



## **FANTASY SPORTS: A GAME OF SKILL OR CHANCE**

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“Luck is what happens when preparation meets opportunity.”  
- Lucius Annaeus Seneca

On May 12, 2019, Ramasubramanian Sundararajan, Head of Artificial Intelligence (AI) at Cartesian Consulting was watching the Indian Premier League (IPL) final match between Mumbai Indians (MI) and Chennai Super Kings (CSK). The match was filled with several twists and turns; finally, it was won by Mumbai Indians by just 1 run in the last ball of the match. Ramasubramanian Sundararajan (nicknamed Ramsu by his colleagues) joined Cartesian as the head of AI in 2017. Cartesian Consulting had been providing analytical solutions for various clients in diverse domains including sports. Ramsu was wondering how the teams selected the playing 11 from a group of around 25 players available to them for an important game such as IPL final. It may be an easy task for experts such as coaches of the team, but there are several fantasy sports companies which provide opportunity for anyone from the public to pick the best team for a sporting event. Fantasy sports was becoming popular among millions of people across the world. Fantasy sports was a fast growing online game and was expected to reach USD 14.40 billion revenue by 2020<sup>1</sup>.

The main concern for lawmakers across the world was whether fantasy sports was a game of skill or game of chance. Edelman in 2016 claimed that fantasy sports was a nerds' game<sup>2</sup>. Similarly, Jennifer Chu<sup>3</sup> claimed that fantasy sports involves real skill. Authors such as Edelman and Jennifer Chu believed that the players of fantasy sports would need a better understanding of the sports, how the players perform under different playing conditions, injury to players, and impact of weather and other playing conditions. For example, until June 2019, Rafael Nadal won 12 of his 18 grand slam titles in the French Open, whereas Roger Federer won just one French Open out of his 20 grand slam titles. This is an example to show that fantasy sports enthusiasts should be aware of the strengths and weaknesses of players before selecting them. Ramsu wanted to see if data could be used to check whether fantasy sports was a game of chance or skill, especially whether skill is a dominant factor in winning fantasy sports competition as claimed by Edelman.

## **ABOUT THE FANTASY SPORTS INDUSTRY**

Fantasy sports was a competition among fans that involved building an imaginary team comprising real players. Based on the actual performance of the players in a match, the fans were awarded points and they could win a prize<sup>4</sup>. History of fantasy sports can be traced to the 1960s when Bill Gamson, former Professor of Psychology at Harvard and Michigan University constructed a game called “The Baseball

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<sup>1</sup> Source: D Haitner, “The hyper growth of daily fantasy sports is going to change our culture and our laws”, *Forbes*, September 2015. Available at <https://www.forbes.com/sites/darrenheitner/2015/09/16/the-hyper-growth-of-daily-fantasy-sports-is-going-to-change-our-culture-and-our-laws/#757f05b15aca>

<sup>2</sup> M Edelman, “A Sure Bet? The Legal Status of Daily Fantasy Sports”, *Pace Intellectual Property, Sports Entertainment Law Forum*”, 6(1), 1-21, 2016.

<sup>3</sup> Jennifer Chu, “There is real skill in fantasy sports”, *Science Daily*, November 7, 2018. Accessible at <https://www.sciencedaily.com/releases/2018/11/181107093816.htm>.

<sup>4</sup> Source: David O Klein et al., “Fantasy Sports – Rapidly Developing Legal Framework”, *Law 360*, September 20, 2017, accessible at <https://www.law360.com/articles/704275>.

Seminar”.<sup>5</sup> Daniel Okrent, student at the Michigan University learned about “Baseball Seminar”, and created his own version of the fantasy sports called “rotisserie baseball,” whose idea had been crystallized in a Manhattan restaurant named La Rotisserie Francaise.<sup>6</sup>

In 2018, the fantasy sports market worth was USD 13.9 billion and expected to grow at a CAGR of 13.7% reaching USD 26.4 billion in 2024, according to a study carried out by Market Study Report LLC.<sup>8</sup> A study conducted by Fantasy Sports and Trade Association, claimed that the fantasy sports users grew at 25% annually.<sup>9</sup> With such high anticipated growth, channels such as ESPN broadcast hour-long shows devoted to fantasy sports and players prior to major sports seasons.

