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Indian T-20 Cricket Game Modelling using Data Mining Techniques

Technical Report

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Declaration Cover Sheet for Project Submission

SECTION 1 Student Details

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SECTION 2 Confirmation of Authorship

The acceptance of your work is subject to your signature on the following declaration:

I confirm that I have read the College statement on plagiarism (summarised overleaf and printed in full in the Student Handbook) and that the work I have submitted for assessment is entirely my own work.

Signature: Kuldeep Rawat___________________Date:13/5/2019__________

Executive Summary

This report provides information how the project is developed and what problems can it solve in the world of cricket game. The project aim is to develop models using data mining techniques which can help user to view the analysis that are performed by the cricket analyst. The first stage of this project is to gather dataset from websites such as espncricinfo.com. Then the analysis on matches, player and other aspects of the cricket is completed, as a cricket fan discussion about the outcome of a cricket matches is very popular and can go on for several minutes. There are many aspects that must be considered about a team such as player health, performance in the previous two, three matches, position, age, history and opponent.

This document intends to help user understand the problems that are identified and the steps taken to improve the problems related to cricket. The main objective of this project is to change the way people think about a game without knowing the truth or facts about a team, player and manager. This project not only going to build but also compare the models and show the facts that can help us predict outcome of the match. With the help of this project it can benefits many people such as team manager, people who like betting and fans who wants gain insight about their favourite team or player.

The idea is simple extract, clean and perform analysis on data that is gathered and use visualizing tools such Tableau to view analysis for then end users, who can then run analysis as she/he wishes on specific player, team and year.

1 Introduction

Cricket is a game that is extremely prominent in India and Australia. It initially started in England in the sixteenth century and later spread to different nations, the first international game, however, isn't played in England, it was played between the United States and Canada in 1844. The cricket is played on an oval-shape playing field, there is no settled measurement for the field yet but the main action takes place on 15-yard territory which is known as the pitch the centre of the huge playing field.

There are many different formats of the cricket game such as Test, One Day International (ODI) and T20. The most popular one is T20 as it consists of 20 overs and usually played for 3hours hours whereas test match go for 5 days and ODI 7-8 hours. There are many different versions of T20 one of the popular one is Indian Premier League(IPL) which is normally played in India and teams can is formed using mix of players from other countries so basically an Australian, South African and Indian team player can be in a same team. This project mainly focusses on T20 international format of the Indian cricket team.

1.1 Project Motivation and Background

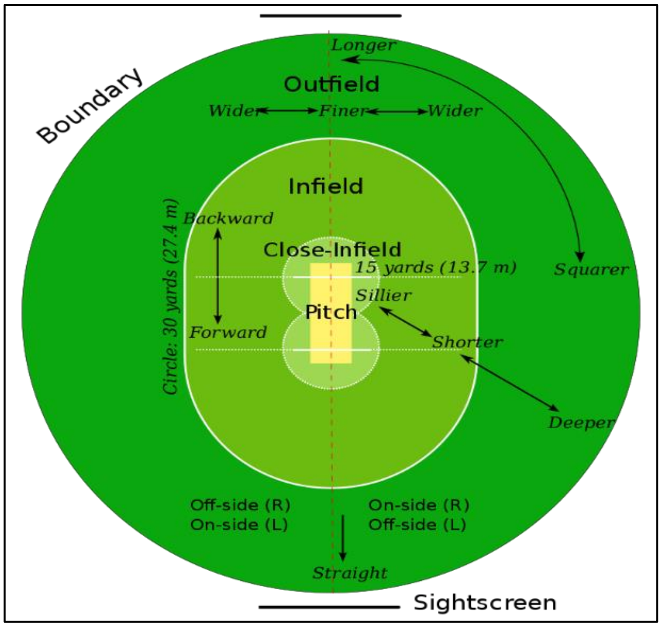


Figure 1: Cricket Pitch

Figure 1 represents the Cricket pitch, which is a game played between two groups of 11 players, where the two groups substitute bowling). A player (bowler) from the bowling group delivers scoring(batting) and defending (a ball to a player (batsman) from the batting group, who should hit it with a bat to score while the rest of the field team (fielders) defend the scoring. Moreover, it is a group activity, the bowler, and batsman, and defenders to some degree, follow up on their own, each completing certain lone activities autonomously, similar to sport baseball.

The idea of doing analysis on cricket generated from personal experience while having conversation talking to friend about specialization for the 4th year. A question, what do data analyst do? was asked during the talk, the answer was that they perform analysis on certain information. It wasn’t quite clear to the friend therefore an example of cricket was given, suppose if someone want to predict an outcome of a match, how would they predict it, they would need to know both team history such as player, team performance and then decide which team has higher chance of winning the match. After providing the example it was clear that data analysing require collecting, extracting and transforming data. Also, show the analysis on charts or graphs to help understand what the result of the analysing mean.

As a cricket fan decision of prediction model on Indian cricket team is decided, developing this idea will allow many experts to see their player or team weakness and could help them to improve their game and help them achieve what they want. The data from well know cricket website is gathered which provides proper data for cricket matches and team player. This has the potential to help in the real-world situation if there is a match that is being played and results of the can be determined before the match begin.

Question such as who will win the match? which team has potential to win and why? what can the team manager to improve the game or change the game. There are many benefits for fans and people who like betting on players and teams. The goal of this project will be to address all the question and provide a solution to the problem and the questions. By doing this analysis it can help to better understand cricket and new way of providing better outcome using analysis and comparing them to social media.

I choose to do this project not just because, I enjoy playing cricket and watching T-20 matches, this is not the only reason, the main reason is because I want to gain more knowledge of cricket, while learning how to extract, clean and perform analysis. As I am a fan of cricket, I want to explore the world of cricket as well as learning to analysis and provide all the information gathered to users who are also interested in learning gaining benefits from outcome of the project.

1.2 Project Scope

The scope of the project is to develop an Indian T-20 Cricket Game Model using data mining technique and visualise the results in Tableau. The dashboard is used to represent the results. The dashboard provides all the relevant information regarding the matches such as number of matches played, probability of a team winning a match, top teams of the T-20 game and Top partnership.

Schedule: The dashboard which contains the information retrieved using data mining technique will be broken down into many small tasks and it will be developed over a period, which will be completed within nine months this includes tasks such as gathering requirements, data extracting and cleaning. Developing models such Linear, Multi and polynomial. the tasks such as implementation, evaluation, debugging and finally creating a dashboard to show the result need to be achieved.

1.3 Problem Statement

There are many issues within the cricket field that I would like to address through this project, the most common problem such as inconsistent team selection, constant change in batting order, lack of match practice for reserve fast bowlers and inexperience spinners. I also want to address problems that are currently faced by Indian cricket team such as poor fielding, different bowling style, conceding too many extra and bowler orders. The analysis will help to overcome these problems by knowing exactly where things are going wrong.

1.4 Aims

1. The first objective of the project is to find a dataset, which includes information about the Indian cricket team and the matches. The data must be real and should contain detailed information based on the number of matches that team India has played against other teams over the past years. The dataset is from ESPNCricInfo.com. website
2. The second objective will be focused on extracting and cleaning the dataset that are relevant to my project such as matches, players, opponent teams and batsman. This objective is very important for the project as this requires cleaning the data, correct and accurate information must be gathered to proceed. To distinguish the work literature review must be concluded, to see whether this project has been completed before or not, if yes what is there that can be improved.
3. The third objective will be to compare the matches, player and team performance in terms of score and result. The outcome this objective will play important role when doing analysis.
4. The fifth objective is to transfer the clean data and generate a better dataset to perform analysis. It will also help me to identify a pattern based on the results and see how team has performed over the years and what could be help them to win the match.
5. The sixth objective is to perform analysis and create prediction and classification model.
6. The final objective will be to complete the documentation with conclusion and use a visualisation tool visualise the result. This will help the users such as cricket player, manager, bettors and cricket fans to predict and gain better understanding of the cricket matches.

1.5 Project Contributions

1. The results of the reviewed literature are presented.
2. A fully developed and evaluated Linear regression model.
3. A fully developed and evaluated Multi regression model.
4. A fully developed and evaluated Polynomial regression model.
5. A fully developed and evaluated Decision tree model
6. Visualised results of all the developed models (2-5) above.

1.6 Technologies Used

R studio: R studio used to develop in implementation of the models, the reason for choosing this is because it widely used by data analyst, gained knowledge of R language achieve goals of the project as the project require processing of the data. The R studio is open source and can be used for graphics, statistic and loading data. The data that is downloaded from websites in the form of csv file in excel can also be used in R studio. R provides various libraries that are inbuilt and can make it easy for user to perform analysis on certain data.

Python: The Python can be used to write the scripts the which plays an important role in cleaning and merging the data. It is one of the most used software for data analysis. In this project, it is being used to clean, merge and develop prediction models.

Excel: is a spreadsheet tool this allows us to build graphs can help us to see all the data very easily therefore it can be used to change data and store the cricket information in structured way such as csv.

Tableau: This application will be used for creating, visualizing and integrating the dataset to the dashboard. This is beneficial for the project as it can display all the work very easily, also Tableau will be accessible for users who wants to view the analysis that is performed.

GitHub: The GitHub is to allow code to be pushed into cloud therefore all of the project can be accessed from anywhere, also keep track of when the code was uploaded and prevents from losing code.

1.7 Definition, Acronyms and Abbreviation

The outlined Definitions, Acronyms and Abbreviations that are related to the project and the aim of this is to help user gain better understanding of the content:

KDD: Knowledge discovery in databases, this is a well know process of discovering and gaining knowledge from data. It is very useful in data mining which is a technique to prepare data, select data, clean and interpret.

Visualization application: This allow user to view and display the results. E.g. Tableau.

GitHub: It is web-based Git repository hosting service, which allows user to save code and share easily with a link.

ESPNcricinfo.com: This is a t website used to find datasets for cricket.

Microsoft Excel: This is a spreadsheet program it consists of table, rows, columns and can used for various of tasks such as performing analysis on data, solving complex arithmetic and functions.

R Studio: This is a programming application that is used for computing statistics using language R, it free and open source.

MySQL: This allows user to access and store data. This open-source anyone can download and use it for the database purpose.

Tableau: This is a software which allow user visualize data and solve problems related to the data. Tableau make it easy for user to analysis data, easy and convenient way without wasting much time.

Algorithm: This is step-by-step operation that is used in math and computer to perform a task such as calculating, data processing, also help user to re-use same algorithm to do other similar tasks again and again.

Machine Learning: This is the future of computer science, as this is a method of analysing, it allows machines such as computers to find patterns that can't not be easily processed by human minds. It helps to find hidden data and learn from data.

1.8 The Structure of This Document

The rest of the technical is structure as follows**:** Chapter 2 presents the literature review of ten past papers, Chapter 3 introduces the scientific methodology approach used and design diagram. Chapter 4 presents requirement specifications, data preparation and feature selection. Chapter 5, presents implementation, evaluation and results of Cricket game models which are developed using a multiple data mining technique.

2 Literature Review on T-20 Cricket Game

2.1 Introduction

The research of related work is required to see whether similar work has been performed on T20 cricket analysis or not. The use of google scholar, and IEEE library provided similar work that has been completed by other people. The finding includes vast amount of work that has been conducted by people from all over the world.

2.2 Review of T-20 Cricket Game

The previous work on T20 cricket game has been completed by four authors, although it is not exactly same as this project because the models are created on different version of the T20 cricket such as IPL. There are various techniques that are used, the most common one is Naïve Bayes and Decision tree. The following literature are closely related to this project. However, it is not exactly same therefore this project work is extended.

Pranavan Somaskandhan, Gihan Wijesingle and Sampath Degalla (2017), address problems for winning and losing match by collecting data from all the IPL (Indian Premier League) matches and storing it in relational database. Naïve Bayes, Support Vector machine algorithm are used to classify the problems. Additionally, Linear, Polynomial, RBF and Sigmoid are used. Important attributes are identified, then the decision boundary which is generated using Naïve Bayes algorithm is visualised in chart. This paper work is well implemented which I believe can be conducted in my project, one of the technique which compares accuracy to different subset of SVM provide good results. The author additionally mention work that can be completed in future such as using clustering to divide player in different groups and analysing player performance.

Gamage Harsha Perera (2015), in his paper 'Cricket analytics' the data is collected from espncrickinfo.com, the data of test cricket matches is taken, this data set is unique because none of the other authors have performed analysis on three types of cricket format. Compare to others they have used ODI and IPL cricket data whereas this author is using T20, ODI and test cricket format. Clustering is used to group batting average and strike rate also two player performances is analysed in detail. This paper consists of vast amount of information about cricket and many problems are addressed which position should player play and performance of player is measured three types of cricket format which provides acceptable results.

Prince Kansal, Pamkaj Kuma and Himanshu Arya (2014), in their paper, Naïve Bayes, multiple regression and decision tree is used to predict player price in IPL auction. The best accuracy is achieved by J48, whereas Naïve Bayes did not perform well. The author further adds this analysis can help IPL franchise in auction to classify a player based on the player past performance.

Ananda B.W. Manage, Stephen M. Scariano and Ceil R. Hallum (2013) in their paper, first principle component is used to rank the top batsman and bowlers of the T20 cricket matches. Similarly, the data is gathered from espncricinfo.com for the year 2013, In this paper both bowler and batsman performance is calculated and as result top 10 batsman of the year 2013 are revealed. The data is limited to only year and use of only one technique does not determine performance of a player, at least 10 matches should be considered.

2.3 Review of Existing Models Developed Using Data Mining Techniques

There are many different types of models developed by authors, the six-literature review below includes usage of Association rule, Naïve Bayes, Support Vector machine, Regression, Decision tree, Linear, Polynomial and Sigmoid. Naïve Bayes and Decision tree is considered as one of the best techniques to be used Naïve Bayes produced accuracy of 91%.

