Statistical Insights into International Cricket Batsmen Performance

Statistical Computing (STAT 50001)

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Introduction:

Why Analyze Batting Average and Strike Rate in Cricket?

Cricket, often referred to as a game of statistics.

Cricket Analytics: Highlights the broader domain of leveraging data science techniques to analyze cricket performance metrics.

Overview

- Data Collection & Preprocessing
- Exploratory Data Analysis (EDA)
- Model Development
- Insights & Validation

Motivation

Simple Answer:- Cricket Analytics!!

Why Are These Metrics Important?

- Batting Average: Measures consistency and reliability over a player's career.
- Strike Rate: Highlights scoring efficiency, critical for limited-overs formats.

Data Description

- The data is sourced from the ICC Cricket Dataset on Kaggle.
- Contains detailed statistics on cricket players' performances across various matches and seasons.

Variables (15)

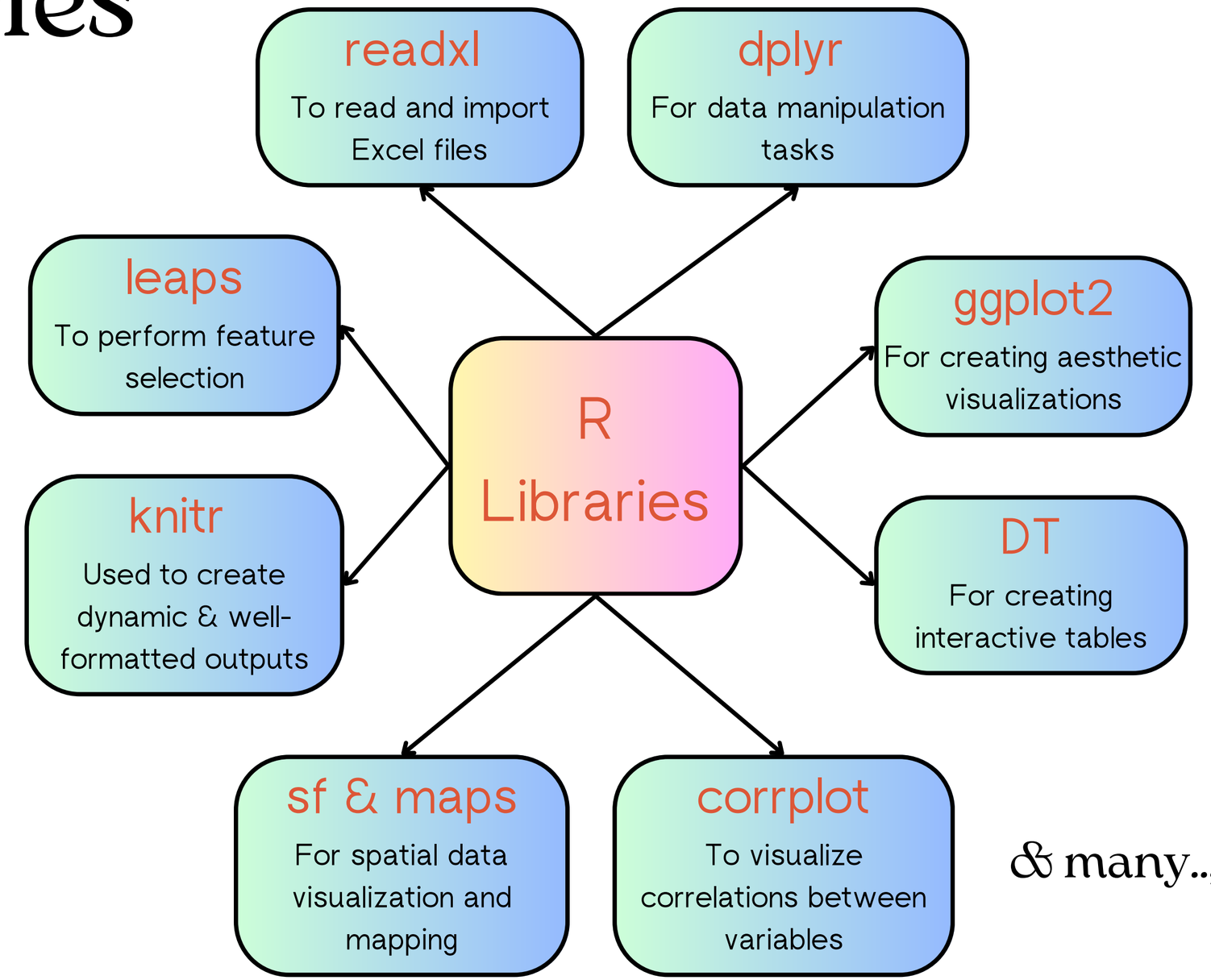
- Player: Name of the player with Country name.
- Span: Start Year and End Year.
- Mat: Number of matches played by the player.
- Inns: Number of innings played by the player.
- NO: Number of times the player remained not out.
- Runs: Total runs scored by the player.
- HS: Player's highest score in a match with out or not status.
- Ave: Average runs scored per innings.
- BF: Number of balls faced by the player.
- SR: A measure of how quickly the player scores.
- 100: Number of centuries scored by the player.
- 50: Number of half-centuries scored.
- 0: Number of times the player got out without scoring.
- 4s: Number of boundaries (4 runs) hit by the player.
- 6s: Number of sixes hit by the player.