In India, fantasy sports has been one of the most popular activities for sports lovers. The major reason for this surge in fantasy sports users could be the rise of league-based sports, and the growth of online viewership combined with increased smartphone penetration. Technological advancement has also contributed to the growth in popularity of fantasy sports in India. While cricket has dominated the sports market in India, the new generation is exploring and getting interested in other sports such as Kabaddi, football, basketball, and hockey.

The Indian fantasy sports market has shown a double-digit growth. A report by AC Nielsen, commissioned by the Indian Federation of Sports Gaming (IFSG) across 12 cities in India claimed that 67% of the survey respondents were aware of fantasy sports and the retention rate of users was 89%.<sup>10</sup> In 2019, India had more than 20 million fantasy sports users across 60 different platforms, which was expected to grow to 100 million users by 2020.<sup>11</sup> The same report claimed an increase in number of users by 200% in 2017. While the United States and Canada had 59 million users in 2018, the Indian market saw an increase in users from 2 million users in 2016 to 20 million in 2018, more than the number of users in the United Kingdom.<sup>12</sup> An interesting fact is that fantasy sports was witnessing 40% growth in female user participation during the International Cricket Council (ICC) World Cup.<sup>13</sup>

Fantasy sports and the gaming industry was set to witness a massive growth in India, growing from Rs. 43.8 billion to reach Rs. 118.8 billion by FY23 at CAGR 22.1%, according to a report by Indian Federation of Sports Gaming (IFSG), India’s first and only self-regulatory industry body for the sports gaming sector and KPMG India Private Limited (KPMG) (1\$ = Rs. 68 approx, in July 2019). The report

<sup>5</sup> Justin Fielkow, “From Fantasy Sports to Reality: The evolution and legality of fantasy sports”, *The Sports Esquire*, May 18, 2015 available at [https://charlesfranklinlaw.com/wp-content/uploads/2016/12/2015.05.18-From-Fantasy-to-Reality\\_-The-Evolution-and-Legality-of-Fantasy-Sports-Fielkow-The-Sports-Esquires-Revised.pdf](https://charlesfranklinlaw.com/wp-content/uploads/2016/12/2015.05.18-From-Fantasy-to-Reality_-The-Evolution-and-Legality-of-Fantasy-Sports-Fielkow-The-Sports-Esquires-Revised.pdf)

<sup>6</sup> Ibid

<sup>7</sup> Source: History and Evolution of Fantasy Sports available at <http://futureoffantasy.com/the-history-and-evolution-of-fantasy-sports>

<sup>8</sup> Source: <https://www.marketwatch.com/press-release/at-137-cagr-fantasy-sports-market-size-is-anticipated-to-reach-us-26400-million-by-2025-2019-03-29>

<sup>9</sup> Source: D Heitner, “The Hyper Growth of Daily Fantasy Sports is Going to Change Our Culture and Our Laws”, *Forbes*, September 16, 2015. Available at <https://www.forbes.com/sites/darrenheitner/2015/09/16/the-hyper-growth-of-daily-fantasy-sports-is-going-to-change-our-culture-and-our-laws/#3331b7615aca>

<sup>10</sup> Source: “Scoring Big with Sports Gaming”, A report on emergence, consumption, patterns, meteoric growth and future of fantasy sports in India”, available at [https://www.ifsg.in/wp-content/uploads/2018/03/IFSG-Report\\_33-low-res.pdf](https://www.ifsg.in/wp-content/uploads/2018/03/IFSG-Report_33-low-res.pdf)

<sup>11</sup> Source: Sporting Revolution in India available at <https://www.thehindu.com/brandhub/a-sporting-revolution-in-india-tracking-the-growth-of-fantasy-sports/article24026469.ece>

<sup>12</sup> Ibid

<sup>13</sup> Ibid

titled ‘The Evolving Landscape of Sports Gaming in India’ provides an overview of the online gaming industry with a focus on fantasy sports and eSports.<sup>14</sup>