Ustsav Jadishbhai Solanki and Prof.Jay Vala (2017), in their paper algorithm called Association rule is used to identify meaningful patterns, the data is gathered from three websites espninfo, sports.ndtv and cricbuzz. Like the project conducted by Ujwal UJ, Dr Antony PJ and Sachin DN (2018), this paper also contains limited data, only 10 matches are taken into the account. Although there is not enough data, the output result of hash apriori algorithm shows accurate performance of the team players. This research help selecting a balance team member who has the potential to win the matches and make it hard for the opponent team to compete. This paper only focused on ICC (International Cricket Council) championship and the batsman performance, which in is not good enough as more aspects should be covered such as bowler and fielder performance because winning a match is heavily dependent on these aspects.

Ujwal UJ, Dr Antony PJ and Sachin DN (2018), in their paper the data is gathered from two websites cricsheet and espncricinfo using Python. Google prediction API played imperative role in choosing the suitable classifier, all the data is saved in Google cloud storage and data training is completed for predictions. The authors further point out, how their project can help the cricket player to change their strategy during the game to make it hard for opponent to win the match. The project did not consist of enough data, only the 10 matches are observed, the result of the prediction shows 9 out of 10 matches are predicted correctly. The authors, additionally added for future scope sentimental analysis can be implemented to gain better understanding of players mood.

Hasseb Ahmad, Ali Daud, Yixian Yang and Haibo Hong (2017), in their paper 'Prediction of rising stars in the game of cricket' focus on using player performance to predict rising star of the cricket. The algorithm Naïve Bayes, Support Vector machine and regression tree used. Compare to other research papers this uses feature evaluation metrics which includes information gain, gain ratio and chi-squared statistic for raking prediction. Dataset for ODI (One Day International) cricket matches is taken, ranging from 2006 to 2013. The paper consists of performing analysis on most of the aspects that reveals lots of information, as talked in previous work by Ustsav Jadishbhai Solanki and Prof.Jay Vala (2017), how their work was lacking the use of other aspects such as batsman, bowler and fielder performance. The author additional state that the rising star can also be predicted in different format of cricket game such as T20, which the one that my project based on. There many techniques that can be learned and improved and can be applied to any filed of the sport.

Tejinder Singh, Vishal Singla and Parteek Bhatia (2016), in their paper ‘Score and winning prediction in cricket through data mining’ they use of Liner regression on training data set, Naïve Bayes algorithms and Weka for exploring the data. This research has very limited data modelling techniques compare to others, the authors further adds that Naïve Bayes achieved accuracy of 91% whereas Linear regression is compared with attribute called current run rate which shows that error linear regression is less than the error in current run rate. This research is again quite like the research conducted by Hasseb Ahmad, Ali Daud, Yixian Yang and Haibo Hong (2017), both research paper uses data of ODI cricket matches.

Sannoy Bhattacherjees, Jayakrushna Sahoo and Adrijit Goswami (2015), in their paper, Association rule data mining technique is used to see performance of cricket player, again the data is gathered from similar website to other which is espncricinfo.com. In this research the R language play important part in performing the analysis on each player, the result of this research shows the player who scores low have lower strike rate and player does not perform well during the away matches. The author further adds, the benefits of this analysis are that team can see which player performs well in certain position and location. Additionally, authors point out this technique is not 100% reliable as it does not provide clear view therefore more analysis needs to be performed on other factors that are related to player performance such as pitch condition, player mood, team performance and opposition team.

P.UmaMaheswari and Dr.M.Rajram (2009) in their paper, principle component analysis on cricket match is performed similar to research conducted by Ananda B.W. Manage, Stephen M. Scariano and Ceil R. Hallum (2013), but the uniqueness of this research is that, it uses data which is gathered from observing cricket match videos. Individual player performance is analysed one the example given in the paper is a cricket player Sachin Tendulkar which show there are 80.82% chance of Sachin striking the bouncing ball to the third man.

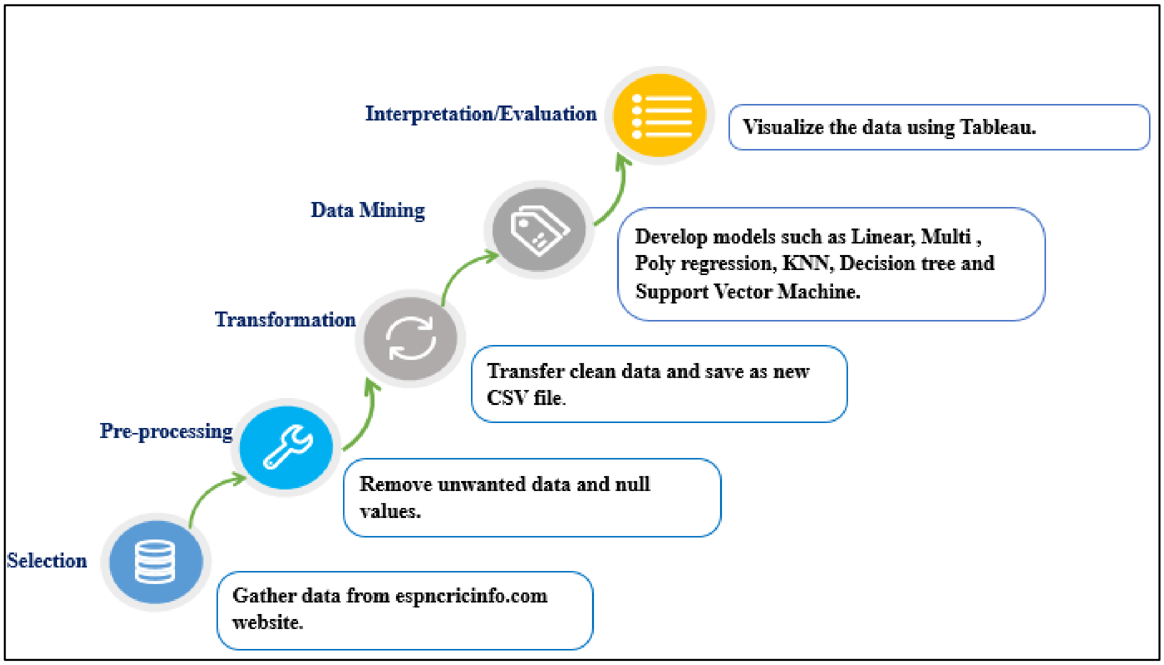
2.4 Challenges, Issues and Problems

The challenges that most of the authors have encountered are not being able to accurately predict the result of the matches due to limited usage of the data mining technique, most of the time it is hard to determine which technique should be used and which one has the potential to produce an accurate result and that has the capability to satisfy the user. This is same case here, where authors did not use a technique that can help them determine the best model for their data.The issues in most of the literature was that the data was very limited, in two of the papers, one by Ustsav Jadishbhai Solanki and Prof.Jay Vala (2017) and other by Ujwal UJ, Dr Antony PJ and Sachin DN (2018), had issues with predicting accurate and reliable result due to lack of data. The other factors such as using less attributes also seems to be one of the major issues thus problems occur due to this reason.

3 Scientific Methodology Approach Used and Design

3.1 Scientific Methodology Used

The scientific methodology used is based on the Knowledge Discovery in Databases (KDD) because it is a process for discovering useful information from a collection of data. To achieve the goals this process is necessary for the success of this project. KDD includes the following approaches (Figure 2):



Interpretation/Evaluation
Visualize the data using Tableau.
Data Mining
Develop models such as Linear, Multi , Poly regression, KNN, Decision tree and Support Vector Machine.
Transformation
Transfer clean data and save as new CSV file.
Pre-processing
Remove unwanted data and null values.
Selection
Gather data from espncricinfo.com website.

Figure 2: Scientific Methodology Approach Used

Phase 1-Selection: This phase involves obtaining the T-20 cricket game dataset from espncricinfo.com website. This is very first and important phase of the KDD approach, here it involves finding and selecting the cricket data that is suitable for the project.

Phase 2-Processing: This is second phase of the KDD approach, where the cricket data that has been collected is then cleaned which means the unwanted data is removed only the data that is required for the project is kept.

Phase 3-Transformation: This is the third step of the KDD approach, as it requires to take the clean set of the data which is produced by second phase and convert it in the form of better data which can include reducing the dimension and then save it a CSV file.

Phase 4-Data Mining: this very important phase of the data, here the discovering of the important information from large sets of data is derived such as matches won, played and lost by a country. Techniques such as Linear Regression, Multi Regression and Polynomial Regression, Decision tree, KNN and Support Vector Machine is used.

Phase 5-Interpretation: The results are visualised in Tableau.

3.2 Project Design Diagram

The design diagram below (figure 3) describes how the data analyst is going to interact with the dashboard, how the query is sent and returned. It helps us to better understand how the whole process is working and how each component is interacting together.

The benefit of having this diagram is that it will help to stay focus on the behaviour of the project.

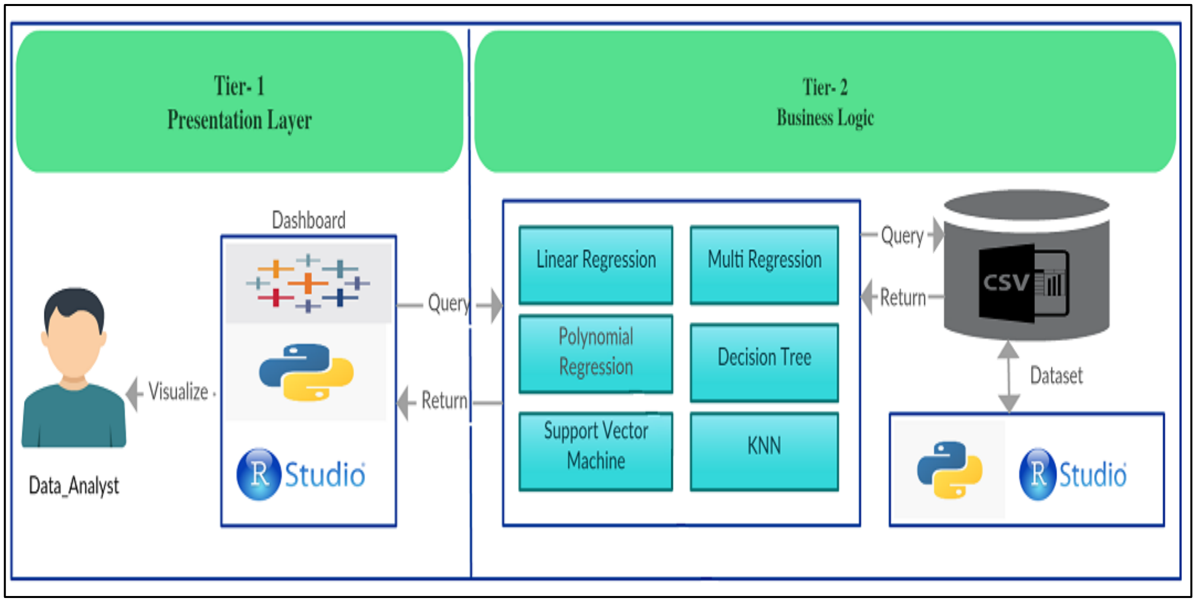


Figure 3: Design Diagram

4 Requirement Specifications, Feature Selection and Data Preparation

4.1 Requirement Specification

This section of the project includes all the requirement that are necessary for the progression, as the project continues, some requirement may be affected due to dropping of a functionality or adding more. The explanation for the changes will be provided.

4.2 User requirements definition

A requirement describes how software/product works and what qualities it must have to attract the users. For this project, the analysis must be performed. The result must be shown on a visualization application such as Tableau in way so the user can easily interact, this will be achieved by creating a dashboard on Tableau. After completion of the project user must be able to access the dashboard, perform analysis on player, check best player of the year, predict match result, predict future of a player based on its performance.

To achieve these requirements, analyses on Indian T-20 Cricket match should be performed so the data can be used to determine performance of a team and probability of wining the match. Also, this will be able to show if there is any relationship between player's performance in matches and result.

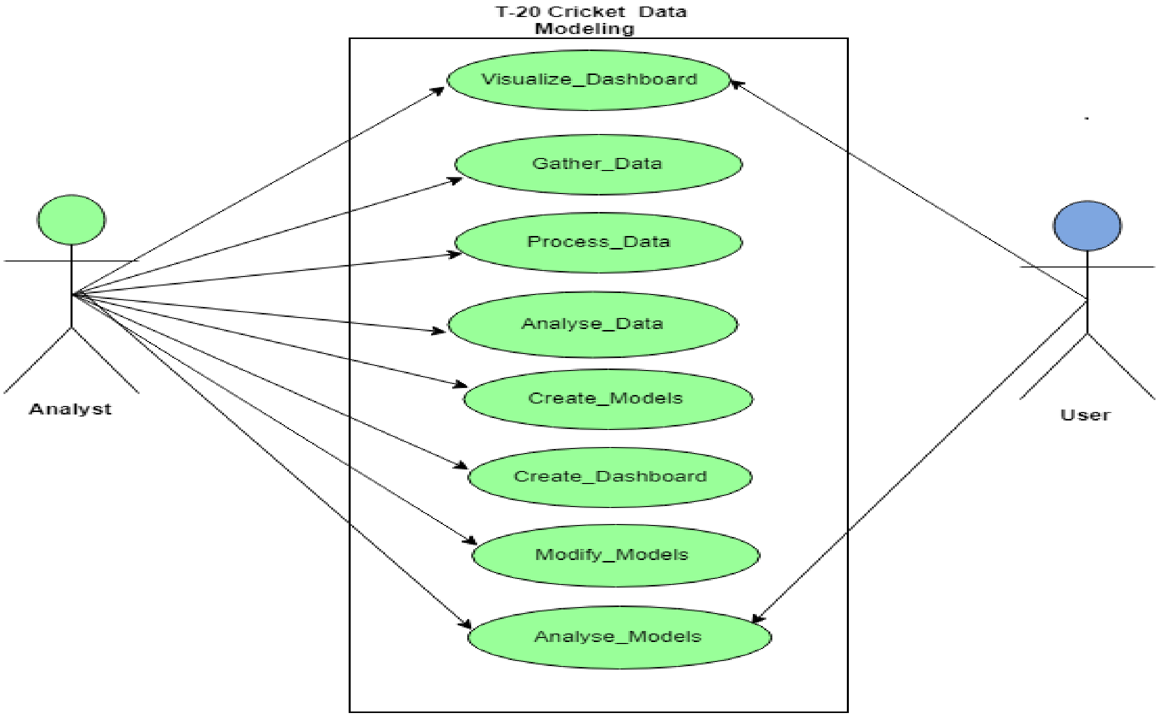
The objective will be to gather datasets on players and the matches, cleaning the datasets and extracting information such as player score, name, number of matches won/loss and team information. The websites such as espncricinfo.com.