Player	Span	Mat	Inns	NO	Runs	HS	Ave	BF	SR	100	50	0	4s	6s
V Kohli (INDIA)	2010-2019	75	70	20	2633	94*	52.66	1907	138.07	0	24	2	247	71
RG Sharma (INDIA)	2007-2019	104	96	14	2633	118	32.1	1905	138.21	4	19	6	234	120
MJ Guptill (NZ)	2009-2019	83	80	7	2436	105	33.36	1810	134.58	2	15	2	215	113
Shoaib Malik (ICC/PAK)	2006-2019	111	104	30	2263	75	30.58	1824	124.06	0	7	1	186	61
BB McCullum (NZ)	2005-2015	71	70	10	2140	123	35.66	1571	136.21	2	13	3	199	91

Table. head(Cricket_Data)
https://www.kaggle.com/datasets/mahendran1/icc-cricket

Tools & Libraries

RStudio®



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Data Preprocessing

Data preprocessing is the process of transforming raw data into a format that's easier for machines to understand and analyze.

Column Preprocessing

- Splitting columns.

Variables (15)

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- 4s: Number of boundaries (4 runs) hit by the player.
- 6s: Number of sixes hit by the player.

Variables (18)

```
> colnames(Batsman_clean)
 [1] "Match"           "Innings"       "NotOut"        "Runs"          "HighestScore"
 [6] "BattingAverage" "BallsFaced"    "StrikeRate"    "Hundreds"      "Fifties"
[11] "Ducks"          "Fours"         "Sixes"         "HS_star"       "PlayerName"
[16] "Country"        "StartYear"     "EndYear"
```

Row Preprocessing

- Removing rows with NA values.
- Removing duplicate rows.

```
> dim(Batsman)
[1] 2006   15
```

```
> dim(Batsman_clean)
[1] 1672   18
```

Exploratory Data Analysis (EDA):

> summary(Batsman_clean)

Summary Statistics and Key Insights

- The median number of matches played is 7, but the maximum is 111, highlighting disparity in experience.
- Median runs (45.5) are significantly lower than maximum runs (2633), reflecting a few exceptional performers.
- Average fours (13.66) and sixes (5.51) highlight boundary play's importance in total runs.
- Average hundreds (0.0329) and a maximum of 4 indicate only a few achieve this milestone consistently.
- Average ducks (0.90 on 10) suggest batsmen contribute positively in most matches, which indicate less probability of scoring a duck.
- Median Highest Score (HS) of 22 compared to maximum (172) shows variability in top-scoring ability.
- Most players have career spans concentrated between 2010 and 2019, with few exceptions.
- Average fifty-count (0.6328) and a maximum of 24 indicate some players consistently perform.
- Players scoring centuries in a match (max 4) demonstrate elite performance levels.

