**Title Page:**

Analysing the Prioritization of Emergency Cases in Hospitals with Innovative Support Vector Machines (SVMs) Algorithm Compared to Neural Networks to Improve the Accuracy

N.Mahesh1, Uma Priyadarsini2

N.Mahesh1

Research Scholar,

Department of Computer Science and Engineering,

Saveetha School of Engineering,

Saveetha Institute of Medical and Technical Sciences,

Saveetha University, Chennai, Tamil Nadu, India, Pincode:-602105.

maheshmahesh1287.sse@saveetha.com

Uma Priyadarsini2

Research Guide, Corresponding Science and Engineering,

Department of Computer Science and Engineering,

Saveetha School of Engineering,

Saveetha Institute of Medical and Technical Sciences,

Saveetha University, Chennai, Tamil Nadu, India, Pincode:602105.

umapriyadarsini@saveetha.com

**Keywords:** Emergency Cases, Prioritization, Neural Network, Research, Innovative Support Vector Machines, Machine Learning.

**ABSTRACT**

**Aim:**The purpose of this research is to create a solid and dependable system that uses the Innovative Support Vector Machines (SVMs) algorithm in conjunction with Neural Networks to prioritize emergency patients in hospitals.**Materials and** **Methods**:Innovative Support Vector Machines are used in hospitals to prioritize emergency cases over neural networks; the sample size for both groups is thirty, with an 80% pretest analysis. **Result:** The SVM-based approach achieved an accuracy rate of 93.33% in emergency case prioritization, which is significantly higher than the neural networks algorithm's 64.07% accuracy rate. **Conclusion:**This research shows that the Innovative SVM-based technique provides a substantially more resilient and accurate method than Neural Networks algorithms when it comes to prioritizing emergency situations in hospitals.

**Keywords:** Emergency Cases, Prioritization, Neural Network, Research, Innovative Support Vector Machines, Machine Learning.

# **INTRODUCTION**

Prioritizing emergency cases, often known as "triage," is the methodical process of assessing and classifying patients according to the seriousness and urgency of their medical issues [(Liu, Timsina, and El-Gayar 2016)](https://paperpile.com/c/J6qFiB/qKzG). Healthcare professionals can more effectively allocate resources thanks to this categorization, which guarantees that the most urgent situations get quick attention while less serious cases are handled properly but with less urgency. Prioritizing emergency cases, often known as "triage," is the methodical process of assessing and classifying patients according to the seriousness and urgency of their medical issues [(Leaman and La, 2024.)](https://paperpile.com/c/J6qFiB/bhNd). In addition, expanding patient numbers, the constant need for urgent care, and the strain placed on healthcare institutions all call for the creation of creative and reliable prioritization systems. Triage systems are used in hospitals to prioritize emergency situations. These systems classify patients according to the severity of their conditions and the urgency of their need for care. These programs may make use of algorithms that take into account medical history, vital signs, symptoms, and available resources in order to effectively distribute resources and medical attention to individuals who are most in need, guaranteeing that life-saving care is provided as soon as possible. Digital triage technologies can also expedite the procedure, empowering medical personnel to act quickly and intelligently, ultimately leading to better patient outcomes in critical circumstances.

About 89 papers on Google Scholar and 53 research pieces on IEEE Xplore discuss hospital emergency instances [(Pandey, 2024.)](https://paperpile.com/c/J6qFiB/vElI).Research highlights the necessity of standard operating procedures and algorithms that take into account variables including the degree of illness, the resources at hand, and the number of patients in order to efficiently prioritize care . Furthermore, further research is being done to improve the precision and effectiveness of triage procedures in emergency situations using cutting-edge technology like artificial intelligence and machine learning.

This study's main goal is to assess how using a specially created dataset affects how accurately hospital emergency patients are prioritized [(“Multi-Sensor Fusion in Body Sensor Networks: State-of-the-Art and Research Challenges” 2017)](https://paperpile.com/c/J6qFiB/hHQU). A comparison shows that the accuracy obtained is higher than the Neural Networks technique. Using Innovative Support Vector Machines with hyperparameter adjustment, this work takes a different approach from the traditional random forest algorithm [(Ma et al., 2024.)](https://paperpile.com/c/J6qFiB/qWEo). The main goal is to improve the accuracy of hospital emergency case forecasting, demonstrating the potential advantage of this Innovative l algorithm over more conventional approaches.

