study using the K-means clustering method

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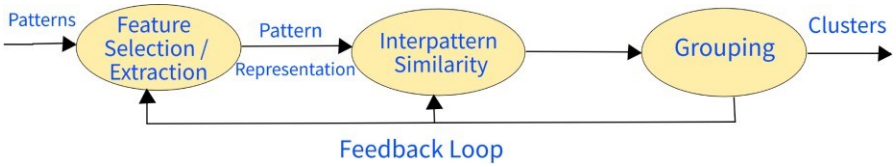
Abstract:- As we all know, clustering analysis is a critical component of machine learning. This method splits data points according to their qualities. Data points that are comparable are grouped together, whereas data points that are dissimilar are grouped separately. So, basically, it allows a group of comparable data points to be studied further.
This paper's analysis Using cricket numbers as an example, the K-means clustering algorithm determines player capability based on stats such as wickets taken and runs scored over their career. This capacity can be utilized to identify suitable batsmen, allrounders, and bowlers for the squad.

Keywords: Analysis, K-means, clustering, pattern matching

1. INTRODUCTION

Clustering algorithms organize data points into groups so that like data points are in the same group and unrelated data points are in different groups. Cluster analysis is used to examine both the link and the difference between datasets. Nowadays, it has a variety of applications in machine learning. Cluster analysis can reveal not only the underlying link and difference between data, but it can also provide a solid platform for additional data analysis and knowledge discovery.
Clustering is a multistage procedure. The first step is "Feature Selection and Extraction," which is used to identify the data input or



pattern that was received and perform dimensionality reduction, which is critical for minimizing model complexity and overfitting [6]. Then, "Interpattern Similarities" is used to determine the similarity of datasets by identifying patterns or trends. Then "Grouping" is used to build a cluster.

Figure 1: Stages in Clustering

2. RELATED WORK

G. Kesavaraj and S. Sukumaran [1] perform a study on different classification techniques. The main purpose of the classification of data is to identify patterns in a given dataset and divide data on basis of classification. It discusses various examples of classification, for example, the segmentation of customers on the basis of credit risk to provide loans. It helps to create a model to classify the dataset on given attributes and datasets. It describes the commonly used methods for data mining classification i.e. Decision tree induction methods, Rule-based methods, Memory-based learning, Neural networks, Bayesian networks, and Support vector machines [1]. And finally concluded that no technique is superior to other techniques. Not all problems can be solved by a single technique with the optimum solution. For each domain, there is a specific algorithm.

Bini B. S. & Mathew T. [2] made a price prediction using clustering and regression techniques. The regression technique is used to predict the price and clustering to find the pattern between data. First of all, Clustering is done on the available stocks validation index and the K-means algorithm appears to be more efficient among all clustering algorithms. Then cluster is passed to multiple regression to find a predicted price.

For this purpose, data is collected for National Stock Market for various stocks like WIPRO, TCS, ROLTA, POLARIS, PERSISTENT, NIITTECH, NAUKRI, MINDTREE, INFY, and HCL TECH [2]. On the selected stocks, various clustering technique is performed to get the best stocks. To get the best technique among all clustering algorithms comparison is done using the c-index, the Rand index, Jaccard index and silhouette index [2]. After comparing all clustering algorithms K-means algorithm and EM algorithm shows better performance than density-based clustering and hierarchical based clustering algorithm. After cleaning data by removing unwanted stocks, price prediction is done using multiple regression techniques. After predicting the

price of all stocks it compares the price for TCS stocks to the predicted and actual prices and it comes out to be approximately accurate. So it helps investors to select the stocks from a given bunch of stocks to choose wisely

Li, Y., & Wu, H [3] discussed the improved k-means clustering algorithm. The new algorithm is based on selecting the initial focal point. So it improves the K-means clustering by not randomly selecting centroid for the first run. It first finds the minimum and maximum distance between data points, to understand the centroid value more accurately. Centroid value not to be adjacent and should be with minimum distance to nearest data points. The new algorithm basically solves two issues of the standard K-means algorithm a). Choosing the beginning focal point dependency. b) Being stuck in a local minimum.

