

# Lack of Efficiency in classifying Concussion of Corona Crisis over Small Businesses using Novel Support Vector Machine Algorithm Comparing K-Mode Algorithm

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## Abstract

**Aim:** The aim of this research is to classify the Concussion of Corona Crisis over Small Businesses using Novel Support Vector Machine Algorithm Comparing K-Mode Algorithm. **Materials and Methods:** Novel Support Vector Machine Algorithms with sample size = 110 and K-Mode with sample size = 110 with G power (value =0.6) were evaluated many times to predict the efficiency percentage. **Results:** Novel Support Vector Machine algorithm has better efficiency (76.70%) when compared to K-Mode algorithm efficiency (68.50%). The results achieved with significance value  $p=0.919$  ( $p>0.05$ ) shows that two groups are statistically insignificant. **Conclusion:** Support Vector Machine performed significantly better than the K-Mode algorithm.

**Keywords:** Novel Support Vector Machine Algorithm, K-Mode Algorithm, Efficiency, Covid-19, Corona Crisis over Small Businesses, Sectors.

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## INTRODUCTION

The objective of these findings is to analyse the concussion of the Corona Crisis on small businesses using novel support vector machine algorithms and K-Mode algorithms. In this case, the experiment aims to improve the efficiency in classifying the sectors affected in small businesses during the COVID-19 pandemic. It is essential for the general public to know the sector wise percentage of sectors in small businesses before and after the pandemic (Byrne 2021; Oliva, Hassan, and Mohamed 2021) in India. With this research in today's world, people can know about the sectors (Aditya 2020) that are affected by this pandemic in small businesses, so if this problem occurs in the future, we can take some resolutions to solve it (Fairlie 2020). The application of this approach is to know about profit and loss that are affected in different sectors before the pandemic and after the pandemic (Oliva, Hassan, and Mohamed 2021).

The impact of the Corona Crisis on small businesses is discussed in different forms compared to this paper's analysis. Around 30 articles were published in IEEE Explore and 100 articles were published in Google Scholar on the impact of the corona crisis on the Indian economy. This paper follows two approaches to assess the impact of the Corona Crisis on small businesses. The first approach is to (Kohonen 2012) analyze sectors affected before lockdown, and the second approach is to observe the percentage difference after the corona lockdown. One of the most referred articles is COVID-19 and its impact on micro, small, and medium enterprises (Nico and Pollock 2021). In this article, they explain the small industry's problems during lockdown time. Due to the lockdown in India, more than 60 (A.-E. Hassanien, Dey, and Elghamrawy 2020) of economic activities in small industries were affected a lot. The growth rate of small business units declined during the post-lockdown period. Only the small industrial sectors are affected and fall in revenues. The revenue falls by more than 21% (Bhardwaj and Sapa 2021). This paper attempted to analyse the corona impact on small businesses in lockdown time. This study makes the public understand the impact that has been created by corona over sectors of small businesses and how much of the country's economy depends on micro, small and medium enterprises (Bartik et al. 2020). In another approach, the author explains how much percentage of the loss occurs, but in my study of research, I explained

sector-wise percentage losses and showed the efficiency difference between before and after lockdown by using the two algorithms (Dutta 2020).

Our team has extensive knowledge and research experience that has translate into high quality publications(Bhansali et al. 2021; Jayanth et al. 2021; Sudhakar, Ravel, and Perumal 2021; Sathiyamoorthi et al. 2021; Deepanraj et al. 2021; Raju et al. 2021; Arun Prakash et al. 2020; Kamath et al. 2020; Shanmugam et al. 2021; Rajasekaran et al. 2020; Adhinarayanan et al. 2020; Rajesh et al. 2020; Aurtherson et al. 2021). The drawback of this research is that it tries to classify the corona crisis over small businesses, which is less efficient in finding data regarding the sectors in small industries. The main aim of our proposed system is to improve efficiency in predicting the concussion of a Corona Crisis over small businesses using a novel Support Vector Machine Algorithm compared to the K-Mode Algorithm.

