to make each ball count.

(ii) One loose ball in an otherwise perfect over is enough to take the pressure off the batsmen. Margin of error is, therefore, very small for bowlers.

(iii) One good wicket-taking ball or even a couple of dot balls at a crucial stage can trigger a panic causing batsman to take suicidal risk.

(iv) Bowling in the so called "death overs" is a bowler's nightmare. The margin of error becomes even smaller.

(v) Risk takers with talent for doing so in both batting and bowling are more necessary in T20.

Therefore, new metrics need to be developed. These additional considerations need to be incorporated fully in the newer metrics designed to find out which batsmen and which bowlers are the real performers in T20. Selected indices are extracted from the raw data available to calculate the ranking of the players. Care is taken to ensure that the indices designed also give a fair chance to upcoming players. Some new indices and a new comprehensive index based on the indices for calculating the ranks of the players are proposed in this work.

In order to evaluate the batting capability in T20, five indices are considered as follows.

1) **HardHitter = (4*Fours + 6*Sixes) / Balls faced by player**

Hard Hitter Score is useful in T20 because players who can score more boundaries in their innings so that they give big boost to the scoreboard as well as create psychological pressure on the bowler are desirable.

2) Finisher = Number of times Not Out/ Total number of played Innings

Finisher Score is useful because we want the batsman to remain not out and guide the innings till the end. In any T20 match the last 2-3 overs are really crucial.

3) FastScorer (PBSR)

A T20 batsman has to be a Fast Scorer.

4) Consistent (PBA)

A consistent scorer is one with a good average.

5) RunningBetweenWickets (RBW) = (PRS - (4*Fours + 6*Sixes))/ Number of balls faced without boundary

Running Between Wickets Score is important because the batsmen have to ensure that the score board keeps ticking even when the boundaries are hard to get. Rotating strike makes it difficult for a bowler to settle into a good rhythm.

The above five measures are typical T20 measures and provide a more detailed analysis of the performance of the batsmen. Similarly, in order to define Bowling Capability five indices are considered as follows.

1) **Economy(PBWER)**= PRC/ (PBB/6)

Economy Score is important because every team wants its bowlers to concede minimum runs. From one end when a bowler bowls economically he can create opportunities for taking wickets for the other bowler.

2) WicketTaker (PBWA)= PBB / PWT

Wicket Taker Score is useful because the bowlers who take important wickets or take wickets at crucial junctures in the match win the match for their team. In T20, after every wicket there is a huge impact on the game especially in the first five and the last five overs.

3) Consistent (PBWSR)= PRC / PWT

Consistent Score is useful because every team wants their bowlers to perform in every match.

4) BigWicketTaker = Number of times four wickets or five wickets taken / Number of innings played

Big Wicket Taking Score is useful because this attribute shows how much impact that bowler can have in a match or in other words, how many matches he can win for his team on the strength of his bowling alone almost single handedly.

5) **ShortPerformance** = (Number of wickets taken – 4* Number of times four wickets – 5* Number of times five wickets taken) / (Number of innings played - Number of times four wickets or five wickets taken)

Short Performance Score is important because sometimes a good spell can change the result of the match.

These indices are calculated considering the first seven (2008-2014) seasons of IPL data and Overall T20 Career data of the players upto IPL 8 considering the same 89 batsmen and 120 bowlers as above (in case of MVPI calculations). Some players who have played international games in T20 but not played in IPL have 0s against their names in IPL metrics. Table 4 shows the sample values of ten indices for the batsmen in alphabetical order and their MVPIs. Table 5 shows sample values of the ten indices for some bowlers in alphabetical order and their MVPIs.

An aggregate function of the 10 indices is required to calculate the actual Ranking of a batsman or a bowler. Since the ranges of absolute values of the indices are widely different, these are first normalized to lie within a range on 0 to 1. This is done as follows.