### FANTASY SPORTS COMPANIES IN INDIA

There were around 150+ online fantasy sports gaming companies in India such as Dream11, MyTeam11, HalaPlay, FirstGames, BalleBaazi, Fanmojo, and 11Wickets. Dream11 was the biggest fantasy sports company in India. Dream11 was co-founded by Harsh Jain and Bhavit Seth in 2008; and in 2012, they introduced the freemium format of fantasy sports to the Indian cricket fans. In 2014, the company reported 1 million registered users, which grew to 2 million in 2016 and to 60 million in 2018<sup>15, 16</sup> [Exhibit 1]. In 2019, it was reported that Dream11 held 90% of the domestic fantasy sports market.<sup>17</sup> In 2018, Dream11 signed MS Dhoni, India’s ex-captain as their new brand ambassador and subsequently launched a media campaign under the banner “*Dimaag se Dhoni*” during Indian Premier League 2018.<sup>18</sup>

HalaPlay was founded by the students of Birla Institute of Technology (BITS) Pilani in 2017. In 2019, HalaPlay reported 4 million users and 10 times growth over the last 12 months.<sup>19</sup> MyTeam11, a Jaipur based startup was founded in 2016 by two engineers and had around 10 million+ users.

### ONLINE GAMBLING LAWS ACROSS THE WORLD

In the United States, fantasy sports were exempted from federal law concerning the Unlawful Internet Gambling Enforcement Act (IGEA).<sup>20</sup> It was left to a state-level decision; each state applied various standards to determine if fantasy sports was a game of skill or chance. The decision between skill and chance was to be decided based on whether the skill-based element was dominant over chance in determining the outcome of the game.<sup>21</sup>

Most European countries recognized fantasy sports as a legal business; it was legal and highly regulated in around 30 countries in Europe. In Sweden, Croatia and Norway, though fantasy sports was legal, it was not very regulated. However, in countries such as Switzerland, Ukraine, Macedonia and Belarus, online gaming was considered illegal<sup>22</sup>.

Online gambling laws have been a state subject in India and respective states can formulate laws for various gaming activities. Most of the laws governing the subject of gaming in India in 2019 were old. The said laws used a yardstick of 'Skill vs. Chance' and predominance of skill over chance to identify if a given game falls within the ambit of gambling. Advent of online games coupled with lack of awareness about them, created confusion as to how this yardstick of skill versus chance or game of mere skill could

<sup>14</sup> Source: The evolving landscape of Sports Gaming in India available at <https://www.ifsg.in/publications/>

<sup>15</sup> Source : <https://www.outlookindia.com/newsscroll/fih-announces-partnership-with-dream11/1430388>

<sup>16</sup> Source : <https://scroll.in/article/919582/big-game-how-a-fantasy-sports-startup-is-making-money-from-indias-ipl-fever>

<sup>17</sup> Source: The Rise of Fantasy Sports in India and Startups to Watch for in the Space, available at <https://yourstory.com/2019/04/fantasy-sports-startup-dream11-mpl-ipl>

<sup>18</sup> Source : <https://en.wikipedia.org/wiki/Dream11>

<sup>19</sup> <https://yourstory.com/2019/04/fantasy-sports-startup-dream11-mpl-ipl>

<sup>20</sup> Jonathan Griffin, “The Legality of Fantasy Sports”, *National Conference of State Legislatures*, 23(33), September 2015.

<sup>21</sup> Source : [https://en.wikipedia.org/wiki/Gambling\\_in\\_the\\_United\\_States](https://en.wikipedia.org/wiki/Gambling_in_the_United_States)

<sup>22</sup> Source : <https://blog.vinfotech.com/fantasy-sports/european-laws-on-fantasy-sports>

be applied. The two main enactments dealing with gaming in India were the Pre-Independence Public Gambling Act, 1867 (“PGA”) and the Prize Competitions Act, 1955 (“PCA”). In general, gambling laws of most states prohibited gambling. Historically, Indian laws have differentiated between the games of skill and games of chance. While the game of skill was permitted by Indian laws, game of chance was strictly prohibited.