4.3 Functional requirements

The functional requirement for the project are required to complete are the following:

1. The analyst gathers the data from the website.
2. The analyst cleans the data.
3. The analyst analyses the data.
4. The analyst creates prediction data model.
5. The analyst creates a dashboard for end user with functionalities such data analysing.

Use case diagram



Requirement 1: Gather Data

Description & Priority

This is the first and the most important requirement of the project because without data, analysis cannot be performed, therefore gathering the data plays an important role in this project. The data can be fetched using R or Python language.

Use Case

The analyst accesses the websites and develop a script in RStudio to fetch and export the data in form of CSV files.

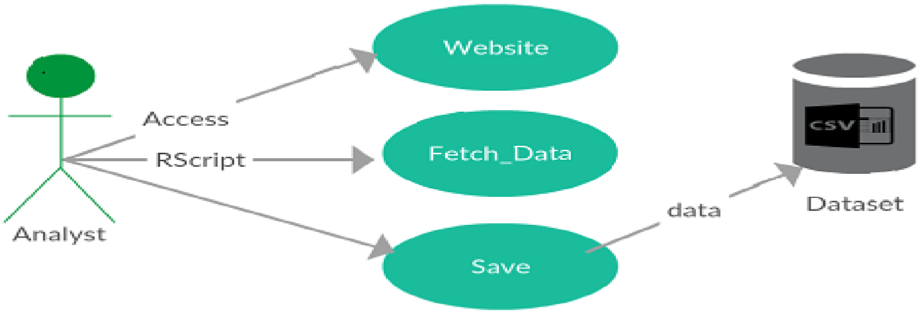
Scope

The scope of this use case is to gather data using website espincricinfo.com.

Descripti

This use case describes the process of analyst gathering data that is essential for the project via website using R.

Use Case Diagram



Flow Description

Precondition

The analyst must access to the website and R studio to fetch the data using RScripts.

Activation

This use case starts when the analyst accesses the data with the help of internet and programming application such as R/Python.

Main flow

1. The analyst identifies data on website.
2. The analyst scraps the data using R or Python.
3. The analyst saves the data to a database e.g. Excel.

Exceptional flow

E1: Errors occurs

1. The website gives an error that dataset is corrupted.
2. The analyst identifies the problem.
3. The use case continues at position 1 of the main flow.

Termination

The data from the website is gathered and saved into a database. After completion of the task use case is terminated.

Post condition

The process goes into a wait state as the datasets are imported and wait for its use.

Requirement 2: Processing Data

Description & Priority

This is the next requirement of the project after the first one, I would consider this as the 2nd important requirement as it involves cleaning the data by eliminating unwanted data such as outliers, null and keeping data that is relevant for performing analysis.

Use Case

The Analyst retrieves the data that is gathered and eliminate unwanted data.

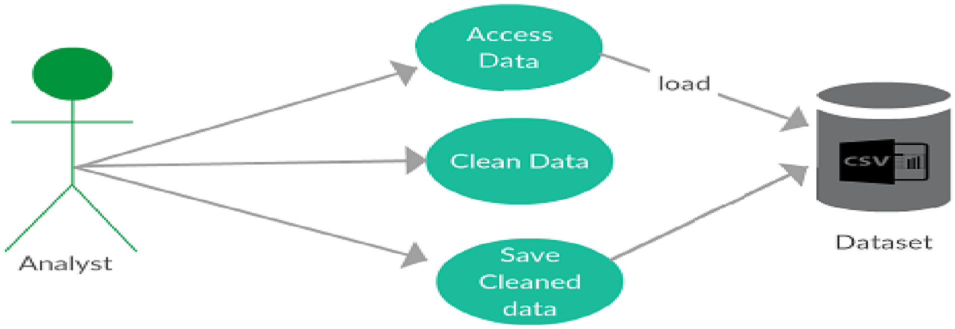
Scope

The scope of this use case is to clean and remove the data that is not required and the data that has potential to prevent us from achieving accurate result.

Description

This use case describes how the data is cleaned for the project to be successful.

Use Case Diagram



Flow Description

Precondition

The data set that is gathered must be in a wait state that is to be loaded using Rstudio or Python.

Activation

This use case starts when an Analyst access the programming application such as R or Python.

Main flow

1. The Analyst access the programming application.
2. The Analyst loads the dataset from database e.g. Excel.
3. The Analyst start cleaning the data with the help of programming application and creates new data that is needed.
4. The Analyst saves the cleaned data to the database.
5. The Analyst exits the programming application.

Exceptional flow

E1: Unable to retrieve dataset
1. The system is not able to load dataset.
2. The Analyst tries to find the cause of the problem and correct it

3. The use case continues at position 2 of the main flow.

Termination

After the cleaning is performed the system terminates.

Post condition

The process goes into a wait state as the new dataset wait for its retrieval.

Requirement 3: Analyze data

Description & Priority

This requirement plays an important role when it comes to analyzing data, I would consider this requirement to be level 3 priority as it comes after all other step such as extracting, cleaning and mining. The purpose of this requirement is to analyses and understand the data.

Use Case

The analyst accesses the database and start to analyses the data and record the data.

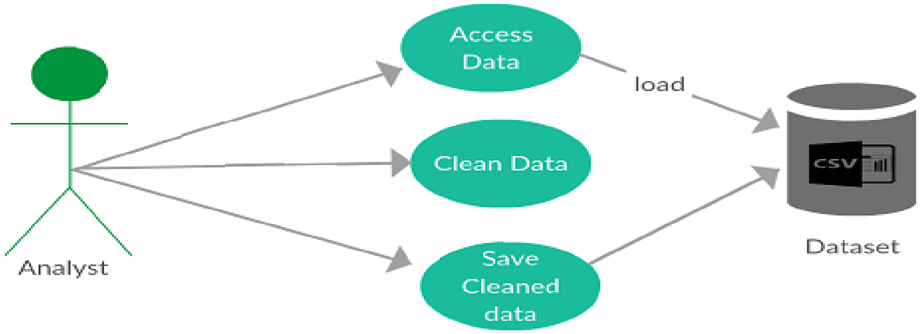
Scope

The scope of this use case is to perform analysis and record the results.

Description

This use case describes how the analyst perform the analysis on the data using a programming language.

Use Case Diagram



Flow Description

Precondition

The process is in initialisation mode waiting for the analyst to load data from the database.

Activation

This use case starts when an Analyst access the programming application, loads the data from the database.

Main flow

1. The analyst loads the data.
2. The analyst run analysis on dataset using programming application.
3. The analyst record the result of the analysis.
4. The analyst saves and exits the programming application.

Exceptional flow

E1: Unable to examine data
1. The application is unable to perform analysis due to unknown reasons.
2. The analyst checks the database, script and correct errors.
3. The use case continues at position 2 of the main flow.

Termination

The analysis is performed successfully and recorded. The use case terminates.

Post condition

The process goes into a wait state for next step to be performed.

Requirement 4: Create Models

Description & Priority

This is the next requirement of the project after the analyzing the data, I would consider this as the 4th important requirement as it involves developing model using machine learning algorithms.

Use Case

The analyst accesses the data that and start performing machine learning algorithms.

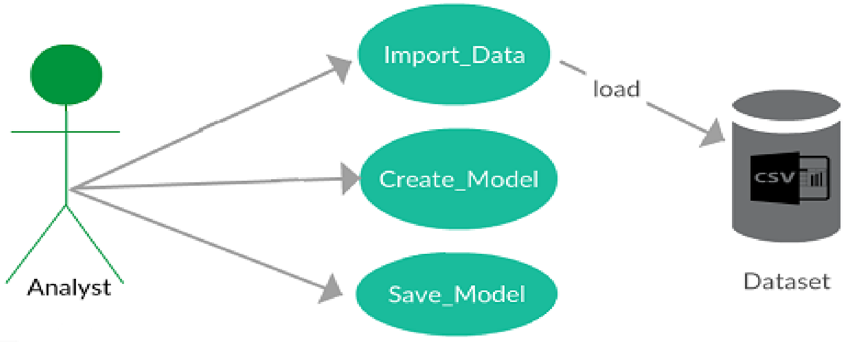
Scope

The main goal of this use case is to create prediction and classification model for Indian cricket team and the opponents.

Description

This use case describes the how analyst performs different machine learning algorithm to create models.

Use Case Diagram



Flow Description

Precondition

The data set that is cleaned and merged must be in a wait state that is to be loaded.

Activation

This use case starts when an analyst accesses the programming application such as R and Python.

Main flow

1. The analyst accesses the programming application.
2. The analyst loads the dataset from database e.g. Excel.
3. The analyst start applying algorithms with the help of programming application and creates models.
4. The analyst saves the scripts for future use.
5. The Analyst exits the programming application.

Exceptional flow

E1: Incorrect algorithm used

1. The programming application cannot output results due to incorrect algorithm used.
2. The analyst checks the fault and fix it.
3. The use case continues at position 3 of the main flow

Termination

After the analyst exits the programming application.

Requirement 5: Visualize

Description & Priority

This requirement is important from both user and analyst point of view as it can be used to visualize and make prediction on data that is analyzed. I would consider this requirement to be level 5 priority because it is the final step and before concluding this it requires all other four requirements to be completed.

Use Case

The analyst accesses the clean and merged data from database and import the data into Tableau.

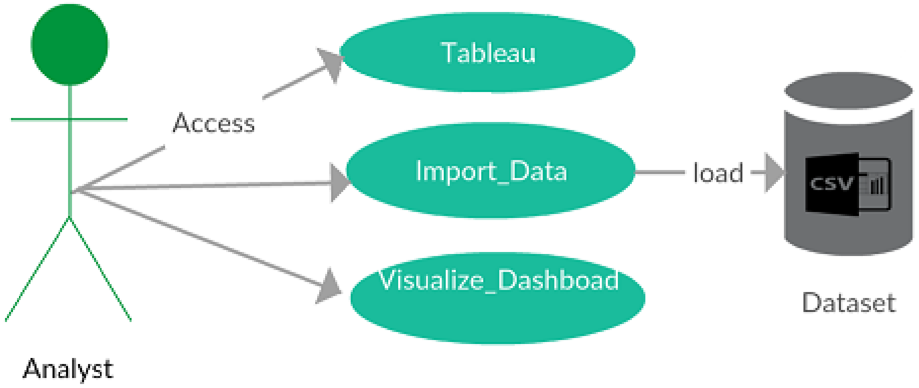
Scope

The scope of this use case is to predict performance of a team, player and others that is related to this data via visualization.

Description

This use case describes how analyst use its knowledge to predict and visualize the information related to team performance.

Use Case Diagram



Flow Description

Precondition

The analysed dataset is in waiting state and ready to be used for the last step of the project.

Activation

This use case starts when analyst access the application and import data from database.

Main flow

1. The analyst import data from the database.
2. The analyst uses Tableau for visualisation.

3. The analyst documents the results of the visualisation.
4. The analyst sends the data to dashboard for the user to view.
5. The analyst saves the data and exits the application.
6. Analyst exits the dashboard.

Termination

The analyst terminates the application when the task of visualisation is completed and documented.

4.4 Non-Functional requirements

In this section the non-functional requirement are discussed for the project.

4.4.1 Performance/Response time requirement

This requirement is very highly prioritising by many businesses as they want to keep their customer happy and informed. The dashboard that is created for the user should run smoothly and should not take more that 1-2 seconds to respond to the user's demands e.g. if the user want to perform analysis for listing the top player, it should be quick and easy.

4.4.2 Availability requirement

As dashboard, will be connected to the internet therefore there should be any downtime, which it should always be available to access from anywhere and anytime. E.g. the when the user search for viewing the dashboard it should show up and doesn't give a message that it is not available.

4.4.3 Recover requirement

This requirement is high priority for the project, make sure the data is saved in two places one on hardware and other in cloud, in the event of hardware failure or server errors. The second storage can be accessed and data can be retrieved. The backup of all the data is necessary.

4.4.4 Robustness requirement

This requirement is good have as it make sure everything is working properly. E.g. if one part of the script gives an error, it doesn't depend on just one script therefore it switches to other script that have similar capability to perform a certain task.

4.4.5 Security requirement

The project should be secure, to provide security for the project, I will be using filter feature which is available on Tableau, it allows analyst to select what information can the user view and from which region e.g. analyst can select only region India can view detail report of Indian cricket player.

4.4.6 Reliability requirement

The data set are gathered from secured website espncricinfo.com, as we know they are updated from time to time and maintained. When the new data is updated about a recent cricket match or a player, the aim of this project should be to provide reliable and accurate figures that can be trusted by the users.

4.4.7 Maintainability requirement

The project requires to be maintained as the datasets can cause some small error which can be easily corrected. The dashboard should be simple and easy to maintain.

4.4.8 Portability requirement

The project should be portable, the dashboard should be available for different device such as mobile phone and computers. By doing this user can access it anywhere and any device.

4.4.9 Extendibility requirement

This project needs to expandable, as the data changes over a period of time and new way of performing task is developed therefore algorithm that can be extended is very useful. Overall the project should be able to cater for changes.