Top Players Based on Performance

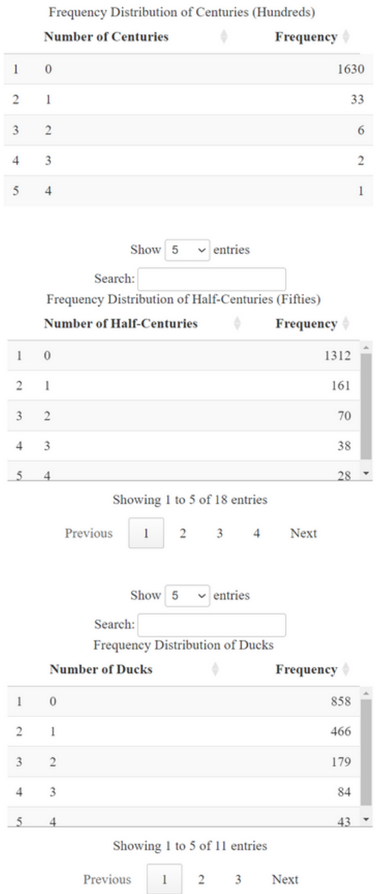
```
> print(top_runs)
# A tibble: 10 × 2
   PlayerName          Runs
   <chr>              <dbl>
 1 V Kohli             2633
 2 RG Sharma           2633
 3 MJ Guptill          2436
 4 Shoaib Malik        2263
 5 BB McCullum         2140
 6 DA Warner           2079
 7 EJG Morgan          2002
 8 Mohammad Shahzad    1936
 9 JP Duminy           1934
10 PR Stirling         1929
```

```
> print(top_avg)
# A tibble: 10 × 3
   PlayerName        BattingAverage Match
   <chr>                      <dbl> <dbl>
 1 Abu Hider                   58      13
 2 Nouman Sarwar               57.3    14
 3 V Kohli                     52.7    75
 4 HA Varaiya                  51      25
 5 Babar Azam                  50.2    36
 6 A Symonds                   48.1    14
 7 RN ten Doeschate            44.4    22
 8 KL Rahul                    43.8    34
 9 Hazratullah Zazai           43.2    13
10 AR Nurse                    42.5    13
```

```
> print(top_strike_rate)
# A tibble: 10 × 3
   PlayerName          StrikeRate Match
   <chr>                    <dbl> <dbl>
 1 Washington Sundar        217.    18
 2 Hasan Ali                174.    30
 3 A Symonds                169.    14
 4 Hazratullah Zazai        163.    13
 5 Izatullah Dawlatzai      162.    14
 6 Dawlat Zadran            162.    34
 7 C Munro                  160.    60
 8 GJ Maxwell               160     61
 9 JC Tredwell              160     17
10 AJ Finch                 156.    58
```

(Constraints/ Condition: with at least mean matches played)

Frequency Distribution



Frequency Distribution of Centuries (Hundreds)

	Number of Centuries	Frequency
1	0	1630
2	1	33
3	2	6
4	3	2
5	4	1

Show 5 entries

Search:

Frequency Distribution of Half-Centuries (Fifties)

	Number of Half-Centuries	Frequency
1	0	1312
2	1	161
3	2	70
4	3	38
5	4	28

Showing 1 to 5 of 18 entries

Previous 1 2 3 4 Next

Show 5 entries

Search:

Frequency Distribution of Ducks

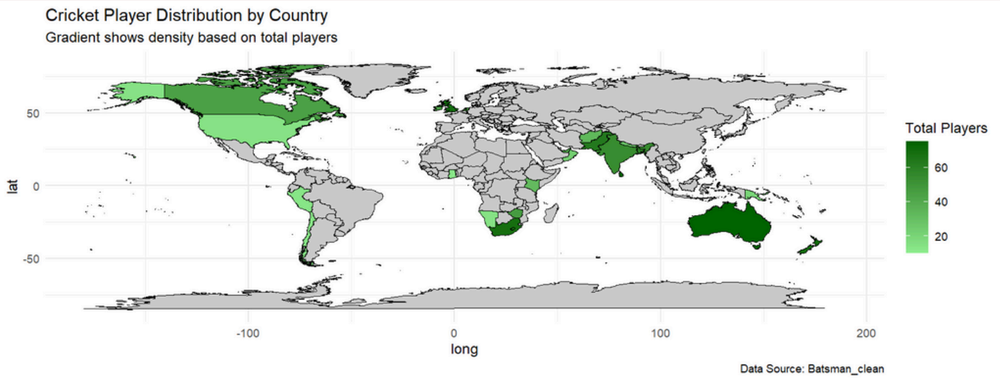
	Number of Ducks	Frequency
1	0	858
2	1	466
3	2	179
4	3	84
5	4	43

Showing 1 to 5 of 11 entries

Previous 1 2 3 Next

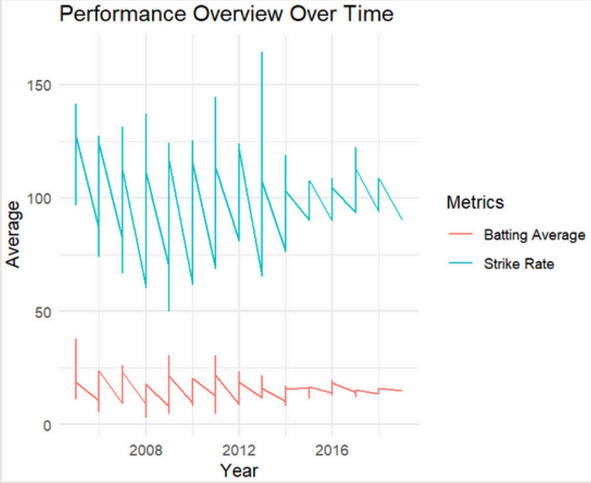
Exploratory Data Analysis (EDA):

Country Based Analysis



- AFG: Afghanistan
- AUS: Australia
- BDESH: Bangladesh
- ENG: England
- HKG: Hong Kong
- INDIA: India
- NEPAL: Nepal
- NZ: New Zealand
- PAK: Pakistan
- SA: South Africa
- SL: Sri Lanka
- USA: United States
- WI: West Indies