- For each index, the list is sorted in descending order of preference i.e. best performer first i.e. the best performer has rank 1 with others following.
- Points for that particular index is calculated by

Points= (No of Players – Rank according to that particular feature)/ No of players

4. MACHINE LEARNING APPROACH FOR SELECTING IMPORTANT FEATURES AND DETERMINING THEIR RELATIVE IMPORTANCE

Ten indices were computed for each batsman and each bowler in the previous section. In the machine learning terminology these can be regarded as features for evaluating their T20 performance. However, when raw data is processed to get some predetermined features it is often the case that there is some strong correlation between some of features and keeping all of them is essentially redundant. One of them could actually suffice in such a case. It might also be the case that some of the so called features do not contribute significantly to the target performance index and actually act as noise. Therefore, it is important to weed out both these categories of features and only retain the significant ones. This is the task of features selection. The next task is to get a single feature for ranking the relative performance of the batsmen and another feature for ranking the bowlers. Some methodology might be used to determine the weightages for aggregation according to their relative importance. In order to find the 5 important indices the "Caret" package in R is used which provides features selection method based on the target variable and the assumed independent variables. In this work, the 10 indices computed in section 3 form the independent variables or X vector and the MVPI forms the target variable for variable selection.

The two tasks are accomplished in this work as follows.

Step 1: 5 indices that are more relevant to the target measure are selected as features out of the 10 indices computed for evaluating performance of batsmen and bowlers.

Step 2: The relative weightages of these features are also computed to obtain a weighted function that represents a comprehensive indices for evaluating T20 performance of batsmen and bowlers.

The algorithm utilized for this purpose is the Recursive Feature Elimination (RFE). First, the algorithm fits the model to all predictors which are the indices in the current work. Let S be a sequence of ordered numbers which are candidate values for the number of predictors to retain (S1 > S2, ...). At each iteration of feature selection, the S_i top ranked predictors are retained, the model is refit and performance is assessed. The value of S_i with the best performance is determined and the top S_i predictors are used to fit the final model.

The predictor rankings are recomputed on the model on the reduced feature set. 10-fold cross-estimation is performed and a ranking procedure is employed to complete the selection process. The 5 indices selected for Batting and Bowling are shown in Table 6 along with their relative importance as determined by this approach.

5. PROPOSED PERFORMANCE RANKING SCHEME

The performance of batsmen and bowlers is ranked according to weighted average of the 5 indices according to the weights selected in section 4. The weighted average is used for determining the rank. This index is named Deep Performance Index (DPI) in this paper highlighting the fact that the index is based on a deeper analysis of the requirements of T20 cricket (and of course, the name of the author). A new performance ranking for Batsmen and Bowlers is thus obtained. The top 10 batsmen according to this DPI ranking are shown in Table 7 along with the top 10 batsmen according to some other notable schemes including the most commonly employed MVPI. Table 8 shows the values of the 5 individual performance indices and the corresponding DP index calculated from them in this paper along with the values of the other performance indices i.e. MVPI, Hussey Index and PCA index for each of the batsmen appearing in Table 7. Some observations from tables 7 and 8 are as follows:

(i) Chris Gayle is ranked number 1 according to all the four schemes confirming his towering stature as a top T20 batsman.

(ii) David Miller and Shaun Marsh are players to watch for in future. This is reflected in their consistent performances and, therefore, in DPI. However, the other indices do not capture the impact of their consistency adequately.

(iii) PCA Ranking ranks David Warner higher than both MS Dhoni as well as Suresh Raina although the latter two are more consistent in their performance and also have higher strike rates. Thus, they are rated higher by DPI. Similar is the case of K Pollard as a batsman. K Pollard, of course, has utility as an allrounder too.

(iv) Glenn Maxwell, Andre Russel and Ben Cutting make it to the top 10 according to Hussey index primarily because of their high strike rate. However, they do not figure in any of the other lists because they are not consistent. Conversely, Duminy is extremely consistent whether overall T20 career record is considered or only IPL record is considered. However, he loses out on fast scoring desired in T20. Thus DPI is able identify the batsmen who are performers according to all the indices.

(v) 4 of the top 10 batsmen in DPI ranking do not appear in any of the other top 10 lists. These are Shaun Marsh, Kevin Peterson, AB de Villiers and Shane Watson. Although the other indices fail in identifying these doyens, DPI is able to do it.