4.4.10 Reusability requirement

This requirement is very important, different type of analysis will be performed on different data set but the concept and the algorithms doesn't change much therefore python script and R script can be used again and again.

4.4.11 Resource utilization requirement

Hardware such as a computer, with the internet access, backup storage such as cloud based GitHub, Google drive will be used and Tableau for visualising.

4.4.12 Environmental requirement

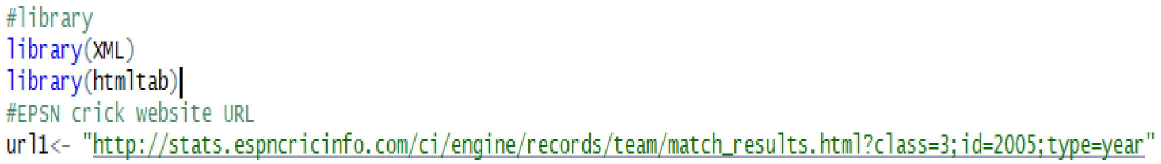
The project needs to be developed in way so it does not have effect on the environment e.g. physical, social and organizational. The dashboard should be accessible for everyone and privacy of the client is necessary. To help user better understand the analysis a support must be provided by having help and support option.

4.4.13 Usability requirement

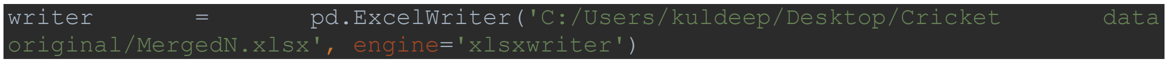
The project aim should be clearly focus on the usability, as this is where the user will be interacting with data. The simple option for selecting data and performing analysis should be provided to the user so it doesn't confuse or prevent them from using the dashboard.

4.5 Data Preparation

The data is downloaded from espncricinfo.com website using Rscript and it is exported in the form of CSV files. The PyCharm is then used to discover and combine the data. Later to make sure data cleaned, the cleaning is performed in RStudio.



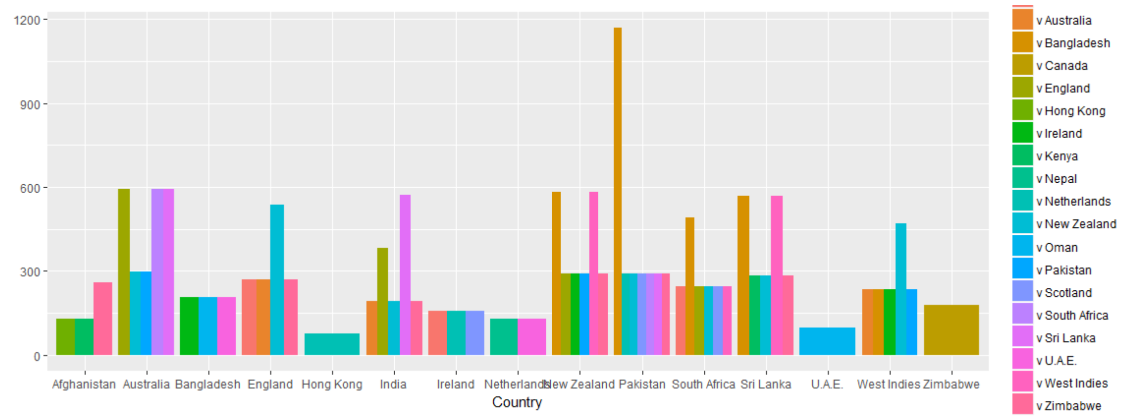
```
#library
library(XML)
library(htmltab)
#EPSN crick website URL
url1<- "http://stats.espncricinfo.com/ci/engine/records/team/match_results.html?class=3;id=2005;type=year"
```



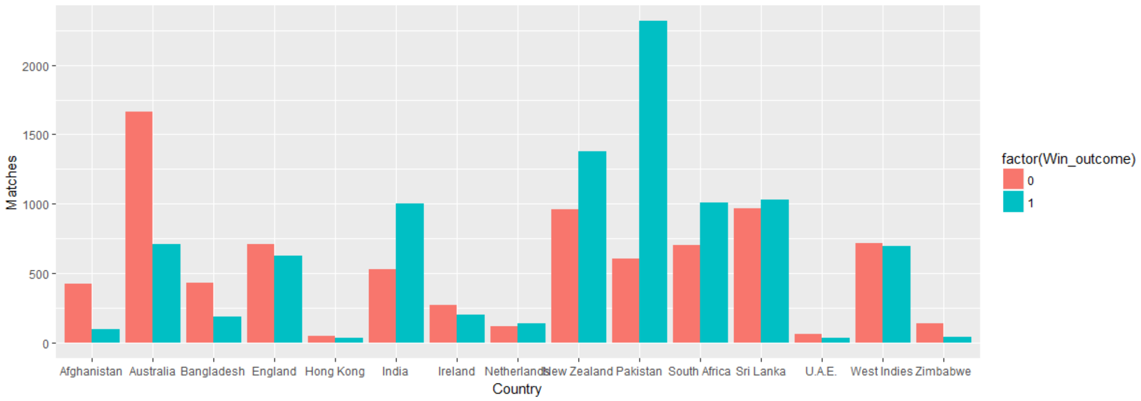
```
writer = pd.ExcelWriter('C:/Users/kuldeep/Desktop/Cricket data original/MergedN.xlsx', engine='xlsxwriter')
```

The data contains 41 columns including country, team matches played, points ratings etc. next unwanted columns, outlier and null values are removed. Also, the summary of the data is checked. Then the file is again saved as a clean file. To understand more about the data, the density plot code is run to see the flow of the data, also Cullen and Frey graph is used to see if there is any imbalance class.

4.6 Data Analysis and Feature Selections

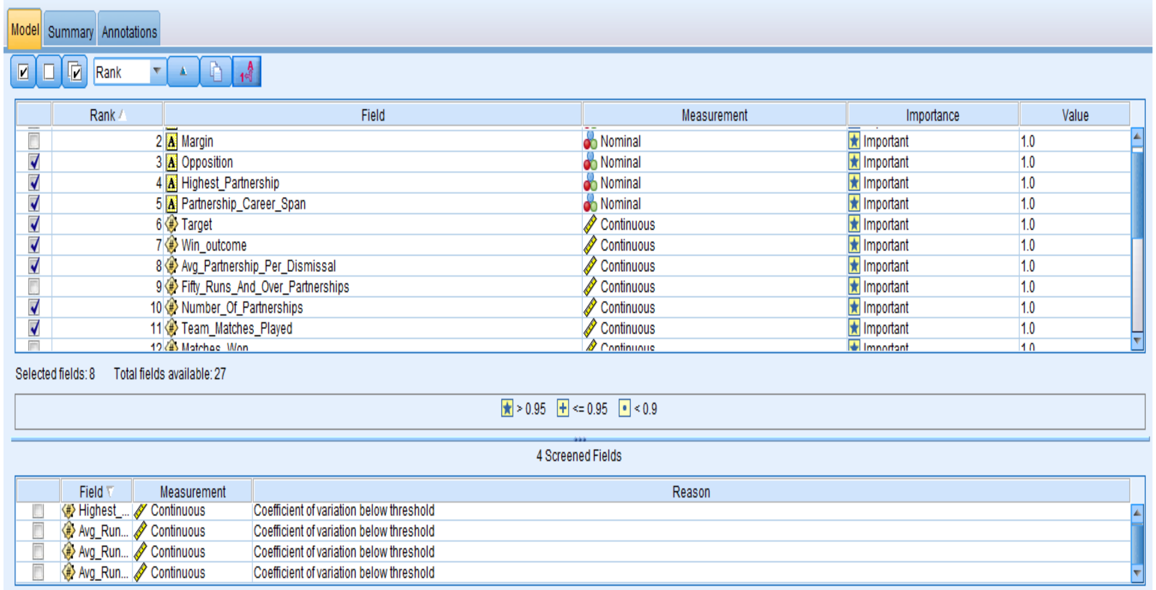


The chart above shows countries and opposition they have played with.



The winning team and matches the team has played is shown in the graph above. Winning is considered as 1 and losing 0. Checking the data win outcome.

After analysing the feature are selected. The selected features are selected and the SPPS is used to gain more understanding about the feature that can used when creating the models.



	Rank	Field	Measurement	Importance	Value
□	2	Margin	Nominal	Important	1.0
☑	3	Opposition	Nominal	Important	1.0
☑	4	Highest_Partnership	Nominal	Important	1.0
☑	5	Partnership_Career_Span	Nominal	Important	1.0
☑	6	Target	Continuous	Important	1.0
☑	7	Win_outcome	Continuous	Important	1.0
☑	8	Avg_Partnership_Per_Dismissal	Continuous	Important	1.0
□	9	Fifty_Runs_And_Over_Partnerships	Continuous	Important	1.0
☑	10	Number_Of_Partnerships	Continuous	Important	1.0
☑	11	Team_Matches_Played	Continuous	Important	1.0
□	12	Matches_Won	Continuous	Important	1.0

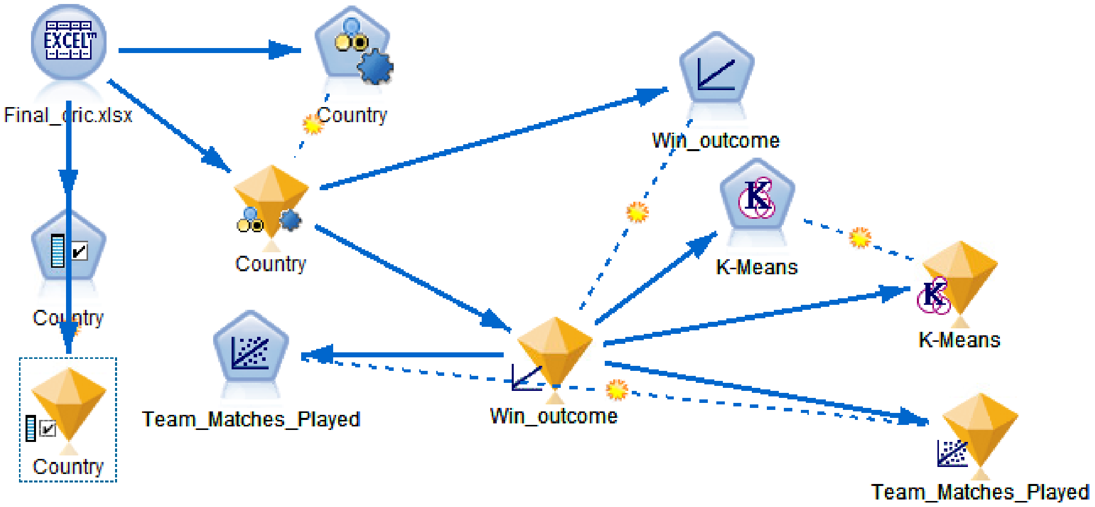
Selected fields: 8   Total fields available: 27

★ > 0.95 + <= 0.95 • < 0.9

4 Screened Fields

	Field	Measurement	Reason
□	Highest_...	Continuous	Coefficient of variation below threshold
□	Avg_Run...	Continuous	Coefficient of variation below threshold
□	Avg_Run...	Continuous	Coefficient of variation below threshold
□	Avg_Run...	Continuous	Coefficient of variation below threshold

Before proceeding to the next step which involves developing models, SPSS is used check what type of model are suitable for the data.



In the diagram above, it shows how data which is in the form of xlsx is used to determine the features, auto classifier is used to see the types of model that can be performed on the dataset. Testing the model is checked here to avoid failure of the model in during the later stage.

5 Implementation, Evaluation and Results of T-20 Cricket Models

5.1 Introduction

In this section of the paper all the six model that are developed are described.

5.2 Linear Regression Prediction Model

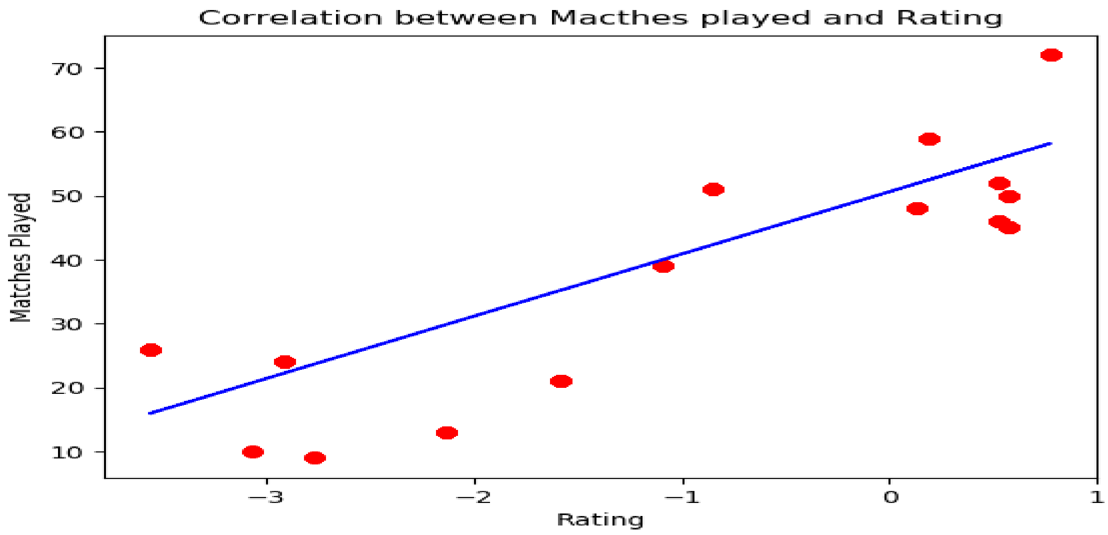
Linear regression is very popular predictive modelling technique that is widely used by data analyst. There are many linear regression, this is considered as the best one. Before going into more details about linear regression, regression analysis must be understood. Linear analysis is like modelling technique, which is also used find relationship between variables. In this project, for example it can be performed on matches played and rating to see, when more matches are the rating goes up or down. The reason for using this is that it provides analysis on relationship between two attributes. The linear model can be performed on continuous or discrete variables. The line which is seen in the regression model is called best fit straight line. The equation $Y=a+b*X+e.$ and it only has one independent variable. For obtaining best line the formula below is used which is minimise the sum of squares.

$$\min_{w} ||Xw - y||_2{}^2$$

5.2.1 Implementation

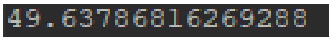
This very first model which is created using Python, the very first step involves installing the packages such as glob, os, pandas, np and then they are imported within the script to successfully run the code. The cleaned data is loaded into the data frames starting from 0 to all the way to 12. To see the data has been loaded small code such as “print (df8.head)())” is used. The merged data which is named as “Merge4” in the python script data is split into training (20%) and testing (80%) randomly. The next step involves feature scaling which basically compute mean and standard deviation that can be used to see average matches won by team and their ratings. Overall the main aim of this is to view the distribution whether it is normal or not normal, if it is not normally distributed or skewed further scaling is completed on train and test dataset. After having that completed, next step is to develop a prediction model which can help to predict future value. The liner regression code is run on the training and test, then standard root mean square is calculated to see how well it has performed. Finally, two attributes are chosen one “Matches played” and other “Rating” to see whether the number of matches has relationship with rating. Also, the scatter plot is created to visualise clearly.

