# Machine Learning Approach for Recognizing Human Activity: An Improved Support Vector Machine over K-Nearest Neighbor Method

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**ABSTRACT**

**Aim:** The main aim of the research is to enhance Human Activity Recognition using Support Vector Machine (SVM) over K-Nearest neighbor (KNN) **Materials and Methods:** SVM and KNN are implemented in this research work. Sample size is calculated using G power software and determined as 10 per group with pretest power 80%, threshold 0.05% and CI 95%. **Result:** SVM provides a higher of 93.32% compared to KNN algorithm with 92.02% in predicting lack of accuracy in Human Activity Recognition. The significance value of $p=0.009$ ($p<0.05$) for SVM is statistically insignificant. **Conclusion:** SVM algorithm predicts human activity recognition better than K-Nearest Neighbor Algorithm.

**Keywords:** Activity Recognition, Machine Learning, Algorithm, Data Analysis, Sensors, K-Nearest Neighbor Algorithm.

## INTRODUCTION

The prediction using machine learning has succeeded in comparing Novel SVM over KNN Algorithm.(Ortiz 2015). Cell phones developed from having straightforward arrangement of sensors into having refined sensors like GPS Navigation frameworks, Proximity Sensors, Accelerometers, Gyroscopes, Fingerprint sensors and numerous different provisions which can be utilized by clients in numerous commonsense applications (Wang et al. 2018). Machine Learning Administered AI calculation needs a set of known information and yield esteems to foresee the approaching information and concentrate data on it dependent on the known info and yield information (Pius Owoh, Mahinderjit Singh, and Zaaba 2018). One of the ordinarily utilized regulated AI calculations for distinguishing examples or conduct of an information dependent on recently realized information is k-closest neighbor (KNN) calculation. KNN can anticipate the order of new information via looking for the most number of comparative arranged information in its neighbors (Xie, Song, and Ciesielski 2013).

In this paper, information is accumulated utilizing an android cell phone with an inherent accelerometer sensor. 6 distinct Machine Learning sorts of exercises are assembled freely and arbitrarily added with one another to deliver a solitary record which is required for preparing the information. To measure and concentrate information highlights by utilizing diverse factual instruments and extra calculations (Moreira et al. 2021). In

the wake of handling with , one more is utilized to change over the document into .arff record which is utilized in the information arrangement stage (Xie, Song, and Ciesielski 2013, 2014). Subsequent to changing over the document, information investigation programming by University of Waikato , an amazing independent AI examination programming with various AI calculations including KNN was utilized. Different measurable results are produced and investigated to get the ideal data dependent on the crude information (Chen et al. 2021).

(Bhavikatti et al. 2021; Karobari et al. 2021; Shanmugam et al. 2021; Sawant et al. 2021; Muthukrishnan 2021; Preethi et al. 2021; Karthigadevi et al. 2021; Bhanu Teja et al. 2021; Veerasimman et al. 2021; Baskar et al. 2021)

The research gap identified from the existing system shows poor accuracy. The study is to improve the accuracy of Classification by incorporating Novel SVM and comparing performance with KNN. The proposed model improves classifiers to achieve more accuracy for prediction of lack of accuracy in Human Activity Recognition.

## MATERIALS AND METHODS

This study setting was done in the Soft Computing Laboratory, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences. The number of required samples in research are two in which group 1 is Novel SVM compared with group 2 of KNN Algorithm. The samples were taken from the device and iterated 10 times to get desired accuracy with G power 80%, threshold 0.05% and CI 95%. A dataset consisting of a collection of activities was downloaded from the Data hub repository ..

### Support Vector Machine

The Novel SVM was utilized for classifying and differentiating input data types. This Novel SVM is widely used in Machine Learning to make predictions. Novel SVM is often used in Human Activity Recognition.. It has a large scale of predicting Human Activity Recognition.