The top 10 bowlers according to this DPI ranking are shown in Table 9 along with the top 10 bowlers according to some other notable schemes including the most commonly employed MVPI. The corresponding values are shown in Table 10. Some important observations from these tables are as follows.

(i) Lasith Malinga continues to be at the top according to DPI as he is according to the other indices.

(ii) Shakib Hassan also ranks high because of his wicket taking capabilities that are important in T20 also.

(iii) However, Dwayne Bravo does not appear in top 10 according to DPI because his performance is not good according to metrics identified in this work.

(iv) Similarly, K Pollard appears in all the other lists but in terms of the metrics identified in this work he does not appear to be a good performer. He neither ranks highly in wicket taking nor in consistency as a bowler. Albie Morkel's case is also similar.

(v) DPI throws up some new bowlers such as S Arvind, Sandeep Sharma, Mohit Sharma and Parvinder Awana who are not identified in any of the other metric. However, they are ranked quite high in terms of the metrics identified in this work and are the players to watch for.

6. CONCLUSIONS AND FUTURE WORK

The proposed DPI Ranking scheme clearly shows some of the emerging talents in the top ten which would never be the case with MVP index. They would not get a chance to be counted when compared to the long time cricketing legends. However, in DPI scheme the names of rising stars clearly show that they are the future of cricketing world. Such an analysis clearly is of benefit to the franchises who can determine the players with higher return of investment potential.

Details can be enhanced with categorization of players according to their perceived roles in the playing XI. This is being pursued. The analysis can further be extended to develop an optimization procedure for selection of playing XI.

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8. APPENDIX

Table 4: Sample values of indices for some batsmen in alphabetical order

Player	T20_ Consistent	T20_FastScorer	T20_ Finisher	T20_ Hard Hitter	T20_ RBW	IPL_ Fast Scorer	IPL_ Consis Tent	IPL_ Finisher	IPL_ Hard Hitter	IPL_ RBW	MVP Index
AB de Villiers	31.15	139.65	0.198	0.792	0.729	138.892	34.864	0.253	0.754	0.756	10116
Abhishek Nayar	19.59	120.22	0.217	0.663	0.628	116.464	17.684	0.24	0.589	0.661	1717
A Tare	23.97	125.52	0.148	0.777	0.579	137.156	17.588	0.190	0.944	0.540	1793
Ajinkya Rahane	29.8	117.69	0.103	0.616	0.653	116.549	30.648	0.129	0.623	0.633	6127
Albie Morkel	25.64	138.49	0.360	0.833	0.663	142.483	22.947	0.406	0.839	0.703	7793
Ambati Rayudu	24.35	123.22	0.148	0.652	0.677	125.183	26.718	0.157	0.655	0.698	5179
Angelo Mathews	25.04	122.08	0.276	0.566	0.745	123.423	24.909	0.266	0.567	0.755	3770
Azhar Mahmood	25.35	135.16	0.212	0.779	0.691	129.054	21.222	0.1	0.777	0.620	8362
B Mcculum	32.53	137.25	0.101	0.904	0.58	122.778	28.344	0.064	0.775	0.544	15037
Chris Gayle	44.21	149.25	0.146	1.102	0.501	154.566	47.508	0.149	1.166	0.496	24974

Table 5: Sample values of indices for some bowlers in alphabetical order

Player	T20_ Economy	T20_ Wicket Taker	T20_ Consisten	T20_Big Wicket Taker	T20_ ShortPerformance	IPL_ Economy	IPL_ Wicket Taker	IPL_ Consistent	IPL_ Big Wicket Taker	IPL_ Short Performance	MVP Index
A Mithun	8.5	21	29.88	0.025	0.769	9.833	41.142	67.428	0	0.437	1038
A Nayar	8.64	25.5	36.81	0	0.5	8.451	25.4	35.777	0	0.473	399
Abu Nechim	7.83	22.7	29.69	0.021	0.820	7.543	23.2	29.166	0	0.857	1068
Albie Morkel	7.7	20.5	26.39	0.011	0.843	8.097	20.227	27.3	0.012	0.95	6138
Amit Mishra	7	18.2	21.32	0.026	1.082	7.207	18.476	22.196	0.034	1.072	4972
A Russell	8.3	23.1	32.07	0.027	0.652	10.035	84	140.5	0	0.222	2854
A Mathews	7.36	24.3	29.9	0.009	0.686	8.051	28.95	38.85	0.031	0.516	1667
Ankit Sharma	7.27	23.8	28.89	0	0.783	6.598	25.575	28.125	0	0.667	658
Ashish Nehra	7.7	17.5	22.6	0.021	1.182	7.913	18.671	24.626	0	1.155	3813
Ashish Reddy	7.77	15.4	20	0.021	1.066	9.016	14.0769	21.153	0	1	1913