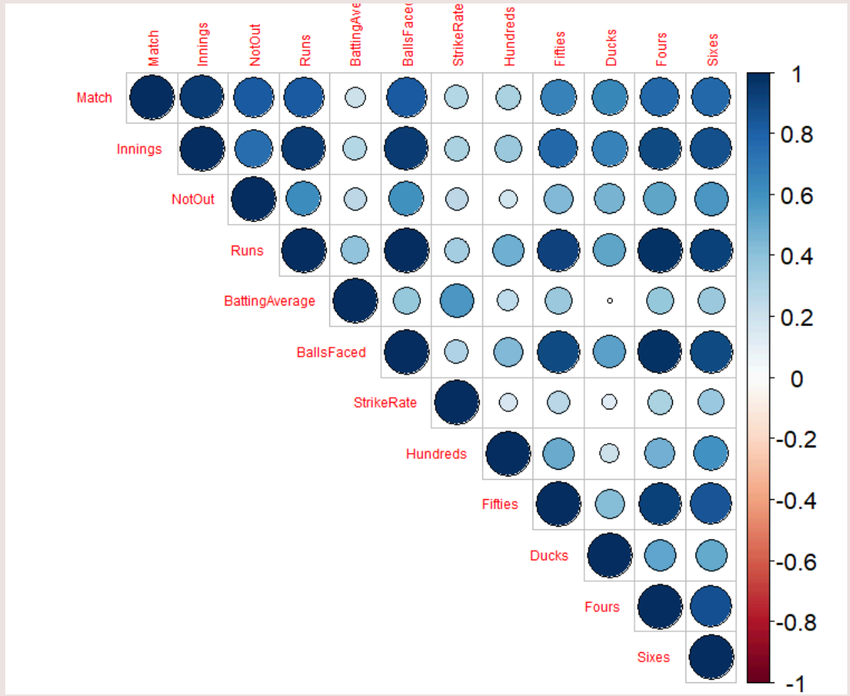
Performance Over Time



INSIGHTS:

- Batting Average showing a gradual decline and Strike Rate exhibiting more significant variability
- Performance in terms of Batting Average has steadily decreased since around 2012, while Strike Rate remains highly inconsistent over the years.

Correlation Matrix

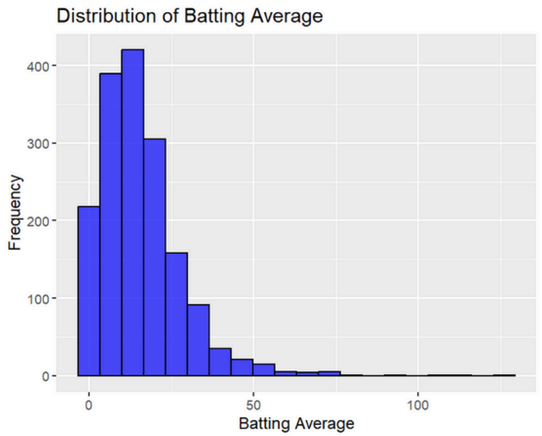


INSIGHTS:

- BATTING AVERAGE:
- has relation with: Balls Faced, Strike Rate, Hundreds, Fifties, Runs etc.,
- STRIKE RATE:
- has relation with: Fours, Sixes, Balls Faced, Ducks etc.,

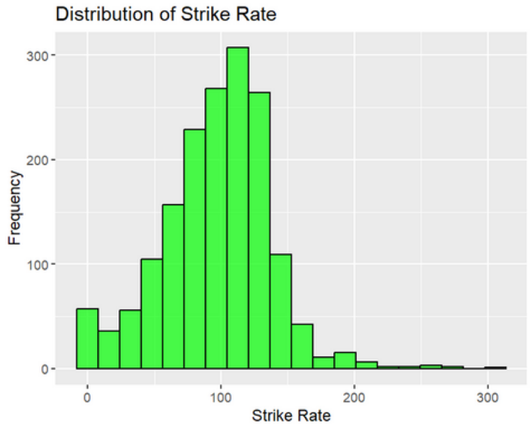
Exploratory Data Analysis (EDA):

Batting Average and Strike Rate



INSIGHTS:

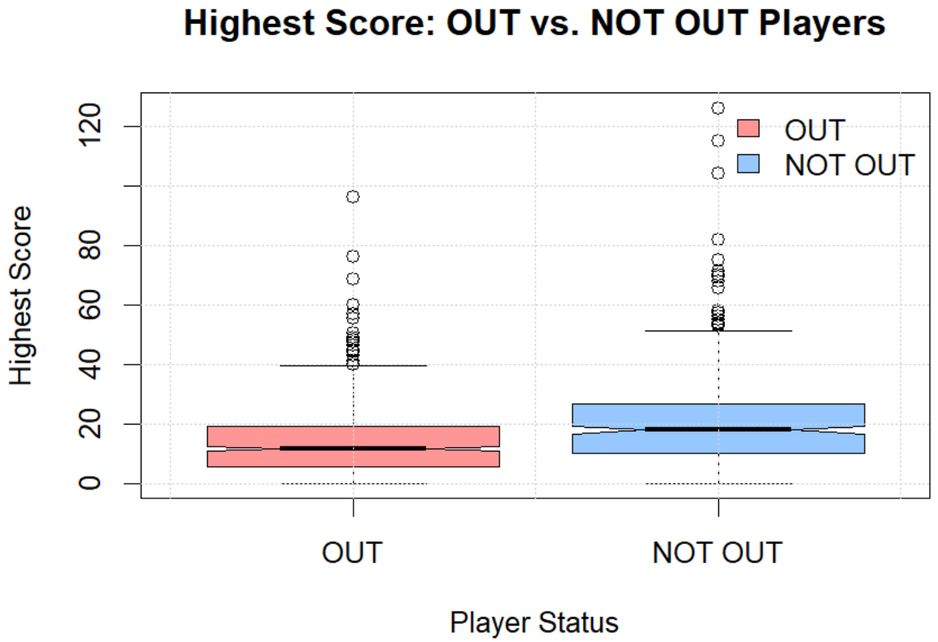
- Majority of players may contribute modestly to the team's runs, while players with a batting average above 50 are rare and may represent elite performers.