### Pseudocode for Support Vector Machine

**Step1:** Import packages.

**Step2:** Create an input dataset.

**Step3:** Analyze the size of the taken input data.

**Step4:** Split the datasets for testing and training the dataset.

**Step5:** Apply Novel SVM algorithm.

**Step6:** Predict the results.

### K-Nearest Neighbor

KNN is one of the most outstanding calculations that can be utilized for such straightforward repeating exercises. Figure 3. Shows how the KNN calculation functions, k-Nearest Neighbor calculation orders an obscure item by counting the quantity of its closest neighbors dependent on the worth of k. The obscure occurrence will be named the class which is generally normal among its k closest neighbors. The worth of k should be a positive odd number to forestall having a similar number of neighbors which will result in a disarray in order of Machine Learning.

### Pseudocode for KNN Algorithm

**Step1:** Import packages.

**Step2:** Create an input dataset.

**Step3:** Analyze the size of the taken input data.

**Step4:** Split the datasets for testing and training the dataset.

**Step5:** Apply KNN algorithm.

**Step 6:** Predict the results.

Recall that the testing setup includes both hardware and software configuration choices. The laptop has an Intel Core i5 5th generation CPU with 12GB of RAM, an x86-based processor, a 64-bit operating system, and a hard drive. Currently, the software runs on Windows 10 and is programmed in Python. Once the program is finished, the accuracy value will appear. Procedure: Wi-Fi laptop connected. Chrome to Google Collaboratory search Write the code in Python. Run the code. To save the file, upload it to the disc, and create a folder for it. Log in using the ID from the message. Run the code to output the accuracy and graph.

**Statistical Analysis**

SPSS is a software tool used for statistics analysis. The proposed system utilized 10 iterations for each group with predicted accuracy noted and analyzed. Independent samples t-test was done to obtain significance between two groups.

## RESULTS

Table 1 shows the accuracy value of iteration of Novel SVM and KNN.

Table 2 represents the Group statistics results which depicts Novel SVM with mean accuracy of 93.32%, and standard deviation is 1.44. KNN has a mean accuracy of 92.02% and standard deviation is 1.55. Proposed Novel SVM algorithm provides better performance compared to the KNN algorithm.

Table 3 shows the independent samples T-test value for SVM and KNN with Mean difference as 8.1, std Error Difference as 0.67. Significance value is observed as 0.99 ($p>0.05$).

Figure 1 shows the bar graph comparison of mean of accuracy on SVM and KNN algorithm. Mean accuracy of SVM is 93.32% and KNN is 92.02%.

## DISCUSSION

In this study, enhancing Human Activity Recognition using SVM algorithm has significantly higher accuracy, approximately 93.32% in comparison to KNN (92.02%). SVM appears to produce more consistent results with minimal standard deviation.

The similar findings of the paper had (“Robust Real Time Based Face Recognition Using Support Vector Machine & Histogram Equalization Algorithm” 2015)an accuracy of 94% with KNN which was used to enhance HAR. The proposed work of (Shuvo et al. 2020) reported KNN has 92% accuracy which is used to predict lack of accuracy in HAR and performance of stock market. The work proposed shows(Shuvo et al. 2020) the SVM has a better accuracy of 94%. (Cao 2019)KNN is a parameter to enhance lack of accuracy in HAR which is used in both traditional and modern methods as per their research it opposes SVM has highest accuracy and KNN will get least accuracy compared to other machine learning techniques (Ma, Zhao, and Wang 2009) which ranges between 60% when compared to other machine learning algorithms will get more accuracy than this. By using KNN for finding lack of accuracy in HAR it will have key issues to pretend that SVM has least accuracy of 78%. Increasing the dataset's value only tends to get desired accuracy. (Peng et al. 2015)SVM performs better with a

combination of other machine learning algorithms.

The limitation of this research is that it cannot give appropriate results for smaller data. In this model it is not able to consider all given feature variable parameters for training. The future scope of proposed work will be prediction of lack of accuracy in Human Activity Recognition based on classification using class labels for lesser time complexity.

## CONCLUSION

In this study, lack of Accuracy in Human Activity Recognition using SVM algorithm provides better accuracy than KNN algorithm.