## Materials And Methods

This research work was performed at the Cyber Forensic Laboratory, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences. The proposed work includes two groups. Group 1 is taken as Centroid tracking at 76.70 and 68.50 as K-Nearest Neighbors. The Novel Support Vector Machine algorithm and K-Mode algorithm were evaluated a different number of times with a sample size of 110.

After dataset collection, the unused data values and unused fields are removed by changing them with the required fields and sectors as per the referred data sets. After updating the data sets for (Chouhan 2021) predicting accuracy, the opencv file and libraries of algorithms Novel Support Vector Machine and K-Mode are installed and calculated (A. E. Hassanien and Darwish 2021).

Hardware configuration references the details and system resource settings allotted for specific devices. The following are the minimum hardware requirements to implement this model processor: Intel i7 processor, 4GB RAM, and 1TB hard drive storage Software specifications are concerned with the resources that must be installed on the target system in order to get an application to work (Fotea, Fotea, and Văduva 2022). The minimal software specifications for this model to work are windows operating system version 7/8/10, python programming language version 3 or above, IDE pycharm.

### Support Vector Machine Algorithm

The Support Vector Machine is a supervised machine learning algorithm. It can be used for both classification and regression challenges, though the latter is mainly used for classification problems. The SVM will map training examples to points in space to maximise the width of the gap between the two categories. Table 5 shows the algorithm of the Support Vector Machine, from dataset processing to output generation.

### K-Mode Algorithm

K-mode, also known as "K-Mode Clustering", is an unsupervised machine learning algorithm that is used to cluster categorical variables. K-Mode makes more localization errors but is less likely to predict false positives in the background. The collected data set shows the complete procedure of the proposed model.

The corona crisis on small industry prediction and comparison follows the following procedure: The comparison of accuracy in algorithms is represented in Table 6. Four filmed plane points are selected from the frame and then transformed into the top-down view. The comparison of the K-Mean algorithm is done with these K-Mode algorithms. In the Jupyter Notebook, we need to run. The Python programming language was used to implement this work.

### Statistical Analysis

In the current study, we used a Statistical tool called IBM SPSS. Using this software's descriptive and group statistics for the accuracy values are calculated. Independent sample tests are taken and significance values are calculated. According to the support vector machine Algorithm and K-Mode, the Support Vector Machine (Wang et al. 2022) appears to perform better than K-Mode in all the platforms. Independent variables are distinct attributes that are helpful in prediction and dependent variables are improved accuracy values. The independent variable is Industry and the dependent variable is percent of industry. The independent sample T-Test analysis is performed.

## Results

Table 1 shows the dataset for various backgrounds and locations. Table 2 represents the simulated accuracy analysis of Novel Support Vector Machines and K-Mode algorithms. Table 3 represents group statistical analysis with a mean value of 76.70 and 68.50, a standard deviation of 3.864 and 4.062 for Novel Support Vector Machine

and K-Mode algorithms, respectively. The results achieved with significance value  $p=0.919$  ( $p>0.05$ ) shows that two groups are statistically insignificant.

Figure 1 will explain the architecture diagram for the comparison of two algorithms. Figure 2 shows the bar graph analysis based on the efficiency of two algorithms. The mean efficiency of the Novel Support Vector Machine and K-Mode is 76.70% and 68.50%, respectively. From the results obtained, it is inferred that the Novel Support Vector Machine algorithm is more efficient than the K-Mode algorithm.

## Discussion

In this research work, we observed that the Novel Support Vector Machine algorithm appears to have a higher success rate than the K-Mode Algorithm ( $p = 0.01$ , Independent Sample Test). The improved accuracy of the Support Vector Machine (mean accuracy = 76.60) compared to K-Mode (mean accuracy = 68.50).