INSIGHTS:

- Strike rates around 100 are typical for average players, while exceptionally high or low strike rates are less common and might represent either elite performers or under-performers.

Highest Score (Out/ Not Out) Status



INSIGHTS:

- Players who achieve higher scores are more likely to remain "NOT OUT" at the end.

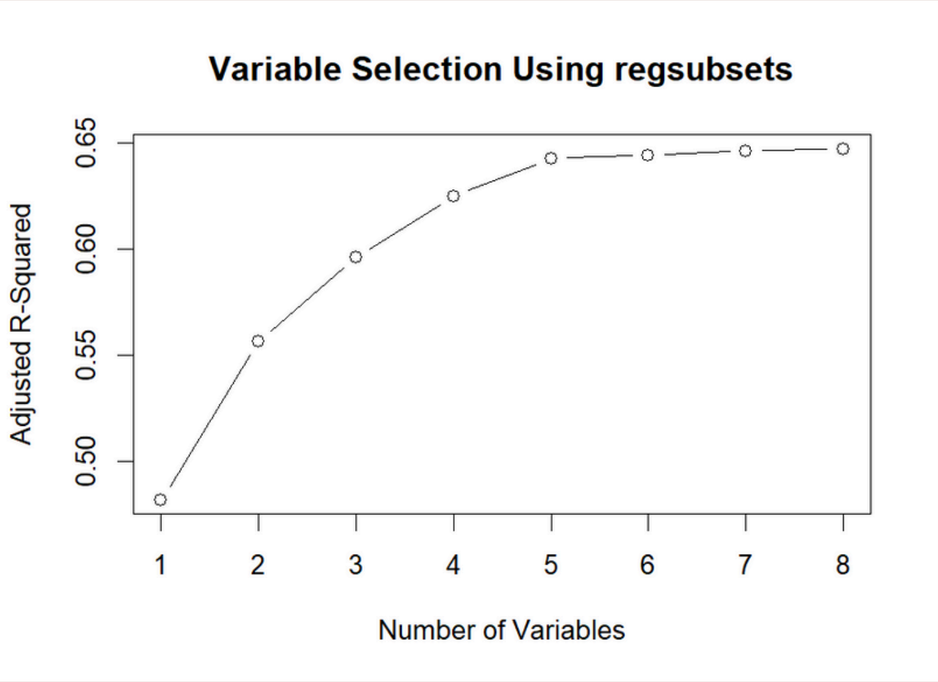
Model 1: Batting Average Prediction

Regression Analysis for Batting Average

Model Objective: To identify the best predictors of a player's batting average using stepwise variable selection (via regsubsets).

Variables Used: "(Intercept)", "Match", "NotOut", "Runs", "HighestScore", "BallsFaced", "StrikeRate", "Fifties", "Ducks".

Flexibility: Flexibility is provided to the stakeholder/ user, allowing them to choose the number of variables to include in the model.




```
> cat("Choose the number of variables to include (1 to 8): ")
Choose the number of variables to include (1 to 8):
> num_vars = as.integer(readline())
6
```

Multiple Linear Regression Model

Using Stepwise Selection

Example: Considered number of variables = 6

Variables selected: "(Intercept)", "Match", "NotOut", "HighestScore", "BallsFaced", "StrikeRate", "Ducks".