**MATERIALS AND METHODS**

The suggested study is carried out at Saveetha School of Engineering's Deep Learning Lab, part of Saveetha Institute of Medical and Technical Sciences. The samples are categorized into two groups: Group 1 makes use of the Innovative Support Vector Machines Algorithm, while Group 2 makes use of the Neural Network Algorithm [(Pavel et al., 2024.)](https://paperpile.com/c/J6qFiB/PJVX). 30 samples make up each group, and the GPower Statistical Software test is used to obtain the sample estimate of 80% for each group.

This research uses the patient priority dataset, which can be accessed through the open-access Kaggle platform. It consists of 6963 rows with 18 different properties [(“Internet of Things (IoT) in High-Risk Environment, Health and Safety (EHS) Industries: A Comprehensive Review” 2018)](https://paperpile.com/c/J6qFiB/35Fe). The main objective is to increase the prediction accuracy of emergency analysis by utilizing particular characteristics. Interestingly, for classification and analysis, the analysis primarily uses the 'need only' attribute as the single text-dependent variable.

**Neural Networks Algorithm**

The primary objective of this study is to evaluate the impact of utilizing a purpose-built dataset on the accuracy of prioritizing hospital emergency cases. A comparative analysis demonstrates that the accuracy achieved surpasses that of the Neural Networks algorithm. Departing from the conventional random forest algorithm, this study employs a novel approach, utilizing Innovative Support Vector Machines with hyperparameter tuning. The central focus is to enhance the precision of forecasting emergency cases in hospitals, showcasing the potential superiority of this innovative algorithm in comparison to traditional methodologies.

**Pseudocode**

Step 1: Collect and Prepare Data.

X\_train = feature matrix for training data

y\_train = corresponding labels for training data

Step 2: Choose the Neural Networks Parameters.

numberOfTrees = 100

numberOfFeaturesPerTree = sqrt(numberOfFeatures)

Step 3: Define Neural Networks Model.

forest = NeuralNetworktAlgorithm(X\_train, y\_train, numberOfTrees, numberOfFeaturesPerTree)

Step 4: Train the Neural Networks Model.

Step 5: Make Predictions.

X\_test = feature matrix for test data

predictions = NeuralNetworksPredict(forest, X\_test)

Step 6: Evaluate Model Performance.

y\_test = corresponding labels for test data

accuracy = calculate\_accuracy(predictions, y\_test)

Step 7:Visualize Results.

**Innovative Support Vector Machine Algorithm**

Support Vector Machine is a powerful supervised learning technique that is widely utilized for regression and classification applications. By identifying the most effective hyperplane in the feature space to split different classes, it maximizes the margin between them. Innovative Support Vector Machines has proven to perform exceptionally well in a variety of fields, including image classification, bioinformatics, and finance. Department of Computer Science, National Taiwan University, Technical Report. "A Practical Guide to Innovative Support Vector Classification." Its ability to handle high-dimensional data and nonlinear interactions makes it particularly suitable for complex datasets. Innovative Support Vector Machines ability to handle small sample sizes and resistance to overfitting make it a popular choice for real-world applications.

**Pseudocode**

Step 1: Collect and Prepare Data.

Assume X\_train is the feature matrix for training data, y\_train is the corresponding labels.

Step 2: Choose the Support Vector Machine Kernel.

Assume a 'linear' kernel for simplicity

Step 3: Define Support Vector Machine Model.

model = SVM(kernel='linear', C=1.0)

Step 4:Train the Support Vector Machine Model.

model.train(X\_train, y\_train)

Step 5: Make Predictions.

Assume X\_test is the feature matrix for test data.

predictions = model.predict(X\_test)

Step 6:Evaluate Model Performance.

You can use metrics like accuracy, precision, recall, and F1-score.

accuracy = calculate\_accuracy(predictions, y\_test)

Step 7:Visualize Results.

**Stastical Analysis**

To do statistical calculations on the data gathered from classifiers at various test sizes, a statistical program known as SPSS tool is utilized [(Yaqoob et al., 2024.)](https://paperpile.com/c/J6qFiB/ekLs). The training dataset's text component is an independent variable, while the text element of the testing dataset is not reliant on it.The corresponding performances of the Innovative Support Vector Machine and Neural Network techniques are compared with heart-rate and blood pressure as dependent variables [(Yaqoob et al., 2024.)](https://paperpile.com/c/J6qFiB/ekLs). The independent sample t-test was performed using the data from the iterations.