The analysis uses a series of algorithms like K-Nearest Neighbor, Support Vector Machine, K-Mode, and others. It is found that the accuracy is lowest for the K-Mode at 0.68, whereas the Support Vector Machine (Wang et al. 2022) is 0.76. The comparison of the Support Vector Machine (Chee, Yi, and Im 2021) with the K-Mode shows that the Support Vector Machine is faring better than the K-Mode. Support Vector Machine has an accuracy of 76.60% and K-Mode with the K-Mode shows that the Support Vector Machine is faring better than the K-Mode. The accuracy of Support Vector Machine is 76.60%, while K-Mode (Ramasubramanian, Phani Kumar, and Anandam 2020) is 68.50%. It has also shown similar results to what we have finalised (Mudunuru 2016). They also performed breast cancer detection on supervised machine learning algorithms and the results show that Support Vector Machine performs better and has the highest accuracy among all other algorithms. Based on the research work done, 4 works showed similar findings and 1 work showed dissimilar findings. Moreover, based on the above discussions and findings, we can conclude that the Novel Support Vector Machine algorithm appears to have better accuracy and performance in all conditions than the K-Mode.

There are some limitations with the Support Vector Machine algorithm; it is not suitable for large datasets and in cases where the number of features for each data point exceeds the number of training data samples, the SVM will underperform. In future work, we will improve this model with better features and the least amount of running time possible, and get more precise results. This might have a better future as the number of sectors affected by the corona crisis has been updated every day.

## Conclusion

In this research work, classification of efficiency percentage for corona crisis estimation using Novel Support Vector Machine appears to have enhanced efficiency (76.60%) when compared to K-Mode (68.50%). Comparisons of percentages before and after the corona pandemic The results reveal that the percentage changes occur by using these algorithms and the efficiency of these algorithms will give the positive values.

### DECLARATIONS

#### Conflict of Interest

The author declares no conflict of interest.

#### Authors Contribution

Author BSS was involved in data collection, data analysis, and manuscript writing. Author SVA was involved in conceptualization, data validation, and critical review of manuscript.

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## References

1. Adhinarayanan, Rajesh, Aravindh Ramakrishnan, Gopal Kaliyaperumal, Melvinvíctor De Pours, Rajesh Kumar Babu, and Damodharan Dillikannan. 2020. "Comparative Analysis on the Effect of 1-Decanol and Di-N-Butyl Ether as Additive with diesel/LDPE Blends in Compression Ignition Engine." *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, June, 1–18.