BattingAverage ~ Match + NotOut + HighestScore + BallsFaced + StrikeRate + Ducks

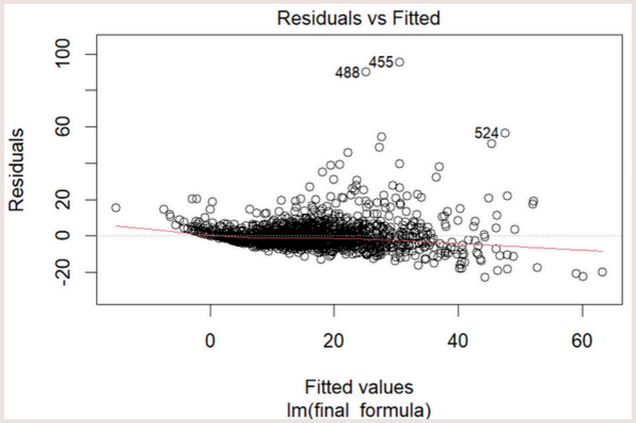
BattingAverage = 2.3689 - 0.4422*Match + 1.6498*NotOut + 0.3371*HighestScore + 0.0051*BallsFaced + 0.0641*StrikeRate - 1.6451*Ducks

Multiple Linear Regression Model

Performing BOXCOX Transformation

Transformed Mode

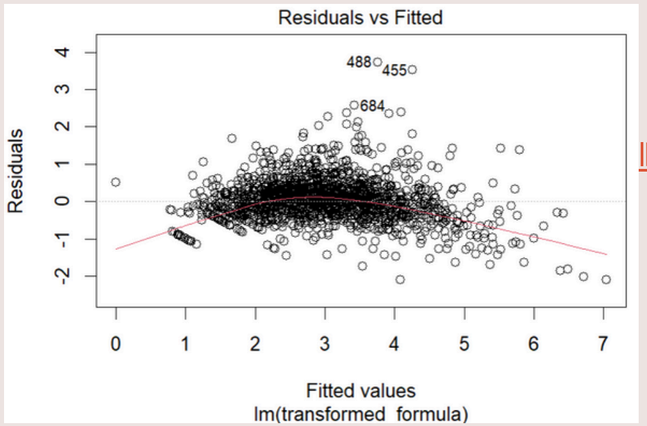
BattingAverage ^ 0.42= 2.3689 - 0.4422*Match + 1.6498*NotOut + 0.3371*HighestScore + 0.0051*BallsFaced + 0.0641*StrikeRate - 1.6451*Ducks



Before boxcox transformation

INFERENCE:

- All 6 variables are significant.
- Multiple R-squared: 0.6455
- Adjusted R-squared: 0.6442



after boxcox transformation

INFERENCE:

- All 6 variables are significant.
- Multiple R-squared: 0.7491
- Adjusted R-squared: 0.7482

Model 2: Strike Rate Prediction

Regression Analysis for Strike Rate

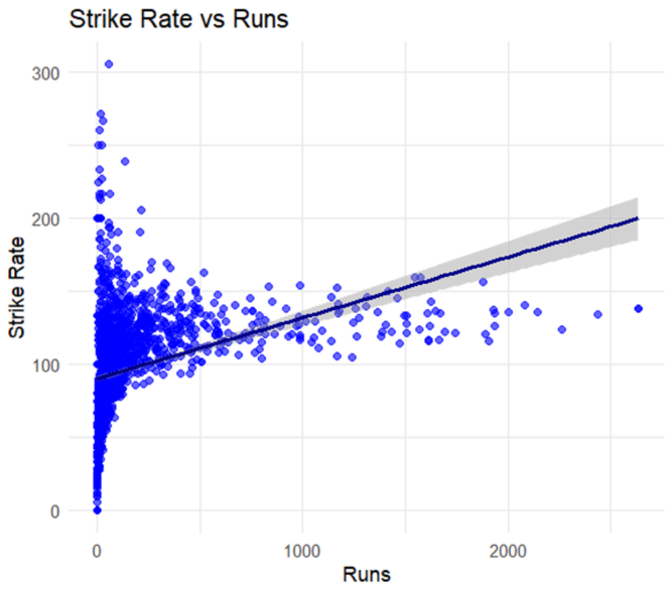
Example: Considered number of variables = 5