### SKILL BASED VS. CHANCE BASED

Games of skill are the games which involve a person’s skill, knowledge and judgment and they rule out chance aspect from the game. On the other hand, games of chance include games that are determined by mere luck, completely uncertain and the players cannot apply their skill to estimate the result.<sup>23</sup>

While deciding whether a game is a game of chance or skill, the Indian courts while interpreting the term “mere skill” have adopted the methodology used by the US government, that is, the “dominant factor test”. It says that while classifying a game, it becomes important to check whether chance or skill is the dominant factor in determining the result of the game. Dominant factor test was applied to Rummy and Horse Racing. The Supreme Court of India classified Rummy as a game of skill, as the fall of cards need to be memorized and considerable skill is required while deciding whether to hold or discard a card.<sup>24</sup> On similar lines, horse racing requires objective assessment of fitness and skill of the horse and the jockey.

In 2018, the Supreme Court of India concurred with earlier verdicts by Punjab and Haryana High Courts that Fantasy sports involves substantial amount of skill.<sup>25</sup> The High Court of Punjab and Haryana ruled that fantasy sports was predominantly a skill-based game. The Telangana government has ruled that a game of skill which has an element of chance could not be described as skill games. It is pertinent to note here that it is difficult to conceive of any game of skill as a game of pure skill and no chance. Some element of chance is always present in any game of skill. For instance, almost all forms of popular sports involving very high degrees of skill, such as chess, cricket, football, hockey, etc., also involve some element of chance. It becomes important to obtain evidence from data by developing statistical models to test and classify fantasy games as a game of skill vs. game of chance. If a fantasy sports is chance based, then every user should have an equal probability of winning, whereas if it is skill based, then one should see consistent performance among the users. The only way to check this is to use the data from a fantasy sports company.

Ramsu approached Dream11 with a request to share anonymized data for testing whether fantasy sports involving cricket was skill dominant or chance dominant. Dream11 agreed to share their data and rules related to fantasy sports, which are described in **Exhibits 2, 3 and 4**.

<sup>23</sup> Source : <https://www.ifsg.in/wp-content/uploads/2018/03/FantasySportsPublication.pdf>

<sup>24</sup> Source: K R Lakshmanan Vs State of Tamil Nadu, available at <https://www.sci.gov.in/jonew/judis/16203.pdf>

<sup>25</sup> Source: G Gokhale and Rishabh Sharma, “The skill element in the fantasy sports games”, *The Sports Law & Policy Centre*, available at [http://www.nishithdesai.com/fileadmin/user\\_upload/pdfs/NDA%20In%20The%20Media/News%20Articles/180406\\_A\\_Legality\\_of\\_Fantasy\\_Sports\\_India.pdf](http://www.nishithdesai.com/fileadmin/user_upload/pdfs/NDA%20In%20The%20Media/News%20Articles/180406_A_Legality_of_Fantasy_Sports_India.pdf)

## DATA ANALYSIS METHODOLOGY

After receiving the data<sup>26</sup> from Dream11, Ramsu called for a meeting of his team with an objective to determine whether fantasy sports was skill dominant or chance dominant. Ramsu opened the meeting by stating:

*I think the biggest challenge in this case is to understand the key difference between skill and chance and how to test it using the data.*

Tapan Khopkar, who was the domain expert on fantasy sports in the team, responded:

*Games such as rummy and horse racing are classified as skill based since in rummy we need to decide to play or hold the card based on knowledge of our own cards and our skill to understand other players' cards. Similarly, in horse racing, the performance, skill and fitness are the deciding factors to put money on a horse. In case of fantasy cricket, the users need a good understanding of the strengths and weakness of each player, playing conditions, information related to injury and so on.*

Ramsu responded:

*Yes, I agree Tapan. To prove that it is skill dominant, we have to prove that users who are scoring high in fantasy sports are playing a strategic game, their selection of players and captain and vice-captain is more knowledge based than random selection.*

Alolika, who was a senior data scientist in the team said:

*If fantasy games involve skill, then we can expect consistency in the performance of the users both low as well as high. Alternatively, we can also check whether a selection specific player increases probability of winning fantasy sports.*

Ramsu summarized:

*I think our approach should be to identify and test several possible hypotheses to establish whether fantasy sports is skill dominant or chance dominant.*

There was a consensus about the approach in the team and they decided to go ahead with the statistical analysis of data by framing and testing several hypotheses.

## DATA DESCRIPTION AND HYPOTHESES

The data available for analysis was provided in various tables. The overall hierarchy of data is as follows.