2. Aditya, Chandrika. 2020. "The Presumptive Tax Regime on Micro, Small and Medium Enterprises in Indonesia." *Syntax Literate ; Jurnal Ilmiah Indonesia*. <https://doi.org/10.36418/syntax-literate.v5i6.1323>.
3. Arun Prakash, V. R., J. Francis Xavier, G. Ramesh, T. Maridurai, K. Siva Kumar, and R. Blessing Sam Raj. 2020. "Mechanical, Thermal and Fatigue Behaviour of Surface-Treated Novel Caryota Urens Fibre-reinforced Epoxy Composite." *Biomass Conversion and Biorefinery*, August. <https://doi.org/10.1007/s13399-020-00938-0>.
4. Aurtherson, P. Babu, Bhanu Teja Nalla, Karthikeyan Srinivasan, Kulmani Mehar, and Yuvarajan Devarajan. 2021. "Biofuel Production from Novel Prunus Domestica Kernel Oil: Process Optimization Technique." *Biomass Conversion and Biorefinery*, May. <https://doi.org/10.1007/s13399-021-01551-5>.
5. Bartik, Alexander W., Marianne Bertrand, Zoe Cullen, Edward L. Glaeser, Michael Luca, and Christopher Stanton. 2020. "The Impact of COVID-19 on Small Business Outcomes and Expectations." *Proceedings of the National Academy of Sciences of the United States of America* 117 (30): 17656–66.
6. Bhansali, Karan J., Kamlesh R. Balinge, Subodh U. Raut, Shubham A. Deshmukh, M. Senthil Kumar, C. Ramesh Kumar, and Pundlik R. Bhagat. 2021. "Visible Light Assisted Sulfonic Acid-Functionalized Porphyrin Comprising Benzimidazolium Moiety for Photocatalytic Transesterification of Castor Oil." *Fuel* 304 (November): 121490.
7. Bhardwaj, Akashdeep, and Varun Sapra. 2021. *Security Incidents & Response Against Cyber Attacks*. Springer Nature.
8. Byrne, David. 2021. *Inequality in a Context of Climate Crisis after COVID: A Complex Realist Approach*. Routledge.
9. Chee, Wonshik, Jee-Seon Yi, and Eun-Ok Im. 2021. "Information Needs of Asian American Breast Cancer Survivors: A Decision Tree Analysis." *Journal of Cancer Education: The Official Journal of the American Association for Cancer Education*, June. <https://doi.org/10.1007/s13187-021-02059-2>.
10. Chouhan, Yashashvi. 2021. "Pandession: Corona Virus Pandemic Leading To The Biggest Economic Crises Since The Great Recession." *Psychology and Education Journal*. <https://doi.org/10.17762/pae.v58i2.1913>.
11. Deepanraj, B., N. Senthilkumar, D. Mala, and A. Sathiamourthy. 2021. "Cashew Nut Shell Liquid as Alternate Fuel for CI Engine—optimization Approach for Performance Improvement." *Biomass Conversion and Biorefinery*, February. <https://doi.org/10.1007/s13399-021-01312-4>.
12. Dutta, Kuntak. 2020. "GLOBAL IMPACT OF CORONA VIRUS DISEASE." *COVID-19 Pandemic Update 2020*. <https://doi.org/10.26524/royal.37.12>.
13. Fairlie, Robert. 2020. "The Impact of COVID-19 on Small Business Owners: Evidence from the First 3 Months after Widespread Social-Distancing Restrictions." *Journal of Economics & Management Strategy*, August. <https://doi.org/10.1111/jems.12400>.
14. Fotea, Silvia L., Ioan Ş. Fotea, and Sebastian Văduva. 2022. *Navigating Through the Crisis – A Special Issue on the Covid 19 Crises: The 2020 Annual Griffiths School of Management and IT Conference (GSMAC) Vol 1*. Springer Nature.
15. Hassanien, Aboul Ella, and Ashraf Darwish. 2021. *Digital Transformation and Emerging Technologies for Fighting COVID-19 Pandemic: Innovative Approaches*. Springer Nature.
16. Hassanien, Aboul-Ella, Nilanjan Dey, and Sally Elghamrawy. 2020. *Big Data Analytics and Artificial Intelligence Against COVID-19: Innovation Vision and Approach*. Springer Nature.