Variables selected: "(Intercept)", "Runs", "BallsFaced", "Hundreds", "Fifties", "Fours"

StrikeRate ~ Runs + BallsFaced + Hundreds + Fifties + Fours

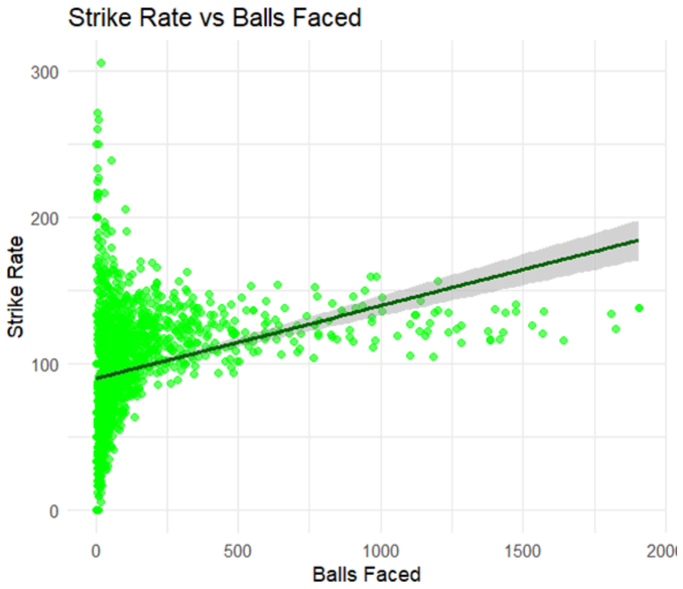
Strike Rate Average = 92.7713 + 0.398*Runs - 0.4141*BallsFaced - 20.7269*Hundreds - 7.8796*Fifties + 0.1236*Fours

Visualizations



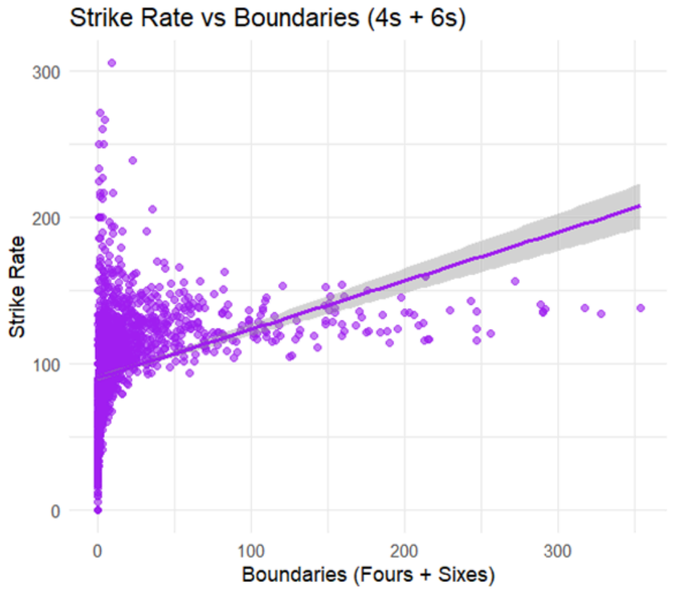
INFERENCE:

- Strong positive Correlation



INFERENCE:

- Positive Correlation



INFERENCE:

- Strong Positive Correlation

Thank you so much!

Open to

Q&A