## DECLARATION

### Conflict of Interests

No conflict of interests in this manuscript

### Authors Contribution

Author CR.Kirankumar was involved in data collection, data analysis, manuscript writing. Author E.K.Subramanian was involved in conceptualization, data validation, and critical review of manuscript.

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## TABLES AND FIGURES

**Table 1.** Accuracy Values for Support Vector Machine(93.2%) and K-Nearest Neighbor(92.02%)

| S.NO | SVM | KNN |
|---|---|---|
| 1 | 94.80 | 93.61 |
| 2 | 94.59 | 93.00 |
| 3 | 93.30 | 92.40 |
| 4 | 92.66 | 91.70 |
| 5 | 91.10 | 89.60 |
| 6 | 92.20 | 91.50 |
| 7 | 95.00 | 92.40 |
| 8 | 94.32 | 93.40 |
| 9 | 91.30 | 89.20 |
| 10 | 94.00 | 93.40 |

**Table 2.** Group Statistics Results- SVM has an mean accuracy (93.32%), std.deviation (1.44), whereas KNN has mean accuracy (92.02%), std.deviation (1.55).

**atistics**

| | Groups | N | Mean | Std deviation | Std. Error Mean |
|---|---|---|---|---|---|
| | SVM | 10 | 93.32 | 1.44 | 0.45 |
| | KNN | 10 | 92.02 | 1.55 | 0.49 |

**Table 3.** Independent Samples T-test - SVM seems to be significantly better than KNN (p=0.99)

**Independent Samples Test**

| **Levene's Test for Equality of Variances** | | **T-test for Equality of M** | | | | | |
|---|---|---|---|---|---|---|---|
| **F** | **Sig** | **t** | **df** | **Sig(2-tailed)** | **Mean Difference** | **Std.Error Difference** | |
| 0.000 | 0.99 | 1.946 | 18 | 0.438 | 8.1 | 0.67882 | |
| | | 1.946 | 17.903 | 0.439 | 8.1 | 0.67882 | 2.96550 1.33583 |

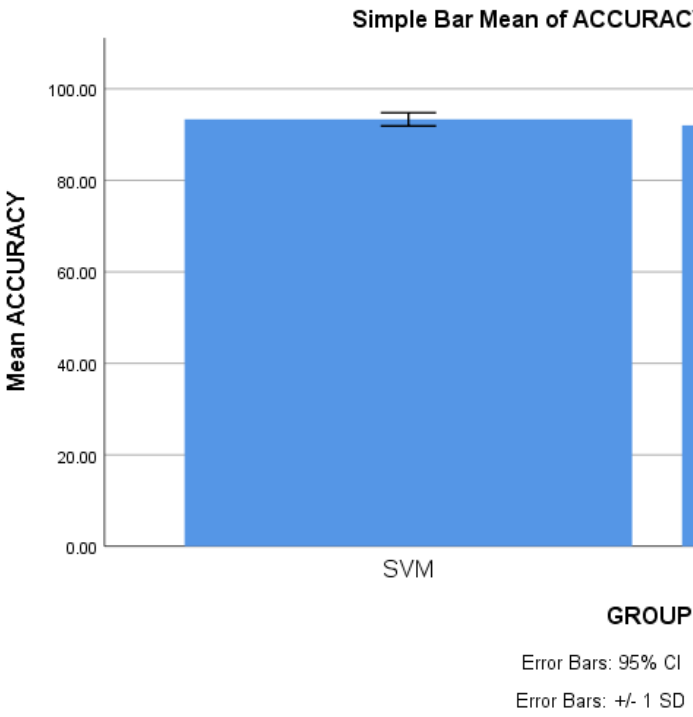


**Fig. 1.** Bar Graph Comparison on mean accuracy of SVM (93.32%) and KNN (92.02%).

X-axis: SVM, KNN, Y-axis: Mean Accuracy with $\pm 1$ SD.IT show that support vector machine has better accuracy than KNN.