"So in this paper, Li, Y., & Wu, H uses the largest minimum distance algorithm to determine K's initial cluster point. The largest minimum distance algorithm is used in order to find hidden information in the field of pattern recognition. It is done to choose the pattern in which pairwise distances are farther apart as much as possible to be the cluster focal point. Thus, it helps to determine the best initial cluster focal point and also increases the efficiency of dividing the initial data congregation. So it makes the initial focal points to be more representative and decentralized" [3].

3. METHODOLOGY

The "K-Means Clustering" is an "unsupervised learning" approach used to solve clustering challenges in "data science and machine learning". It's an iterative technique that divides the input dataset into "K" unique clusters, each of which contains only 1 dataset. The "K-means algorithm" locates "K" centroids before assigning each data point to the cluster with the closest centroids. Basically as explained in [6], "K-means algorithm name consists of two words, *K* - represents the number of centroids you need in the dataset. A centroid is the imaginary or real location representing the centre of the cluster. *Means* - refers to averaging of the data, i.e finding the centroid" [6].

The algorithm works by continuously finding the best value for "K centre point" or "Centroid" using iterative methods. The K-means algorithm begins with the initial group of randomly chosen centroids, which serve as the starting points for each cluster, and then performs iterative (repetitive) calculations to optimise the centroids' placements [6]. It stops forming and optimising clusters when either the centroids have stabilised or the specified number of iterations was completed [6].

Selecting The Right Number Of Clusters.

We already knew the "K value" in the situation presented before. However, knowing the "K value" before to computation is impossible in every scenario. As a result, the best value for "K" must be chosen. We shall not choose the no. of clusters in the approach at arbitrary. Each cluster is created by calculating and comparing the average distances between its centroid.

To calculate the correct number of clusters, the "Within-Cluster-Sum-of-Squares" (WCSS) method can be utilised. WCSS stands for the sum of the squares of the data points' distances from the cluster's centroid in each cluster [6].

The "Elbow Method" is a popular method for determining the correct value of "K".

4. RESULTS

To analyse the K-means clustering algorithm, we used the cricket problem to understand the K-means clustering. For the team selection process in cricket, it is necessary to understand the capability of the players. For this purpose, we cluster three groups of players on the basis of runs scored and wickets taken to classify them on basis of category of Batsman, Bowler and All-rounder.

Firstly we extracted the data of known cricket players and cleaned data on basis of matches played so that there is no outlier in the results. The player data is shown in Figure 2. Secondly, we perform a clustering algorithm on runs scored and wickets taken to make 3 clusters using sklearn library (Refer to Figure 4). The plot is drawn to represent the data in user-interactive form (Refer to Figure 5.).

As a result, we can conclude that K-means clustering performs very well as Bowlers like Anil Kumble, James Anderson and Shane Warne are classified in a single group and batsmen like Sachin Tendulkar, Ricky Pointing, Rahul Dravid, Brian Lara are represent in another group.

	Player Name	Runs	Wickets
0	Sachin Tendulkar	15921	46
1	Ricky Ponting	13378	5
2	Rahul Dravid	13288	1
3	Brian Lara	11953	0
4	Anil Kumble	2506	619
5	Harbhajan Singh	2225	417
6	Glen Mcgrath	563	641
7	Sunil Gavaskar	10122	1
8	Kapil dev	5248	434
9	Imran Khan	3807	362
10	Sir Garry Sobers	8032	236
11	James Anderson	1262	640
12	Shane Warne	3154	708
13	Shaun Pollock	3781	421

Figure 2: Player Stats

	Player Name	Runs	Wickets	Y-axis	X-axis
0	Sachin Tendulkar	15921	46	1.000000	0.064972
1	Ricky Ponting	13378	5	0.834419	0.007062
2	Rahul Dravid	13288	1	0.828558	0.001412
3	Brian Lara	11953	0	0.741633	0.000000
4	Anil Kumble	2506	619	0.126514	0.874294
5	Harbhajan Singh	2225	417	0.108217	0.588983
6	Glen Mcgrath	563	641	0.000000	0.905367
7	Sunil Gavaskar	10122	1	0.622412	0.001412
8	Kapil dev	5248	434	0.305053	0.612994
9	Imran Khan	3807	362	0.211225	0.511299
10	Sir Garry Sobers	8032	236	0.486326	0.333333
11	James Anderson	1262	640	0.045514	0.903955
12	Shane Warne	3154	708	0.168707	1.000000
13	Shaun Pollock	3781	421	0.209532	0.594633