17. Jayanth, Bellappu Venkat, Melvin Victor Depoures, Gopal Kaliyaperumal, Damodharan Dillikannan, Dilipsingh Jawahar, Kumaran Palani, and Ganesha Prasad Meravanigee Shivappa. 2021. "A Comprehensive Study on the Effects of Multiple Injection Strategies and Exhaust Gas Recirculation on Diesel Engine Characteristics That Utilize Waste High Density Polyethylene Oil." *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, June, 1–18.
18. Kamath, Manjunath, Subha Krishna Rao, Jaison, Sridhar, Kasthuri, Gopinath, Sivaperumal, and Shantanu Patil. 2020. "Melatonin Delivery from PCL Scaffold Enhances Glycosaminoglycans Deposition in Human Chondrocytes – Bioactive Scaffold Model for Cartilage Regeneration." *Process Biochemistry* 99 (December): 36–47.
19. Kohonen, Teuvo. 2012. *Content-Addressable Memories*. Springer Science & Business Media.
20. Mudunuru, Venkateswara Rao. 2016. *Modeling And Survival Analysis Of Breast Cancer: A Statistical, Artificial Neural Network, And Decision Tree Approach*.
21. Nico, Magda, and Gary Pollock. 2021. *The Routledge Handbook of Contemporary Inequalities and the Life Course*. Routledge.
22. Oliva, Diego, Said Ali Hassan, and Ali Mohamed. 2021. *Artificial Intelligence for COVID-19*. Springer Nature.
23. Rajasekaran, S., D. Damodharan, K. Gopal, B. Rajesh Kumar, and Melvin Victor De Poures. 2020. "Collective Influence of 1-Decanol Addition, Injection Pressure and EGR on Diesel Engine Characteristics Fueled with diesel/LDPE Oil Blends." *Fuel* 277 (October): 118166.
24. Rajesh, A., K. Gopal, De Poures Melvin Victor, B. Rajesh Kumar, A. P. Sathiyagnanam, and D. Damodharan. 2020. "Effect of Anisole Addition to Waste Cooking Oil Methyl Ester on Combustion, Emission and Performance Characteristics of a DI Diesel Engine without Any Modifications." *Fuel* 278 (October): 118315.
25. Raju, P., K. Raja, K. Lingadurai, T. Maridurai, and S. C. Prasanna. 2021. "Glass/Caryota Urens Hybridized Fibre-Reinforced nanoclay/SiC Toughened Epoxy Hybrid Composite: Mechanical, Drop Load Impact, Hydrophobicity and Fatigue Behaviour." *Biomass Conversion and Biorefinery*, March. <https://doi.org/10.1007/s13399-021-01427-8>.
26. Ramasubramanian, P., S. Phani Kumar, and D. Anandam. 2020. "Experimental Work on Data Clustering Using Enhanced Random KMode Algorithm." *International Journal Of Recent Advances in Engineering & Technology*. <https://doi.org/10.46564/ijraet.2020.v08i04.009>.
27. Sathiyamoorthi, Ramalingam, Gomathinayakam Sankaranarayanan, Dinesh Babu Munuswamy, and Yuvarajan Devarajan. 2021. "Experimental Study of Spray Analysis for Palmarosa Biodiesel-diesel Blends in a Constant Volume Chamber." *Environmental Progress & Sustainable Energy* 40 (6). <https://doi.org/10.1002/ep.13696>.
28. Shanmugam, Rajasekaran, Damodharan Dillikannan, Gopal Kaliyaperumal, Melvin Victor De Poures, and Rajesh Kumar Babu. 2021. "A Comprehensive Study on the Effects of 1-Decanol, Compression Ratio and Exhaust Gas Recirculation on Diesel Engine Characteristics Powered with Low Density Polyethylene Oil." *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects* 43 (23): 3064–81.
29. Sudhakar, M. P., Merlyn Ravel, and K. Perumal. 2021. "Pretreatment and Process Optimization of Bioethanol Production from Spent Biomass of Ganoderma Lucidum Using Saccharomyces Cerevisiae." *Fuel* 306 (December): 121680.
30. Wang, Gengyuan, Xiaolong Zeng, Guanquan Lai, Guoqing Zhong, Ke Ma, and Yu Zhang. 2022. "Efficient Subject-Independent Detection of Anterior Cruciate Ligament Deficiency Based on Marine Predator Algorithm and Support Vector Machine." *IEEE Journal of Biomedical and Health Informatics* PP (February). <https://doi.org/10.1109/JBHI.2022.3152846>.