5.1.2 Evaluation and Results



The linear diagram above shows the number of matches played and the relationship between the ratings. We can the more matches the team plays, the rating increases whereas the less matches the rating decreases.

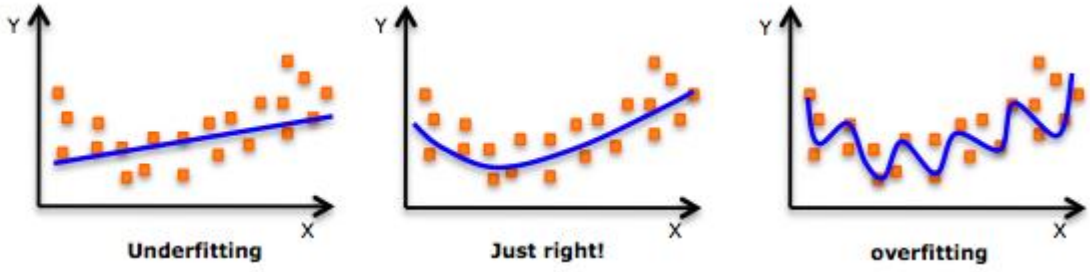
For evaluation the 49.64, this show the spread of the around the which ok but not good. More improvement is needed, the prediction needs to trained and tested again for producing the better results.



```
49.63786816269288
```

5.3 Polynomial Regression Model

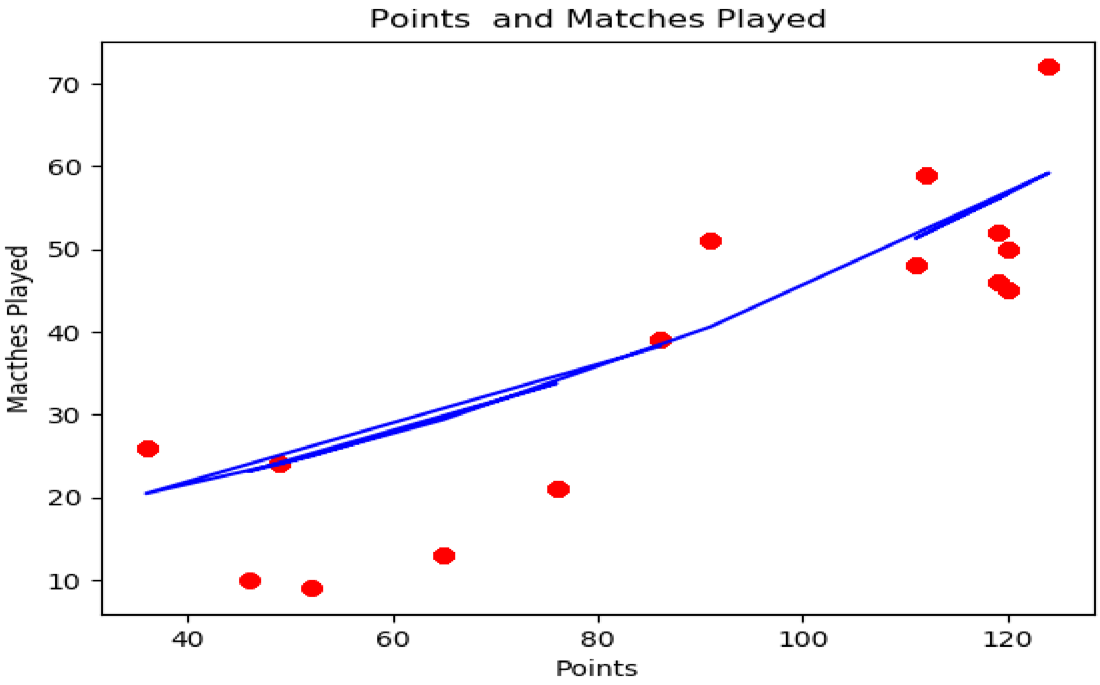
This is another very popular regression used by data analyst, it is calculated using the equation, y =a+b*x^2, however the best fit line in this one is curved not a straight like linear. The figure below shows how to read the charts properly, as we can the first on the left is underfit, in the middle just right and the last one on the right overfit.



5.3.1 Implementation

This is the second model developed in Python, again like the linear regression model the packages are installed, working directory is set and data is loaded to perform the polynomial regression. Before adding the code for polynomial regression, little data exploration is completed to understand data and determine which attribute can be used. Again the "Merged4" is used, therefore data is split into test (20%) and train (80%) randomly. The next step like the above one feature scaling is used to compute and see mean and standard deviation, that tell us distribution of the data. Finally, the prediction model polynomial is developed by running the code for polynomial regression and then the code for fitting the data is run and finally the visualization using the plot diagram is used.

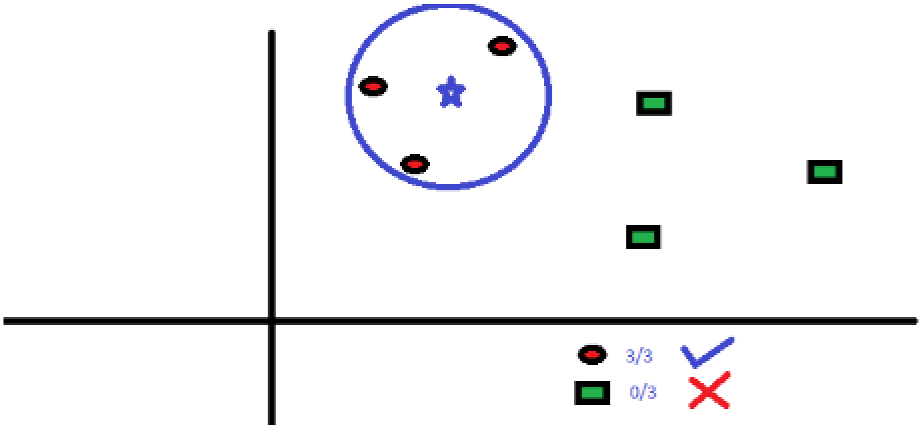
5.3.2 Evaluation and Results



The diagram above shows correlation between matches played and points we can clearly see the data is underfitted, not much information can determined from the chart above, it shows as number of the matches are played by team members the points tend to increase like the ratings which is common in real world situation because the more match the team plays and wins it the points are likely to increase.

5.4 K- Nearest Neighbors

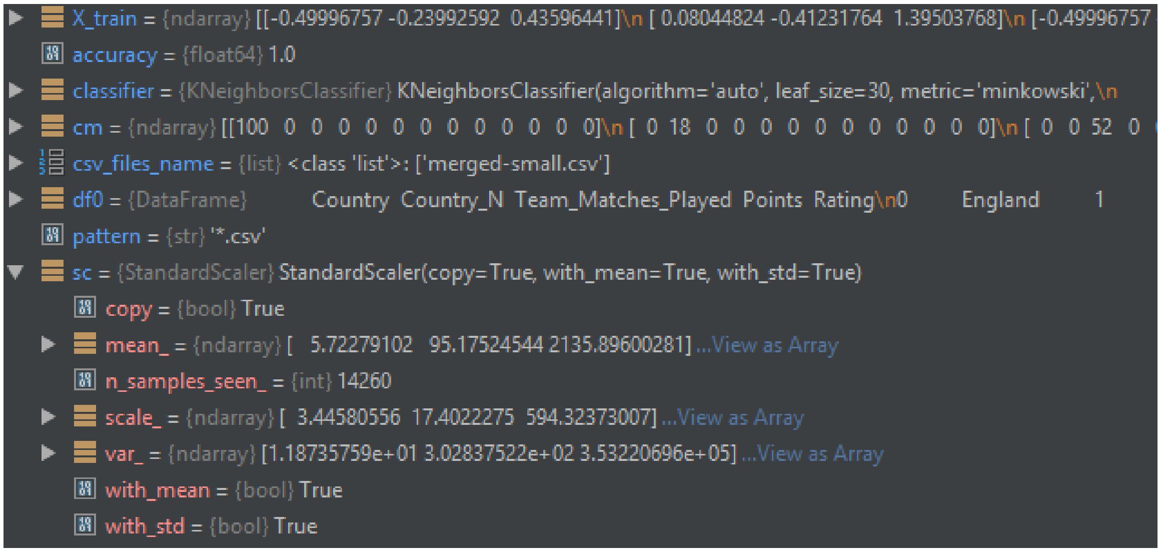
This is one of the mostly used algorithm in data analytics field due to its ability to perform classification and regression prediction. It very powerful and yet easy to interpret, basically it works by detecting the nearest attributes and presumes that they belong to same class if one different element is found with a similar group. Setting a k value plays an important role as it only check the data within that field. Setting k value too low and too high can cause problems. Setting a K-values depends on the dataset but normally it should be between 3 and 10. For example in the diagram below k is set to 3 so it only looks within a circle, where if we were to set it to 6 it would expand the circle.



5.4.1 Implementation

This is the third model developed using Python, as a first step the data is loaded, the attributes on which KNN is to be performed are selected, the data is then split into the train (20%) and test (80%). The feature scaling is used again and the Euclidean distance is calculated to see the distance between the test and train data. After this, prediction on the test data is encoded to see classification of the closest values and then finally, the accuracy a of train and test is completed.

5.4.2 Evaluation and Results

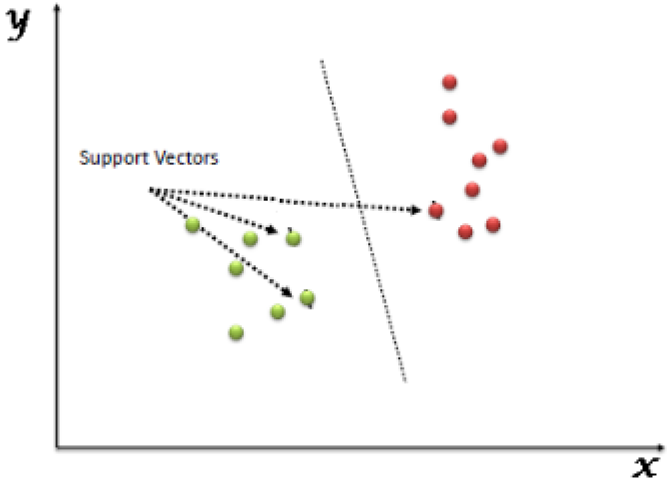


```
▶ X_train = {ndarray} [[-0.49996757 -0.23992592  0.43596441]\n [ 0.08044824 -0.41231764  1.39503768]\n [-0.49996757
  accuracy = {float64} 1.0
▶ classifier = {KNeighborsClassifier} KNeighborsClassifier(algorithm='auto', leaf_size=30, metric='minkowski',\n
▶ cm = {ndarray} [[100   0   0   0   0   0   0   0   0   0   0   0]\n [  0  18   0   0   0   0   0   0   0   0   0   0]\n [  0   0  52   0
▶ csv_files_name = {list} <class 'list'>: ['merged-small.csv']
▶ df0 = {DataFrame}        Country  Country_N  Team_Matches_Played  Points  Rating\n0       England        1
  pattern = {str} '*.csv'
▼ sc = {StandardScaler} StandardScaler(copy=True, with_mean=True, with_std=True)
      copy = {bool} True
    ▶ mean_ = {ndarray} [   5.72279102   95.17524544 2135.89600281] ...View as Array
      n_samples_seen_ = {int} 14260
    ▶ scale_ = {ndarray} [  3.44580556  17.4022275  594.32373007] ...View as Array
    ▶ var_ = {ndarray} [1.18735759e+01 3.02837522e+02 3.53220696e+05] ...View as Array
      with_mean = {bool} True
      with_std = {bool} True
```

The code above in figure shows the accuracy is 1.which mean it is 100% accurate and mean of the attributes are 5.77222 and 95.17 etc. the sample which knn is performed is 14260.