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<sup>26</sup> Data can be downloaded from [http://hrm.iimb.ernet.in/iimb/Harvard/Fantasy\\_Sports\\_Data/index.htm](http://hrm.iimb.ernet.in/iimb/Harvard/Fantasy_Sports_Data/index.htm)

- Various rounds/match were played. For example, one IPL match would be one round.
- There were players who were available to be picked up for a round or match. (This number is more than the number of players who would actually play in that match, so it was possible that a player selected by a user in his team may not actually play.)
- For every round, multiple contests were opened. The contests were of different categories, from free to paid, and various types of playing and winning options (public, private, special).
- User selected a team for a round and for a contest.
- There was a player round performance table which indicated how the player performed in the specific round.
- Teams selected by users were scored on the basis of the selected player's performance in a contest and those team level scores were provided in the contest user's table.

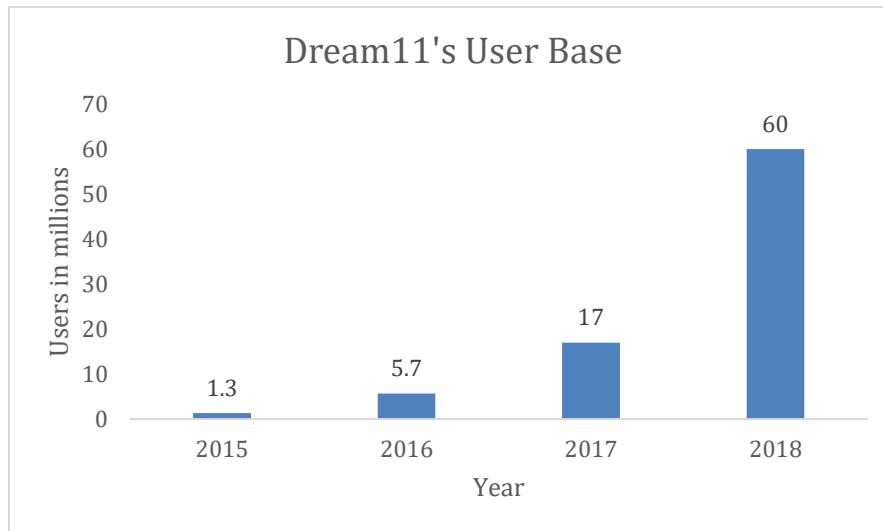
Description and details of the data are described in **Exhibits 4 and 5**.

Using the data, one can validate several hypotheses to infer whether fantasy sports is skill dominant or chance dominant. Few possible hypotheses are listed below:

1. Users playing free contests are scoring lower than users playing paid contests. This can prove that when users play paid contests, they play more cautiously and strategically, and do not select teams at random.
2. Scores of randomly selected players can be tested against scores of the teams based on a specific strategy such as selecting players who have performed well in the recent matches.
3. Is the selection of captains and vice captains of the team random (equal probability)?
4. Selection of players and winning or getting high scores are dependent on each other.
5. As the user plays more games, his chance of winning increases (learning effect).

Exhibit 1

**Dearm11's User Base**



Source: <https://scroll.in/article/919582/big-game-how-a-fantasy-sports-startup-is-making-money-from-indias-ipl-fever>

Exhibit 2

**DREAM11: LET'S PLAY (Rules and constraints)**

The following steps were to be adopted to play a game in Dream11.

- Select A Match: Select any of the upcoming matches from any of the current or upcoming cricket series.
- Create Your Team: Create a team with all available players for a match with the following constraints.
  - Each player comes at a price, a budget of 100 credits is available to create a team of 11 players.
  - User can create multiple teams and choose to join a contest with any of the teams created.
  - After creating your Dream11 team, choose a Captain and Vice-Captain for the team.
    - Captain – Gets 2x points scored by him in the actual game
    - Vice-Captain – Gets 1.5x points scored by him in the actual game
  - There will be multiple contests for a match, User needs to select a contest and assign a team.
  - You can make as many changes to your Dream11 teams as you wish until the deadline of that match. You can also change your Captain or Vice-Captain before the deadline of the match.
  - Contests would be open for submitting a team till the deadline of that match. There can be no changes to submitted team or possibility of adding new team after the start of a match.
  - Team submission can be done till slots are available in a contest.
  - Create your Dream11 team by picking 11 players as per the following combination C2, ns (C1, C2, C3...) within a budget of 100 credits. Maximum number of players from a team cannot exceed 7.