**RESULT**

Innovative Support Vector Machine algorithms outperform Neural Network algorithms in terms of accuracy. The experiment is run multiple times before the data are collected in order to establish different accuracy rate scales. We performed the statistical calculations using the SPSS software and the results of the experiment. We perform the independent sample t-test.

The group statistics table, which shows the number of values and groups that have been chosen, is shown in table 1. This table compares the mean accuracy and standard deviation of the Innovative Support Vector Machine algorithms, 93.33% and 1.807. The Innovative Support Vector Machines Algorithm (.330) and Neural Networks Algorithm (.392) have standard error means of 1.807 and 93.33%, respectively It is discovered that the accuracy of the Innovative Support Vector Machines technique is higher at 93.33% than that of the Neural Networks method, which is 64.07% accurate.

Table 2 demonstrates that the Independent Sample T-Test is employed with the sample collections following the application of the SPSS computations to the Innovative Support Vector Machine Algorithm, with the level of significance set at (p=0.01, p<0.05) with a 95% confidence interval. To compare the means of the two groups, a different Sample t-test is employed.The mean accuracy of the Innovative Support Vector Machine algorithm (93.33) and the Neural Networks approach (64.07) are contrasted in the bar graph. Let's examine each algorithm's mean accuracy in isolation. The Innovative Support Vector Machine Algorithm appears to generate results more consistently when the standard deviation is smaller.

Figure 1 shows a comparison of the bar graphs representing the mean accuracy of Innovative Support Vector Machines and Neural Networks. The methods with error bars from the Innovative Support Vector Machine and Neural Networks methodologies, along with their +/-2 SD and 95% CI, are displayed on the x-axis, while the y-axis shows the mean accuracy.

**DISCUSSION**

The Neural Networks approach is approximately less accurate than the Innovative Support Vector Machine in this research investigation on health prioritization. Greater significance (p=0.01, p<0.05) is obtained with the Innovative Support Vector Machine technique using the independent samples t-test . With a standard deviation of 1.807 and a mean accuracy of 93.33, the Innovative Support Vector Machine method performs well. 64.07 and 2.149 are the algorithms for neural networks [(Xia, Chen, and Yang, 2024.)](https://paperpile.com/c/J6qFiB/hoeC).

The accuracy of health prioritizing must be improved by comparing the techniques used by Neural Networks and Innovative Support Vector Machines. Neural networks are superior to SVMs in a number of ways, the primary one being their capacity to efficiently handle big, high-dimensional datasets [(“Cognitive Radio for M2M and Internet of Things: A Survey” 2016)](https://paperpile.com/c/J6qFiB/oC4Y). Using many decision trees and averaging their predictions, the Neural Networks ensemble technique frequently produces results with higher levels of robustness and generalization [(Rodgers, Pai, and Conroy, 2024.)](https://paperpile.com/c/J6qFiB/867L). Because datasets in the healthcare sector may show intricate patterns and different levels of class distribution, this functionality is essential.When choosing between Neural Networks and Innovative Support Vector Machines in clinical practice, one should carefully evaluate the special features of the dataset, the intended interpretability of the model, and any computing restrictions [(Alam et al., 2024)](https://paperpile.com/c/J6qFiB/5Ol5).There is no opposite findings in this research.

While comparing Innovative Support Vector Machines and Neural Networks to prioritize healthcare, it is important to consider the characteristics of the dataset and clinical requirements while choosing the best solution [(“Extending the Framework for Mobile Health Information Systems Research: A Content Analysis” 2017)](https://paperpile.com/c/J6qFiB/O6V6). In order to improve diagnosis accuracy and enable customized treatment plans, future research projects should concentrate on investigating hybrid techniques that combine the advantages of both algorithms [(Rodgers, Pai, and Conroy, 2024.)](https://paperpile.com/c/J6qFiB/867L).In situations when model openness is crucial for healthcare practitioners to make decisions, Innovative Support Vector Machine is a better option despite its potential for more accuracy and efficiency in some cases [(Cook et al., 2024.)](https://paperpile.com/c/J6qFiB/ZtNN). This is because of its theoretical guarantees and support [(Deng et al., 2024.)](https://paperpile.com/c/J6qFiB/zaxG).

This innovative approach, which advances machine learning applications in healthcare management, also offers significant implications for clinical practice. It does this by combining entropy with neural networks [(Abdelwahab et al., 2024.)](https://paperpile.com/c/J6qFiB/XPQU). The greater precision of this methodology compared to more antiquated methods like Innovative Support Vector Machine may lead to better patient outcomes in healthcare settings [(“Medicine Reminder and Monitoring System for Secure Health Using IOT” 2016)](https://paperpile.com/c/J6qFiB/YTwF). This could alter the process for early diagnosis and intervention.