5.5 Support Vector Machine

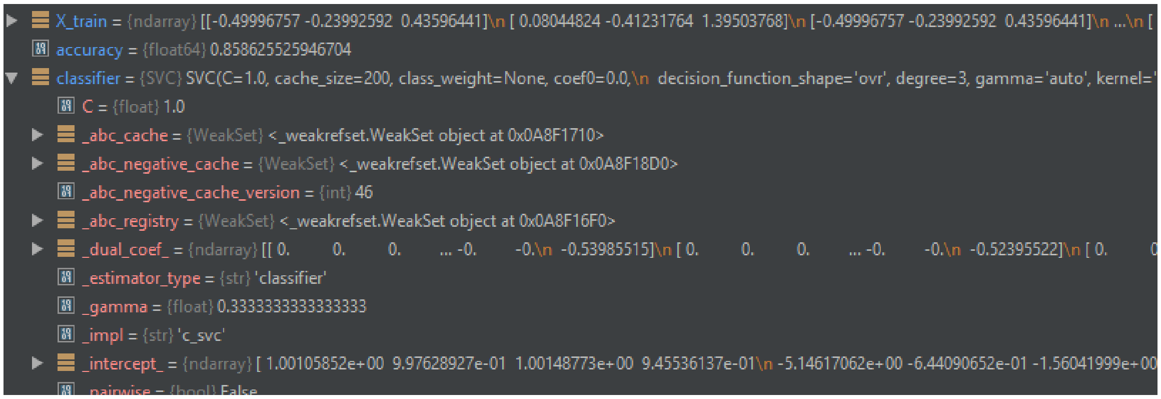
The Support Vector Machine is gaining popularity after Naïve Bayes, Random Forest, this is a supervise machine learning algorithm. This is one of the best algorithm as it has the ability to classify and similar functionality regression which is mentioned above two. The hyperplane is used to separate the classes. Like the graph show below, that is how the two classes are differentiated using hyperplane, there are many other it can have divided the two classes, which is completed by adding one or more hyperplanes. The advantage of using SVM works good with clear margin. It is effective and the disadvantage is that it does not perform good on large dataset or if the data has too much outliers.



5.5.1 Implementation

This is the fourth model, which is created using Python, here the data is loaded, then it is split into train (20%) and test (80%), feature scaling is completed then the Linear Support Vector Machine is used for classification to compare more of elements. Predict linear classification code is encoded to see the classification on sample. Polynomial Support Vector Machine is also used to get better understanding of the data and how it is classified from different point of view. Again, prediction code is encoded to see the classification, then finally, to output the result confusion matrix is developed and accuracy is shown.

5.5.2 Evaluation and Results



```
X_train = {ndarray} [[-0.49996757 -0.23992592  0.43596441]\n [ 0.08044824 -0.41231764  1.39503768]\n [-0.49996757 -0.23992592  0.43596441]\n ...\n [
accuracy = {float64} 0.858625525946704
classifier = {SVC} SVC(C=1.0, cache_size=200, class_weight=None, coef0=0.0,\n  decision_function_shape='ovr', degree=3, gamma='auto', kernel='
    C = {float} 1.0
    _abc_cache = {WeakSet} <_weakrefset.WeakSet object at 0x0A8F1710>
    _abc_negative_cache = {WeakSet} <_weakrefset.WeakSet object at 0x0A8F18D0>
    _abc_negative_cache_version = {int} 46
    _abc_registry = {WeakSet} <_weakrefset.WeakSet object at 0x0A8F16F0>
    _dual_coef_ = {ndarray} [[ 0.         0.         0.        ... -0.         -0.\n  -0.53985515]\n [ 0.         0.         0.        ... -0.         -0.\n  -0.52395522]\n [ 0.         0
    _estimator_type = {str} 'classifier'
    _gamma = {float} 0.3333333333333333
    _impl = {str} 'c_svc'
    _intercept_ = {ndarray} [ 1.00105852e+00  9.97628927e-01  1.00148773e+00  9.45536137e-01\n -5.14617062e+00 -6.44090652e-01 -1.56041999e+00
    _pairwise = {bool} False
```

The figure above shows result of the SVM with accuracy of 0.86% which is very good, this means we are able sure that 86% the prediction would be correct.

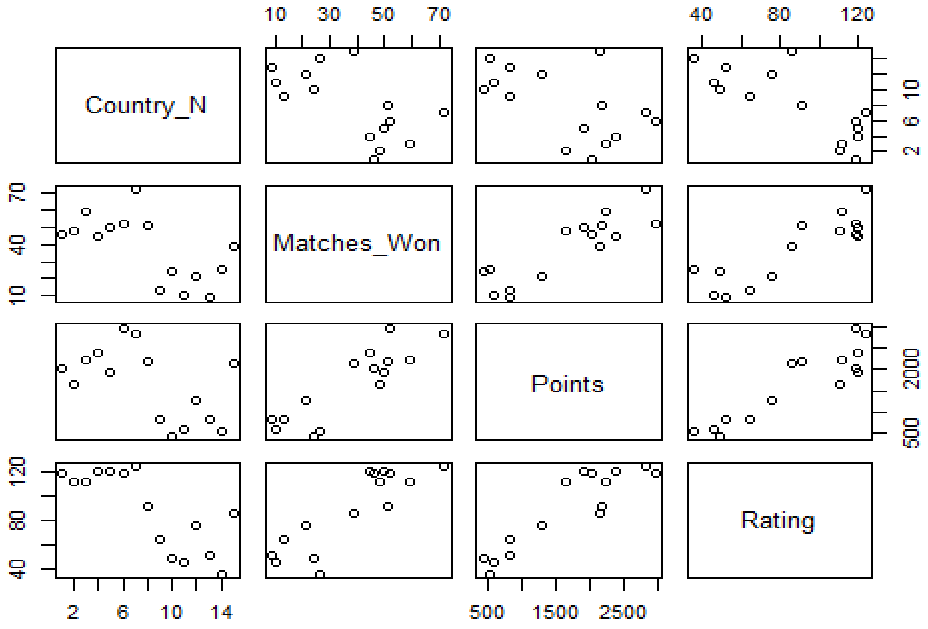
5.6 Multilinear Regression Model

The Multilinear regression is same as linear regression the only difference is that it has is there are more than one independent variable.

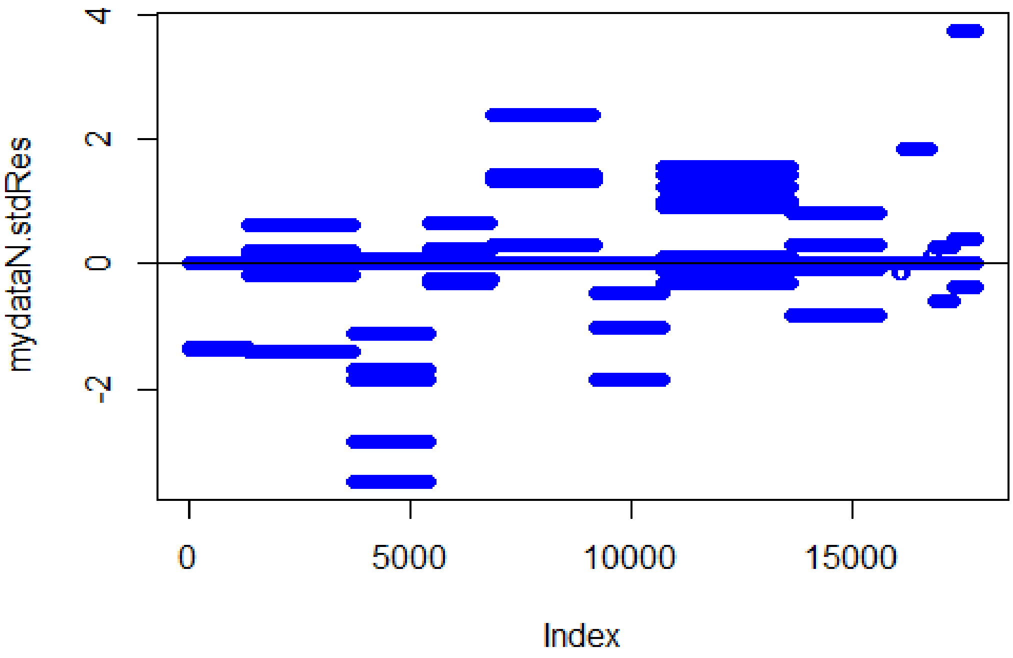
5.6.1 Implementation

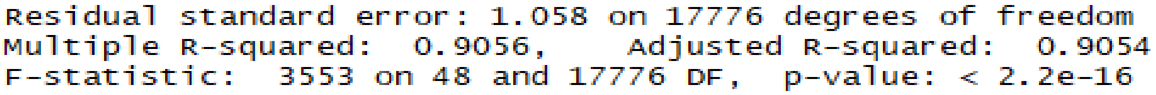
This is the fourth model that is developed using R, the file this time is read in RStudio, the correlation between the attributes is checked e.g. country, matches won, points, ratings. The next step involves pairing the correlation and create a scatter plot to see the relationship between the listed attributes. The model is then created, after that the residuals are checked and they are plotting to gain better understanding, when all the step of above is completed a quick code for checking the normality of is encoded to see whether the results are normal or not.

5.6.2 Evaluation and Results



In the figure above the high correlation between Matches_won and Points, Rating. Three of these are highly related to each other which makes sense, if a team wins matches the points and rating is likely to go up.



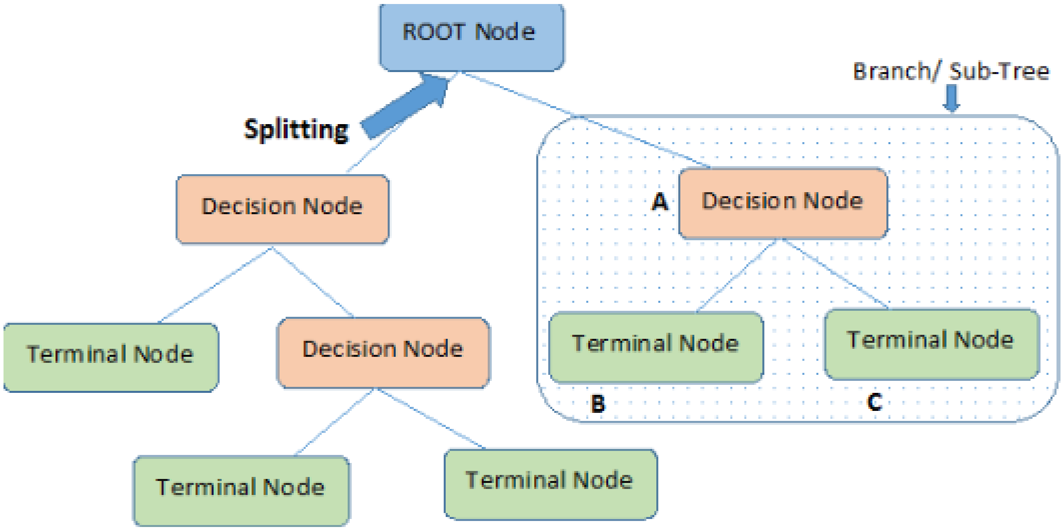


```
Residual standard error: 1.058 on 17776 degrees of freedom
Multiple R-squared:  0.9056,    Adjusted R-squared:  0.9054
F-statistic:  3553 on 48 and 17776 DF,  p-value: < 2.2e-16
```

The p- value is less than alpha value of 0.05 which means the there is a significant difference between country, matches won, points and rating. Therefore reject the null hypothesis which state that there is no difference between the groups and are in favour of alternative hypothesis which state that there is a significant difference between the country, rating, points and matches won.

5.7 Decision Tree

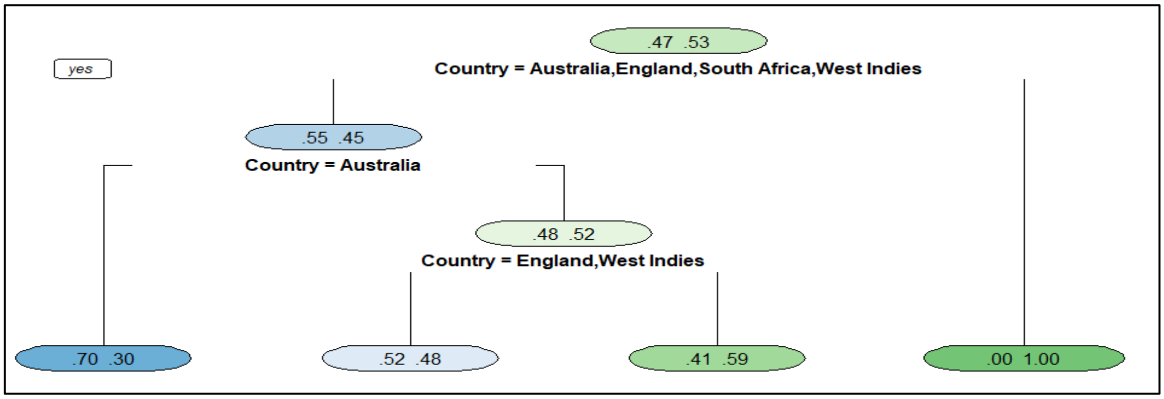
Decision tree is normally used to classify problems. Basically, it works by pre- defining what needs to be completed that is why it is called supervised algorithm. It helps us to solve problems related to making decisions by providing multiple solution to the given problem. It consists of root node which is at the very top, test node and leaf for the result of the test. It is very fast, effective and less time consuming. This can be used to avoid making the errors when solving the problem. The figure below show how it splits the problems into the sub problem for making the decision.