Exhibit 2 (Contd.)

Player type	C1	C2	C3	C4	C5	C6	C7
WK	1	1	1	1	1	1	1
Bat	5	5	4	4	4	3	3
AR	2	1	1	2	3	2	3
Bowl	3	4	5	4	3	5	4
Total	11	11	11	11	11	11	11

Exhibit 3

**Brief description of the data provided by Dream11**

Brief description of the data provided by Dream11

- Data tables
  - CONTEST MASTER – Provides details of a contest such as if the contest is free or paid, public or special or private. It also has details on the size of the contest.
  - CONTEST USER RELATION – Provides details points scored by a user in a contest for the team which has been fielded.
  - PLAYER ROUND PERFORMANCE – It has details on performance of a player in a round.
  - ROUND MATCH – Association between roundid and matchid which denotes number of matches played for a specific round or game. The scores are given for a match; hence to get the scores for a user team, we need to map roundid with matchid using this table.
  - USER ROUND PLAYER – This table has all the players selected by user or the team which is formed by the user for a round.
  - USER ROUND TEAM – This table contains the date on which the user formed the team, this table is mainly used for joining all other tables since it contains all the required information about a round→user→team.
  - AGGREGATE\_DATA – This table has aggregate data which provides details of user's performance across multiple rounds.
- Attributes description
  - roundid – Unique identifier for round played
  - matchid – Unique identifier for matches played in a round
  - contestid – Unique identifier for a contest. A round can have multiple contests.
  - Contesttype – Public/Special/Private
  - Contestcategory – Free/Paid
  - teamid – Unique identifier for a team. User can create multiple teams for a round.
  - currentpoints – Points scored by the user for the selected team in a contest for a round
  - userid – Unique identifier of a user

Exhibit 4

**Entity relationship diagram between various tables (P = Primary Key, F = Foreign Key)**



**Exhibit 5****Details of data in all the tables provided along with the case**

**2 Rounds 5365 & 6349 have been considered. These 2 rounds are having high numbers of users playing the game.**

- 5365 - Is a T20 Premier League match played on 29/05/16?
- 6349 - Is a ODI IND vs NZ match played on 29/10/16?

**File: USER ROUND PLAYER.CSV**

This table has information on team formed and fielded (11 players along with captain and vice-captain) by the user for a round/match

- It has 531425 rows with 17 columns.
- 2 unique round ids
- 3006757 unique users
- Users having as many as 4 teams per round

**File: CONTEST MASTER.CSV**

This table has information on the contest which is open for a round/match. It also has details on type and size of each contest.

- It has 74220 rows and 5 columns.
- 2 unique round ids
- 74220 unique contests
  - 5365 has 42247 unique contests
  - 6349 has 31973 unique contests
- 4 unique contest types (public, private, special, grand)
- 2 contest categories (paid and free)

**File: CONTEST USER RELATION.CSV**

This table has information on points scored by a user for a team formed, in a round/match and contest combination.

- It has 962602 rows and 6 columns.
- 2 unique round ids
- 72652 unique contest
- 239670 unique user ids
- 4 unique contest types (public, private, special, grand)
  - special - 699330 records
  - public - 160271 records
  - grand - 84051 records
  - private - 18950 records
- Max number of points scored by a user is 447.25, minimum being 0.
- Max number of teams formed by a user is 4.

**File: PLAYER ROUND PERFORMANCE.CSV**

This table has information on points scored by a player in a round/match. It has detailed break-up of how many points player scored for bowling, batting and fielding.

- It has 44 rows and 43 columns.
- 2 unique match ids
- 43 unique players
- Highest point scored by a player is 72, minimum being -1.

**File: round\_match.csv**

This table has mapping between matchid and roundid.

- It has 2 rows and 2 columns.
- 2 unique match ids
- 2 unique round ids

**File: USER ROUND TEAM.CSV**

This table has information on date of match, user and round/match.

- It has 285630 rows and 4 columns.
- 2 unique round ids

**File: AGGREGATE DATA.CSV**

This table has aggregated information of user's performance across multiple rounds.

- It has 385235 rows and 17 columns.
- 385235 unique user ids