Table 6: Relative importance of the top 5 performance indices for Batting and bowling

Batting Features	Relative Importance as determined by RFE	Relative weightage	Bowling Features	Relative Importance as determined by RFE	Relative Weightage
T20_Consistent	33.2824	0.471	IPL_ShortPerformance	18.457	0.3486
IPL_Consistent	13.7837	0.195	T20_BigWicketTaker	15.441	0.2916
IPL_FastScorer	8.3443	0.118	T20_Consistent	7.718	0.1457
IPL_HardHitter	7.7019	0.109	IPL_WicketTaker	6.064	0.1145
T20_FastScorer	7.5683	0.107	T20_ShortPerformance	5.261	0.993

Table 7: Comparison of results obtained from various Batting Ranking Schemes

Rank	**DPI**	**MVPI [21]**	**HusseyIndex [29]**	**PCA [25]**
1	Chris Gayle	Chris Gayle	Chris Gayle	Chris Gayle
2	David Miller	K. Pollard	Andre Russel	B. Mccullum
3	Shaun Marsh	B. Mccullum	Kieron Pollard	D. Warner
4	MS Dhoni	D. Warner	Glen Maxwell	K. Pollard
5	Suresh Raina	Suresh Raina	Ben Cutting	Suresh Raina

6	K. Peterson	Rohit Sharma	David Miller	D. Smith
7	D. Warner	R. Doeschate	David Warner	R. Sharma
8	S. Watson	Virat Kohli	V. Sehwag	R. Doeschate
9	K. Pollard	JP Duminy	David Wiese	Virat Kohli
10	AB De Villiers	MS Dhoni	Yusuf Pathan	G. Gambhir

Table 8: Values of Deep Performance Index and various popular indices for top T20 batsmen

Player	DPI Rank	T20_ Consistent	IPL_ Consistent	IPL_ Fast Scorer	IPL_ Hard Hitter	T20_ Fast Scorer	DP Index	Hussey Index	PCA Index
Chris Gayle	1	1	0.988	0.977	0.988	0.932	0.986	193.459	4352.75
David Miller	2	0.977	1	0.955	0.887	0.808	0.951	176.510	2083.17
Shaun Marsh	3	0.988	0.977	0.752	0.764	0.584	0.890	170.97	2260.35
MS Dhoni	4	0.943	0.966	0.876	0.707	0.719	0.890	172.09	2295.99
Suresh Raina	5	0.898	0.910	0.865	0.797	0.842	0.879	174.269	2897.96
K. Peterson	6	0.910	0.921	0.797	0.775	0.707	0.862	169.430	2024.41
David Warner	7	0.887	0.842	0.775	0.853	0.876	0.860	175.76	3082.49
Shane Watson	8	0.820	0.898	0.887	0.932	0.865	0.860	171.85	2183.26
K. Pollard	9	0.831	0.662	0.910	0.898	0.955	0.828	184.47	3041.26
AB de Villiers	10	0.808	0.887	0.831	0.696	0.831	0.816	170.799	2233.11
Rohit Sharma	12	0.876	0.853	0.674	0.685	0.617	0.799	164.61	2724.59
Virat Kohli	13	0.921	0.808	0.539	0.595	0.561	0.780	164.34	2530.04
JP Duminy	14	0.966	0.943	0.505	0.325	0.314	0.767	159.85	2479.46
V. Sehwag	15	0.640	0.707	0.988	0.977	0.921	0.761	175.46	2177.43
B. Mcculum	16	0.853	0.685	0.483	0.719	0.775	0.753	169.78	3323.30
Yusuf Pathan	17	0.651	0.651	0.932	0.943	0.910	0.744	174.87	1913.61
R Doeschate	19	0.775	0.505	0.853	0.831	0.797	0.740	167.78	2695.60
Dwane Smith	23	0.550	0.876	0.764	0.910	0.505	0.674	153.6	2891.19
G. Gambhir	24	0.719	0.775	0.595	0.584	0.280	0.653	150.29	2500.67
G Maxwell	31	0.224	0.820	1	1	0.988	0.598	176.98	1369.42
Andre Russell	70	0.359	0.112	0.112	0.112	1	0.323	191.29	1199.94
Ben Cutting	72	0.314	0.101	0.101	0.101	0.962	0.294	176.67	322.104
David Wiese	82	0.146	0.044	0.044	0.044	0.977	0.192	175.44	512.644