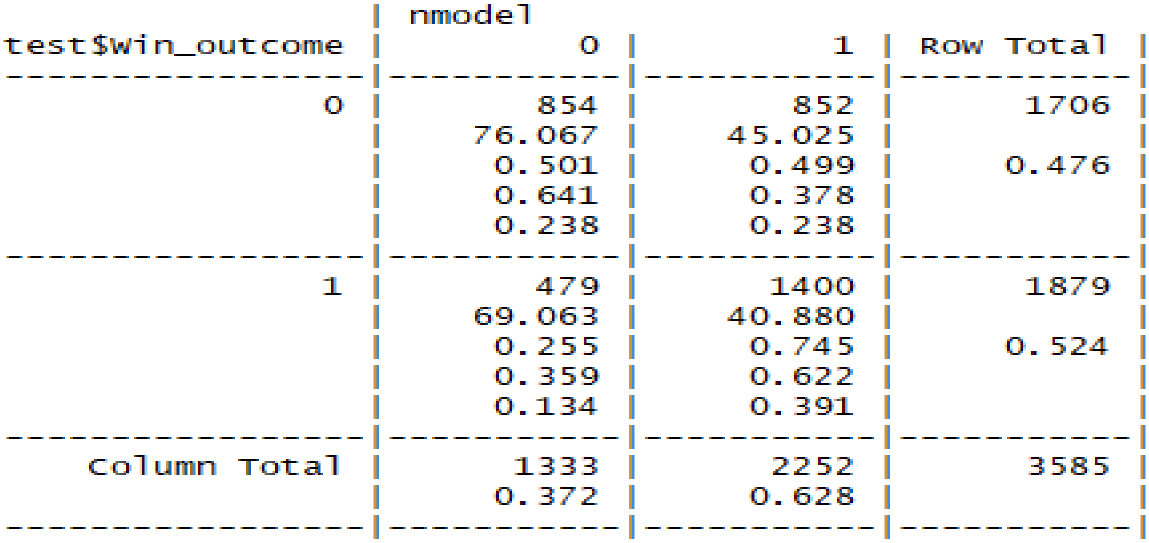
5.7.1 Implementation

This is the sixth and the last model which is also developed using RStudio, the very first step in this includes installing and running the libraries such as C50, which necessary for running developing the model, then data is normalised, min and min technique is used for normalising the data. Then the bar plot is created to see classification distribution of the attribute “Win_outcome”. After the normalisation process the data is split into tarin(20%) and test(80%), model is trained on column “6” of the data and finally the model is developed using rpart library and the confusion matrix is also developed. To improve the model, it is trained and tested again.

5.7.2 Evaluation and Results


yes
.47 .53
Country = Australia,England,South Africa,West Indies
.55 .45
Country = Australia
.48 .52
Country = England,West Indies
.70 .30
.52 .48
.41 .59
.00 1.00

```
1) root 8000 3790 1 (0.4737500 0.5262500)
  2) Country=Australia,England,South Africa,West Indies 6833 3043 0 (0.5546612 0.445
3388)
    4) Country=Australia 2368  706 0 (0.7018581 0.2981419) *
    5) Country=England,South Africa,West Indies 4465 2128 1 (0.4765957 0.5234043)
     10) Country=England,West Indies 2750 1325 0 (0.5181818 0.4818182) *
     11) Country=South Africa 1715  703 1 (0.4099125 0.5900875) *
  3) Country=New Zealand 1167    0 1 (0.0000000 1.0000000) *
```



```
                 | nmodel
test$win_outcome |          0 |          1 | Row Total |
-----------------|------------|------------|-----------|
               0 |        854 |        852 |      1706 |
                 |     76.067 |     45.025 |           |
                 |      0.501 |      0.499 |     0.476 |
                 |      0.641 |      0.378 |           |
                 |      0.238 |      0.238 |           |
-----------------|------------|------------|-----------|
               1 |        479 |       1400 |      1879 |
                 |     69.063 |     40.880 |           |
                 |      0.255 |      0.745 |     0.524 |
                 |      0.359 |      0.622 |           |
                 |      0.134 |      0.391 |           |
-----------------|------------|------------|-----------|
    Column Total |       1333 |       2252 |      3585 |
                 |      0.372 |      0.628 |           |
-----------------|------------|------------|-----------|
```

Looking at the figure above we can see 479 out of 1333 “No/0” was incorrectly classified as “Yes/1” and vice versa same in “0”. this leads to problem which is called true negative win outcome. The correctly classified are 1400 times winner therefore 479 is false negative. The result needs to be improved.

6 Conclusion and Recommended Future Work

This report shows how different data mining techniques can be used to predict the win outcome of the cricket game, this data is fetched from the cricket, due lack of data size the data is artificial generated to produce a certain size. The challenges were deciding the correct model to be used. Both R and Python are used to created models, also removing the noise from the was one of the toughest one to. The difficult in creating model occurred due to lack correct data, the result shown above are not correctly justified due to this problem. The Linear Regression, Multilinear Regression and Decision Tree however produced better result in compare to the KNN and Polynomial and Support Vector machine.

The factors such team matches played and win outcome does affect rating and points that is gained by team. The study does not correctly predict win outcome but, we can presume from the study if this is conducted on a cleaned dataset the models does have the ability produce the better, where. The finding of this are mainly dependent on the three model which performed better result, which reveals that cricket win outcome is affected many factors such as team players, number matches it has played and the number matches won.

If the team performance is consistent it is likely that is happy to the rating and points increasing whereas the team who does not perform well tend have low rating and points which affect the players. Correlation between team playing matches and rating and points increasing.

For the future, first thing that should be considered is good selection of the data because in this project the data was not realistic enough. The second aim should be to have variety of the such as male and female cricketers. If I were to do this project again I would consider performing more model that are suitable for the data to produce better result and stay focused on the project. The twitter analysis can also be performed to see player or team emotion and reaction cricket fans during the matches. Next time I would also keep in mind that evaluation part need be properly evaluated to give the reader better understand of the problem that is being addressed and solution that is provided.

The future I will also focus on writing the document properly as well coming up new ideas that can added to the project such as creating a website that allow user to access matches and perform analysis based on the data that is provided to him/her. The website can include functionality that will teach user how cricket is played before he/she wants to perform analysis. This means anyone who is not even cricket fan he/she can but want to learn about it they can so with the help of the website they can gain more understanding of the cricket matches and become interested in it so in.

Overall the I learned a lot from doing this project and will focus on improving data analyst skill and produce good result using the data mining effectively.

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7 Appendix

7.1 Project Proposal

7.1.1 Objectives

Objective 1: For the success of this project my first objective would be to find dataset of cricket matches that are played by certain teams and player over the years. I will be using the websites that are well known and provide correct information about cricket such as insights which is powered by ESPNCricInfo and it provides two decades of historical data.

Objective 2: The second objective will be focused on extracting and cleaning the dataset that are relevant to my project such as matches, players, teams. This objective is very important for my project as this requires cleaning the data therefore I would need to make sure, the correct and accurate information is gathered in order to proceed.

Objective3: My third objective will be to compare the matches, player and team performance in terms of score and result. The outcome this objective will play important role when doing analysis.

Objective 4: The fourth objective will to identify a pattern based on the results and see how team has performed over the years and what could be help them to win the match.

Objective 5: My fifth objective will be to create survey on Twitter and Facebook. As well as gathering tweets from twitter, I will also have results from survey this will make the analysis unique and help me to predict the result of a match accurately.

Objective 6: The sixth objective will be used to compare the information that I have gathered from social media, own analysis and analysis that is performed by a firm/agency.

Objective 7: The final objective will be to complete the documentation with conclusion and see how the analysis could help cricket team to improve their performance and change the game.

7.1.2 Background

The idea of doing analysis on cricket generated from my personal experience when I was talking to one of my friend about my specialization for the 4th year. I was asked a question what do data analyst do and my answer was that they perform analysis on certain information. It wasn't quite clear to him therefore I gave him an example of cricket, suppose you want to predict an outcome of a match, how would you predict it, you would need to know both team history such as player and team performance and then decide which team has higher chance of winning the match. After giving him this example it was clear to him that data analyzing require collecting, extracting and transforming. Also, show the analysis on charts or graphs so we can understand what the result of the analyzing mean.

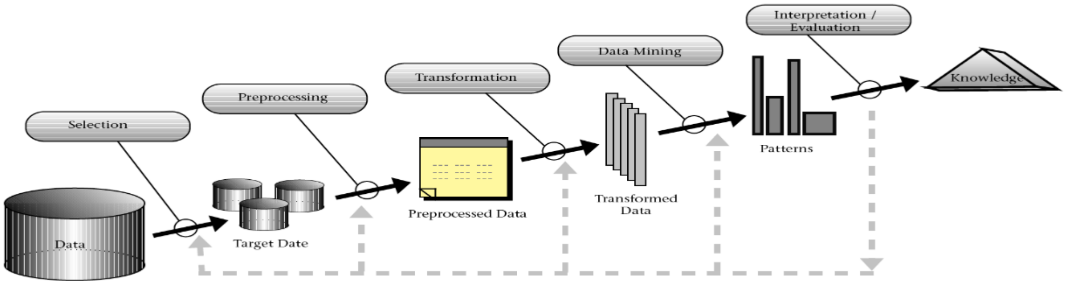
As I am a cricket fan therefore I decided, why not do this for my final year and add something to it to make it bit more interesting.

Developing this idea will allow many experts to see their player or team weakness and could help them to improve their game and help them achieve what they want. I will be gathering data from many well know cricket website that provides proper data for cricket matches and team player. I would be able to help in the real-world situation if there is a match that is being played and results of the can be determined before the match begin, as I will be taking factors such as player and team performance, also what people think from all over the. The social media, Facebook, Twitter will be used to compare data analysis against the data that is gathered from cricket websites.

Question such as who will win the match? which team has potential to win and why? what can the team manager to improve the game or change the game. There are many benefits for fans and people who like betting on players and teams. The goal of this project will be to address all the question and provide a solution to the problem and the questions. By doing this analysis it can help to better understand cricket and new way of providing better outcome using analysis and comparing them to social media.

7.1.3 Technical approach

I will be using KDD (Knowledge Discovery in Databases) because it is a process for discovering very useful information from a collection data, therefore it will help me to discover data for the cricket.



KDD includes the following approaches:

1. Selection: This is very first and important phase of the KDD approach, here it involves finding and selecting the data information that are suitable for the project and that will help me to achieve the goal of the project.

2. Processing: This is second phase of the KDD approach, where the data that has been collected it cleaned which mean the data that is not needed is eliminated and only the data that is required for the project are kept.

3: Transformation: This is the third step of the KDD approach, as it requires to take the clean set of the data which is produced by second phase and convert it in form of better data which can include reducing the dimension.

4: Data Mining: this very important phase of the data, here the discovering of the important information from large sets of data is derived. There are many techniques to be used because the data mining uses many mathematical analyses to show patterns.

5: Interpretation: this stage requires to interpret data from the records. After doing the analysis I will using this method to read and interpret data.

7.1.4 Special resource required

R Studio: It is required for fetching and exploring the data.
Python: This is required to cleaning and creating model.
Tableau: This is required to visualize the prediction model.
MySQL: It is required to store the cricket data.

7.1.5 Technical details

R Studio: I will use the R studio to extract the data from the web and to perform some analysis.

Python: The Python will be used to clean, perform cross validation and feature scaling. It will also be used to create prediction model for the project.

SPSS: This application is very popular which has the capacity to perform well, using less complex technique. So, this will help me selecting the right model for specific data.

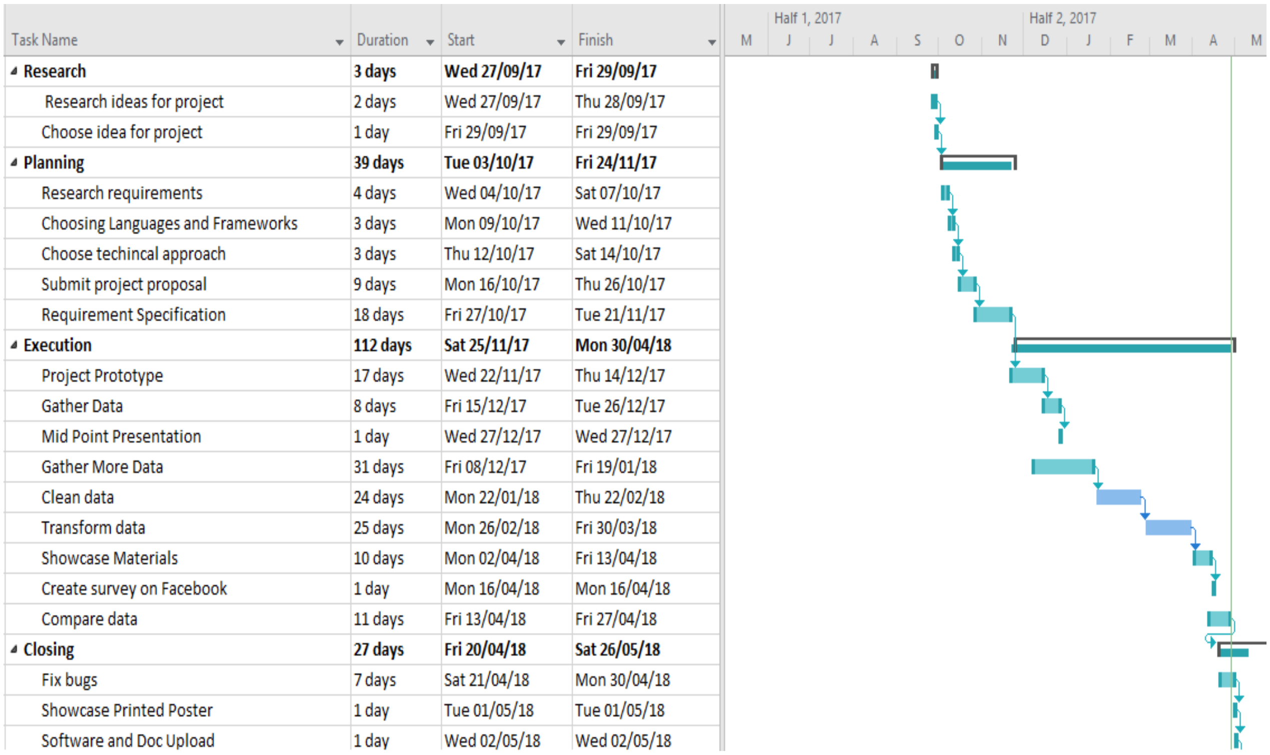
Excel: It is a spreadsheet tool this allows us to build graphs that can help me see all the data very easily therefore it can be used to change data and store the cricket information in structured way.