The main limitation of the experiment is the limited collection of variables in the dataset that can be used to forecast the accuracy % for healthcare prioritization [(“Internet of Things (IoT) in High-Risk Environment, Health and Safety (EHS) Industries: A Comprehensive Review” 2018)](https://paperpile.com/c/J6qFiB/35Fe). With more independent and dependent variables, the accuracy will increase even more.

Future hospital emergency room scope is probably going to include technological developments, modifications to healthcare delivery systems, and an emphasis on enhancing overall effectiveness and patient outcomes.

**CONCLUSION**

The proposed framework for healthcare prioritizing analysis has the accuracy of 93.33% for Innovative Support Vector Machine Algorithm compared with the Neural Networks Algorithm having the accuracy of 64.07%. The proposed framework proves that the Innovative Support Vector Machine has better significant accuracy than the Neural Networks Algorithm.

**DECLARATION**

**Conflicts of interests**

No conflict of interest in this manuscript.

**Author contributions:**

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

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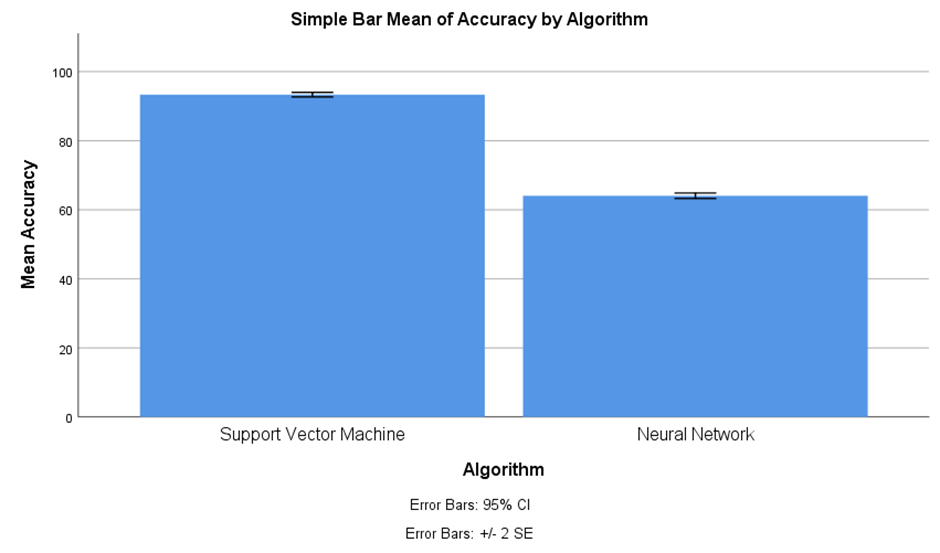
**TABLES AND FIGURE**

**Table 1.** The mean values for the Innovative Support Vector Machine is 93.33,While this mean for Random Forest is 64.07. The standard deviations for both algorithms are 1.807 and 2.149 respectively.

|  | **Algorithm** | **N** | **Mean** | **Std. Deviation** | **Std.Error Mean** |
| --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Support Vector Machine** | 30 | 93.33 | 1.807 | .330 |
| **Neural Network** | 30 | 64.07 | 2.149 | **.**392 |

**Table 2.** The accuracy rises as the error decreases in independent sample testing. The two tailed significance ,falling below 0.001 (p<0.05), shows the statistical significance of this relationship.

|  | **Leven’s test for equality of Variances** | | **T-test for equality of means** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | | | | | | |
| **f** | **Sig** | **t** | **dif** | **Sig (2-tailed)** | **Mean.diff** | **Std.Error difference** | **95% confidence interval of the difference** | |
| **Lower** | **Uppe**r |
| **Equal variances assumed** | .737 | .394 | 57.103 | 58 | .000 | 29.267 | .513 | 28.241 | 30.293 |
| **Equal variances not assumed** |  |  | 57.103 | 56.342 | .000 | 29.267 | .513 | 28.240 | 30.293 |



**Fig. 1.** The Innovative Support Vector Machine Algorithm outperforms the Neural Networks Algorithm with 93.33% versus 64.07% accuracy, and slightly superior standard deviation. The comparison is depicted on the graph, with the X-axis representing Innovative Support Vector Machine and Neural Networks Algorithms and the Y axis reflecting mean size and accuracy with a range of ±2 standard errors.