Figure 3: Player Stats after adding x and y axis value

	Player Name	Runs	Wickets	Y-axis	X-axis	cluster
0	Sachin Tendulkar	15921	46	1.000000	0.064972	0
1	Ricky Ponting	13378	5	0.834419	0.007062	0
2	Rahul Dravid	13288	1	0.828558	0.001412	0
3	Brian Lara	11953	0	0.741633	0.000000	0
4	Anil Kumble	2506	619	0.126514	0.874294	2
5	Harbhajan Singh	2225	417	0.108217	0.588983	1
6	Glen Mcgrath	563	641	0.000000	0.905367	2
7	Sunil Gavaskar	10122	1	0.622412	0.001412	0
8	Kapil dev	5248	434	0.305053	0.612994	1
9	Imran Khan	3807	362	0.211225	0.511299	1
10	Sir Garry Sobers	8032	236	0.486326	0.333333	1
11	James Anderson	1262	640	0.045514	0.903955	2
12	Shane Warne	3154	708	0.168707	1.000000	2
13	Shaun Pollock	3781	421	0.209532	0.594633	1

Figure 4: Player Stats with cluster value
(0 represent batsman, 1 represent Allrounder and 2 represent bowler)

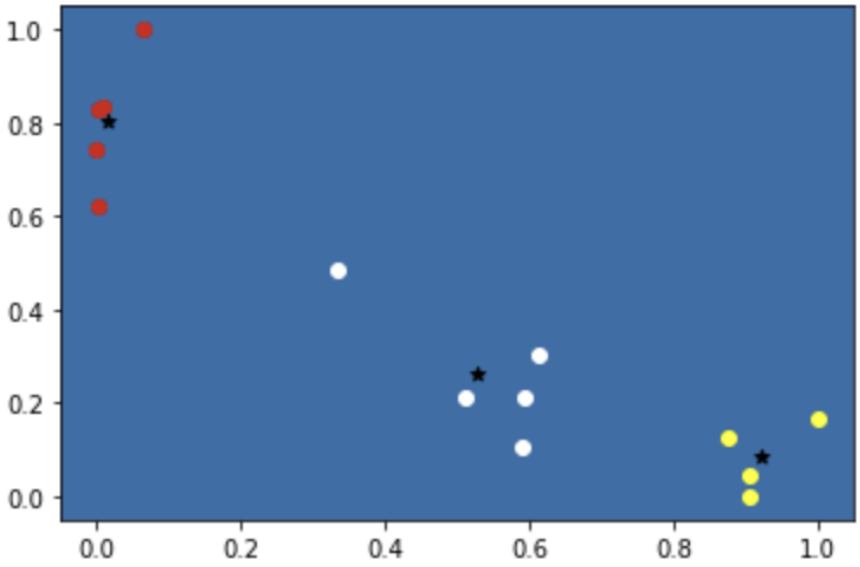


Figure 5: Plotting K-means graph
(red color represents batsman, white color Allrounder, yellow color as a bowler, black color represent centroid of each cluster)

5. CONCLUSION AND FUTURE WORK

Clustering is a technique for detecting similarities between sets of data. Its uses include data mining, pattern recognition, web content classification, and the grouping of geographic information such as seismic data. This paper discusses k-means, a popular clustering algorithm. This research uses the K-means algorithm to analyze cricket players' performance and capability. And it successfully categorizes players as batsmen, bowlers, or all-rounders. The same classification can be used to select a team for a match by locating player statistics for the provided match venue or a similar condition venue. This may aid in selecting the best combination of batsman, bowler, and allrounder for the match.

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