SQL Server: It is very popular for easy accessing and storing data, I will be using it to I access all the data from where ever I want.

Tableau: I will be using this tool to create and visualize the result of the output, it will be very beneficial to display all the work very easily.

7.1.6 Project Plan

TASK	PRIORITY	DAYS	START DATE	END DATE	DUE DTAE
Project proposal	Medium	9	17/10/2017	27/10/2017	27/10/2017
Requirement specification	Medium	18	01/11/2017	20/11/2017	24/11/2017
Gather data	Medium	Throughout project			
Project prototype	High	17	04/11/2017	25/11/2017	02/12/2017
Mid-point presentation	Medium	1	05/12/2017	05/12/2017	05/12/2017
Analyze the data	Low	Throughout project			
Showcase materials	Low	10	23/03/2018	05/04/2018	06/04/2018
Software & document upload	High			12/05/2018	13/05/2018
Presentation	Medium	6	14/05/2018	20/05/2018	22/05/2018
Showcase	Low			30/05/2018	30/05/2018



Task Name	Duration	Start	Finish
Research	**3 days**	**Wed 27/09/17**	**Fri 29/09/17**
Research ideas for project	2 days	Wed 27/09/17	Thu 28/09/17
Choose idea for project	1 day	Fri 29/09/17	Fri 29/09/17
Planning	**39 days**	**Tue 03/10/17**	**Fri 24/11/17**
Research requirements	4 days	Wed 04/10/17	Sat 07/10/17
Choosing Languages and Frameworks	3 days	Mon 09/10/17	Wed 11/10/17
Choose techincal approach	3 days	Thu 12/10/17	Sat 14/10/17
Submit project proposal	9 days	Mon 16/10/17	Thu 26/10/17
Requirement Specification	18 days	Fri 27/10/17	Tue 21/11/17
Execution	**112 days**	**Sat 25/11/17**	**Mon 30/04/18**
Project Prototype	17 days	Wed 22/11/17	Thu 14/12/17
Gather Data	8 days	Fri 15/12/17	Tue 26/12/17
Mid Point Presentation	1 day	Wed 27/12/17	Wed 27/12/17
Gather More Data	31 days	Fri 08/12/17	Fri 19/01/18
Clean data	24 days	Mon 22/01/18	Thu 22/02/18
Transform data	25 days	Mon 26/02/18	Fri 30/03/18
Showcase Materials	10 days	Mon 02/04/18	Fri 13/04/18
Create survey on Facebook	1 day	Mon 16/04/18	Mon 16/04/18
Compare data	11 days	Fri 13/04/18	Fri 27/04/18
Closing	**27 days**	**Fri 20/04/18**	**Sat 26/05/18**
Fix bugs	7 days	Sat 21/04/18	Mon 30/04/18
Showcase Printed Poster	1 day	Tue 01/05/18	Tue 01/05/18
Software and Doc Upload	1 day	Wed 02/05/18	Wed 02/05/18

7.2 Monthly Journals

7.2.1 Introduction

I am Kuldeep Rawat and Today is 29nd September, which is the first day of writing this journal. I am in 4th year of my degree and studying data analytics as the specialization for the final year at National College of Ireland.

7.2.2 September 2017

My achievements

This month I looked at many websites, which shows the recent ideas and trending products and service. I am required to come up with an idea based on data analytics. Finding a new idea from data analysis point of view was bit tough because I have never created a project which require analysing data therefore lots of research was put into it. After doing my research, I finally decide to choose an idea for final project on Cricket T20 matches. I knew this idea was not innovative at all but I just wanted to choose a topic that I am interested in and whose data is easily available from internet. I also prepared a little plan for presenting this idea on 2nd October 2017 to the three judges.

My reflection

I felt, there was benefit of doing lots of research for coming up with an idea to solve problems in real world situation. However, I was not confident enough to present my idea with someone else because I did not have clear picture of how I was going to achieve goal of the project.

Intended changes
Next month, I will try to do more research in cricket filed and see if anything can be added to the idea to make it more interesting.

Supervisor meeting
No supervisor is assigned yet.

7.2.3 October 2017

My Achievements
This Month on 2nd October, I presented my idea for the final project to the three judges. The idea was based on the analysis of cricket world cup 2019, when I was presenting this idea to the three judges they were not really interested in it as it was not new or innovative. I knew this before going to the three judges, but I had a plan which was to add few things to make it different, as I expected the judges did not agree to accept it therefore I also added few things such creating a web-app after doing an analysis of the cricket match. The judges suggested me to do analysis on recent match rather than the world cup and added instead of creating voting system on the web-app retrieve data from Facebook, Twitter and then compare it to the analysis that you'll be performing.

I agreed to what they were saying, this talk went for approximately 12 minutes. After coming out of the room I was relieved.

5th October 2017
I have completed bit of research how I am going to proceed with idea and what tools to use.

10th October 2017
Today I started working on the project proposal I checked the example of the project proposal which was given on the Moodle. After writing my objectives for the project proposal, I decided to meet my supervisor to learn about structure of the proposal and what else can write to improve it. I emailed my supervisor on the 19th for meeting.

20th October 2017
Today I had meeting with my supervisor at 1:00pm, she described many aspects of cricket that I can work on and helped me understanding the project proposal structure. The benefits of meeting her was, that I was able expand my idea and make it more interesting by adding few more functionalities. Also, got helped with improving the proposal.

22nd October 2017
As discussed with my supervisor, I started to write about the project proposal, in the that I wrote about objectives of the project, background, technical approach, project plan and technical details. All this information is relevant for my project.

25th October 2017
I did not finish writing the project proposal therefore I tried to complete it, at this stage, I had everything done except for the project plan and Evaluation.

26th October 2017
Today I created a project plan using Microsoft Project and completed it. I also wrote evolution.

27th October 2017
I uploaded the project proposal on the Moodle, but made a mistake to not press the submit button, therefore it was uploaded but not submitted. On the next day when opened Moodle, I saw the assignment was overdue by 14 hours, after viewing it I pressed the submit button and it was uploaded and submitted. I still be feel that It can be still improved and I will start working on the next assignment.

My Reflection
This month I put lots effort in the project, looking back I knew I had to do well to succeed in completing this project. Although there was lots of work pressure from other subjects, which constantly stops me from focusing properly on this project.

Intended Changes
I intend to focus more on this project as it is worth 20 credits. I know there are other subjects too, but I need to create a plan for this project so it can be completed easily and effectively without having too much work load.

Supervisor Meeting
Supervisor Name: Catherine Mulwa
Date of Meeting: 22/10/2017
Item discussed:

1. Project proposal structure.
2. Type of model that I should consider.
3. New functionalities.
4. Type of data and where to get from.

Action Items:

1. Complete project proposal.
2. Do research about types of functionalities.
3. Check out cricket website for data.
4. Learn how to gather data using R or Python.

7.2.4 November 2017

My Achievements

This month, I worked on requirement specification document, which took longer than expected. Finally, I was able to finish the document and uploaded it on time. In this document, I added more information about what exactly my project is about, also listed all the technologies and described the process that need to be completed for the project. I would say this month was one of the busiest month as I had to finish requirement specification, technical report and prepare for CA for other subjects.

Although, it was busy month for I had positive feelings towards the CA and project. The requirement specification was due on the 24th and then technical report was due on the 30th. The technical report was easy to do as it required us to just take the work from requirement specification and modify it, which I did without any issues. After visiting my supervisor, I was able to improve the document layout and there were few errors such as incorrect use case, heading for some section were not written properly, I also prepared presentation slides and was able to fetch a small data of cricket players and used Rstudio to demo the work to the examiner.

My Reflection

The amount work that I was putting in was not making me tired at all, although, it was increasing my energy to do more and more work. Submitting all the work on time gave me beautiful rewarding feeling.

Intended Changes

Next month I will continue to follow the KDD process which I decided to use in my project, I hope to gather more data from the website and start cleaning code. I also believe technical report need to be updated so I will make sure change the document also.

Supervisor Meeting

Supervisor Name: Catherine Mulwa

Date of Meeting: 21/11/2017 and 28/11/2017

Item discussed:

1. Requirement specification document structure.
2. Use case.
3. How to draw architecture diagram.
4. What will be required for the presentation.

Action Items:

1. Complete the document.
2. Change the Use case and architecture diagram.
3. Complete prototype.
4. Create error free presentation slides.

7.2.5 December 2017

My Achievements

During the start of the month it was little stressful month for me because I got ill therefore I was not able to attend the presentation which was due on the 6th. However, during the middle of this month I was recovered fully and was able to complete my assignments and attend Introduction to R, CA. At this stage I did not know the date for my presentation because I was waiting for mail from NCI360 in regard to the extension of the presentation date, few days I received an email on the 19th that my application has been approved and straight away I emailed Eammon and Catherine to arrange a presentation slot for me. The reply received from Catherine was that my presentation was going to be in January and date cannot be confirmed. While all this happening, I was also preparing for my exams in January.

My Reflection

This month was bit stressful month for me as I was bit sick and there was a lot going on in college, however I kept trying hard and did not lose confidence.

Intended Change

I did not work much on the project this month but for next month I would look forward to start analyzing the data make some small changes that is required.

Supervisor Meeting

There was supervisor meeting this month because I was ill for few days during the start of the month and then I also CA and Christmas holidays.

7.2.6 January 2018

My Achievements

The end of this month was the beginning of new semester and the start of the month was spent preparing and then doing the exams. After the exam were completed, I was happy and did not focus too much on the project for few days as I wanted to relax and enjoy feeling of joy and the end of one semester. I met my supervisor and discussed next few tasks that I should focus on, I also spent some time doing the research on algorithm that can be applied to my data. The outcome of the research, I found there are many techniques such as regression, classification and clustering that can be applied to the project. I discovered SPPS modeler which can help me generate models for my project. I learned how to use it and applied it to the cricket data. Finally, on 25th I did my presentation which went really and I received lots of good feedback from my supervisor and Lisa Murphy (Second examiner).

My Reflection

This month I got back on track with all the positive energy and was satisfied with my presentation results.

Intended Change

After doing the presentation, there were many feedbacks given by my supervisor and Lisa Murphy which I believe was very helpful for me such as keeping the idea related to the data analyst and using Tableau to visualize graph easily and quickly, also making sure to double check my document before uploading because there were many small errors in the document. I believe these feedbacks were valuable and should considered.

Supervisor Meeting

Supervisor Name: Catherine Mulwa
Date of Meeting: 10/01/2018 and 30/01/2018
Item discussed:

5. Mid-point presentation feedback.
6. Feature selection.

7. Prediction model and classification model.
8. Problems encounter and solution.

Action Items:

5. Focus on the feedback that is provided.
6. Start developing models.
7. Continue working on the document.

7.2.7 February 2018

My Achievements

This month, I was in second week of my final semester, over the las few weeks I worked on gathering the data from various websites, I looked at many videos and tutorial on YouTube and data camp. Today I found helpful website which consist lots of cricket data, the name of the website espncricinfo although, I have visited this website before but never really thought it had so much information in it.

February 2nd, 2018

On this day I received an email from FDM about video interview. I researched about the company and clicked on the practice video interview link that was provided within the email. This was completely new for as I have never completed a video interview and have no idea how it works and what kind of questions will be asked or how long will it go for.

February 5th, 2018

I planned to meet Helen Conway to get my CV approved and to ask her about the video interview, she approved my CV and said it was very well done. When I talked to her about the interview she suggested me to lookup few presentations that were on Moodle and a link to sparks where I could practice the interview.

February 8th, 2018

I was at work on this day and when I came home 9:00pm I quickly changed my clothes and put on shirt to look professional for the interview. The interview was quite hard because I had to very less time to come up with an answer and less time to answer the question. This was my first interview, which I think I did not do well. I prefer the face-to-face as I do well and express myself to the employer where in the video interview, I did not get much time to explain.

February 10th, 2018

I did an online aptitude test for the company Virgin Media. This test went well.

February 23rd, 2018

Today I had 3rd meeting of the month with my supervisor at 1:00 PM. She explained what I need to next, she suggested me to work on the prediction model and write a literature review on cricket. Find at least 10 papers between 2002-2018.

February 25 to 28, 2018

I uploaded my assignment for data mining on 25th. Overall this month I gathered all the data that was required, merged and cleaned. I also moved on to the next phase of the project which was to create analyses and create models.

My Reflection
This month was very easy productive month for me as I had the data cleaned and merged, all my literature review was completed and linear model was started.

Intended to Change
I need to have clear picture where I am going therefore need to update my plan and set few targets to effectively achieve them.

Supervisor Meeting
Catherine has been supportive over the past few months and always guided me to the right direction. This month I had three meeting with her.

Supervisor Meeting
Supervisor Name: Catherine Mulwa
Date of Meeting: 08/02/2018, 15/02/2018 and 27/02/2018
Item discussed:

9. Literature Review
10. More about prediction model and classification model.
11. Solution to the errors.

Action Items:

8. Complete Literature review.
9. Fix errors.
10. Develop more models.

7.2.8 March 2018

My Achievements
This month, I created the showcase poster and developed two models. I also wasted most of my time fetching the twitter data because I was thinking of performing some sentimental analysis on the cricket matches as well as prediction models. I did not focus too much on creating the model because I already had some research completed and wanted to start after finishing some sentimental analysis on the twitter data. After talking to my supervisor and one of friend about the project I decide to leave the idea of fetching the data from twitter as it was going to take too long to download the data. Catherine agreed to this and told me to focus on the supervised data that you have gathered from the cricket website.

My Reflection
This month I was very active but I think I wasted most of time and energy in doing the work that should not have been completed and it was not suitable for my project. I was lucky to discover and stop before I move too close to the project deadline.

Intended change

I did finish two of the regression model and need to make few change to improve it.

Supervisor Meeting

The supervisor meeting throughout the year has been great and it was very helpful and full support of supervisor was provided with very useful tips which keeps us on track. I feel confident enough to complete my project on time.