**TABLES AND FIGURES**

**Table 1.** Dataset name, Extension and Source.

S.NO	DATASET NAME	DATASET EXTENSION	DATASET SOURCE
1	Impact of corona on small businesses	CSV	kaggle
2	Covid-19 economical impact	CSV	kaggle

**Table 2.** Efficiency of Novel Support Vector Machine and K-Mode. The Novel Support Vector Machine is 9.500% more efficient than the K-Mode algorithm.

ITERATION NO.	support vector machine(%)	K-Mode(%)
1	82.03	76.2
2	79.3	72.1
3	81.9	71.0
4	80.5	70.3
5	75.0	69
6	77.3	68.5
7	76.2	67.3
8	73.02	66.2
9	72.3	64.1
10	71.0	62.0

**Table 3.** Group Statistics of Novel Support Vector Machine and K-Mode algorithm with the mean value of 73.85% and 62.50%.

GROUP	N	Mean(%)	Std.Deviation	Std.Error Mean
support vector machine	10	76.60	3.864	1.222
K-Mode	10	68.50	4.062	1.285

**Table 4.** Independent sample T-test is performed for the two groups for significance and standard error determination. The significance value  $p=0.919$  ( $p>0.05$ ) shows that two groups are statistically insignificant.

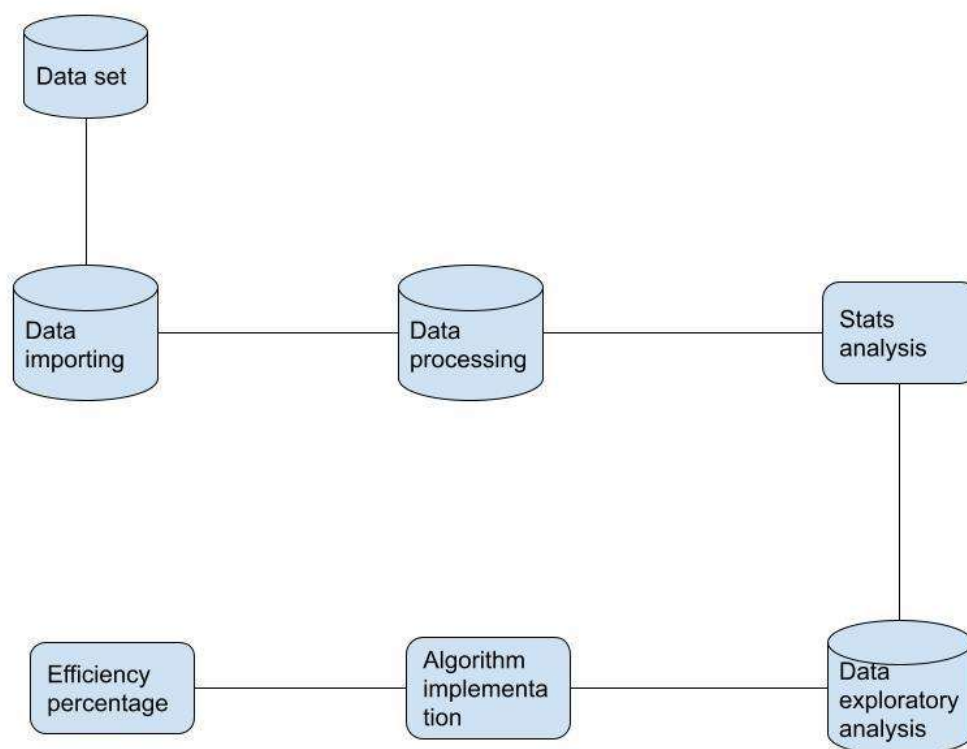
	Equal Variance	Levene's Test for Equality of Variance		T-test for Equality of Means						
		F	Sig	t	df	Sig(2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Efficiency	Assumed Not Assumed	.011	.919	4.569	18	<.001	8.100	1.773	4.375	11.825
				4.569	17.955	<.001	8.100	1.773	4.375	11.825