Table 9: Comparison of results obtained from Various Bowling Ranking Schemes

Rank	**DPI**	**MVPI [21]**	**PCA [25]**	**MCDM [24]**
1	Lasith Malinga	Dwayne Bravo	Lasith Malinga	Lasith Malinga
2	Shakib Hasan	Lasith Malinga	Dwayne Bravo	Dwayne Bravo
3	S. Arvind	Azhar Mahmood	Azhar Mahmood	Azhar Mahmood
4	S. Narine	K. Pollard	S Narine	A Morkel
5	Sandeep Sharma	Albie Morkel	Albie Morkel	K Pollard
6	Mohit Sharma	Shakib Hasan	Kieron Pollard	Sunil Narine

7	Imran Tahir	Sunil Narine	Shakib Hasan	H Singh
8	P. Awana	Amit Mishra	Amit Mishra	Dale Steyn
9	James Faulkner	James Faulkner	Dale Steyn	Shakib Hasan
10	A. Mishra	Morne Morkel	R Ashwin	R Ashwin

Table 10: Values of Deep Performance Index and various popular indices for top T20 bowlers

Player	DPI Rank	IPL_ Short Performance	T20_ Big Wicket Taker	IPL_ Wicket Taker	T20_ Consistent	T20_ Short Performance	DP Index	MCDM Index	PCA Index
Lasith Malinga	1	0.933	0.925	0.95	0.95	0.95	0.936	95.96	103.72
Shakib Hasan	2	0.992	0.85	0.966	0.908	0.816	0.917	58.94	54.30
S Arvind	3	0.958	0.958	0.983	0.783	0.716	0.911	7.584	1.65
Sunil Narine	4	0.825	0.966	0.933	0.966	0.841	0.900	70.11	68.952
Sandeep Sharma	5	1	0.658	1	0.825	0.916	0.866	7.839	2.05
Mohit Sharma	6	0.95	0.8	0.958	0.65	0.758	0.844	14.59	5.09
Imran Tahir	7	0.983	0.583	0.991	0.866	0.891	0.841	38.19	29.60
P Awana	8	0.883	0.841	0.858	0.633	0.858	0.829	12.39	2.14
J Faulkner	9	0.9	0.708	0.941	0.775	0.875	0.827	38.94	33.19
Amit Mishra	10	0.875	0.717	0.875	0.841	0.808	0.817	55.49	49.31
Dwayne Bravo	15	0.85	0.767	0.908	0.641	0.7	0.786	92.47	91.09
A Mahmood	17	0.967	0.483	0.9	0.608	0.8	0.749	85.66	79.45
M Morkel	18	0.817	0.758	0.691	0.575	0.741	0.742	51.82	40.54
Dale Steyn	24	0.867	0.467	0.708	0.708	0.75	0.696	59.95	47.24
H Singh	33	0.692	0.667	0.658	0.491	0.466	0.628	62.56	42.87
R Ashwin	36	0.767	0.458	0.633	0.6	0.641	0.624	57.61	42.89
K Pollard	46	0.55	0.55	0.8	0.7	0.416	0.587	72.89	64.48
A Morkel	48	0.75	0.433	0.816	0.366	0.366	0.571	81.86	64.86