**Table 5.** Pseudocode for Novel Support Vector Machine algorithm.

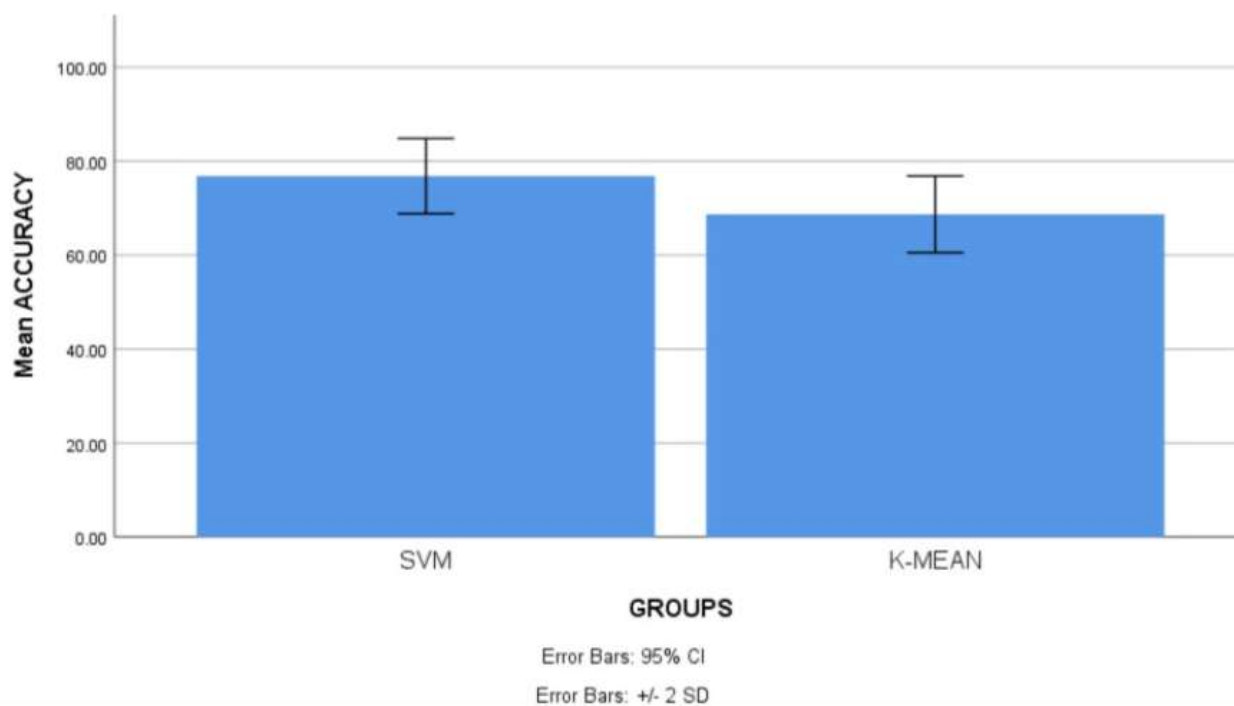
<ol style="list-style-type: none"> <li>1.Start program</li> <li>2.Import the data from the required library</li> <li>3.Give the path of the dataset in the csv extension</li> <li>4.Data as per the sector wise in small industries validation             <ol style="list-style-type: none"> <li>i. stats of the data</li> <li>ii. Data analysis as per the dataset</li> <li>iii. plot the graph by using matplotlib</li> </ol> </li> <li>5.From sk learn library importing the classification</li> <li>6.Now the use model selection for importing use train and test split</li> <li>7.Use the SVM(support vector machine) algorithm for the importing and sklearn.metrics and use import SVM</li> <li>8.Give the sample size</li> <li>9.Give the test size and tarin size then fit the train and test</li> <li>10.Then print the Efficiency</li> <li>11.End the program</li> </ol>
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**Table 6.** Pseudocode for K-Mode algorithm

<ol style="list-style-type: none"> <li>1.start program</li> <li>2.Import the data from the required library</li> <li>3.Give the path of the dataset in the csv extension</li> <li>4.Data as per the sector wise in small industries validation</li> <li>5.From sk learn library importing the classification</li> <li>6.Now the use model selection for importing use train and test split</li> <li>7.Use the K-Mode for the importing and sklearn .metrics</li> <li>8.Give the sample size (k-mode)</li> <li>9.Give the test size and tarin size then fit the train and test</li> <li>10.Then print the accuracy</li> <li>11.End the program</li> </ol>
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**Fig. 1.** Architecture for comparison of percentage efficiency using Novel SVM and K-Mode algorithms



**Fig. 2.** Bar graph analysis of Novel Support Vector Machine Algorithm and K-Mode algorithm. Graphical representation shows the mean accuracy of 76.70% and 68.50% for the proposed algorithms Novel Support Vector Machine and K-Mode respectively. X-axis : SVM vs K-Mode, Y-axis : Mean accuracy  $\pm$  1 SD.