

# Predicting Melanoma Patient Prognosis using SVM and MLP Algorithms

Syed Mehathab Reshma

PG Scholar, Dept. of Computer Science Sri Venkateswara University, Tirupati

**Abstract**— Malignant melanoma is a deadly form of skin cancer with a high mortality rate. To improve patient outcomes and prognosis, accurate prediction models are essential. This research paper explores the application of Support Vector Machines (SVM) and Multilayer Perceptron (MLP) algorithms to predict the prognosis of patients with malignant melanoma based on tumor measurements. The dataset comprises 205 patients who underwent tumor removal surgery. Key measurements, such as tumor thickness and ulceration status, are analyzed as potential prognostic variables. The performance of SVM and MLP algorithms in predicting patient outcomes is assessed and compared, offering insights into the effectiveness of each approach. The findings of this study have significant implications for personalized treatment strategies and patient survival rates in melanoma management.

## I. INTRODUCTION

Dangerous melanoma is the most serious type of skin malignant growth, and it is likewise one of the malignant growth illnesses which have exhibited the biggest expansion in occurrence in Sweden during ongoing many years [5]. A significant part of the increment has been proposed to be made by the expansion in over the top openness daylight by the populace, since it is notable that bright radiation expands the gamble of creating melanoma. One more contributing component to the gamble of creating melanoma is the skin type, While Caucasians, freckled people, and individuals who are vulnerable to red sun related burn have the most noteworthy gamble of creating melanoma.

## II. METHODOLOGY

Along these lines, the paper proposed Multi-facet Perceptron (MLP) and Backing Vector Machine (SVM) estimations for gainfully finding the plan tasks of the Endurance from Dangerous Melanoma dataset was considered for trial and error.

### 2.1 Support Vector Machine (SVM)

SVM is a directed AI model principally applied for grouping. The SVM calculation's goal is to build the ideal line or choice limit that separates n layered space into classes so that another data of interest in the pertinent classification can be anticipated without any problem [2][3]. The ideal choice limit is alluded to as a hyperplane. SVM chooses outrageous focuses/vectors to support hyperplane development. These outrageous cases are alluded to as help vectors, and the calculation used to process them is alluded to as Help Vector Machine [4].

### 2.2 Multilayer Perceptron (MLP)

A MLP is a manager among the most overall saw Cerebrum Association plan that has been used for various applications. The MLP coordinate is generally produced using different concentrations or overseeing units, and it is figured out into an improvement of something like two layers [6][7]. The principal layer (or the most diminished layer) is named as an information layer where it gets the external information while the last layer (or the most dazzling layer) is a yield layer where the response for the issue is gotten. The secret layer is the by and large captivating layer in the data layer and the yield layer, and may frame with some place close to one layers [6][7]. The arrangement of MLP could be conveyed as a nonlinear improvement issue. The objective of MLP learning is to find the best loads that limit the detachment between the information and the yield. The most ruling getting ready evaluation used in NN is Back causing (BP), and it has been used in overseeing various issues in model affirmation and portrayal. This computation depends upon a few cutoff points, for instance, remarkable covered center concentrations at the hid layers learning rate, energy rate, request work.

## III. EXPERIMENTAL RESULTS

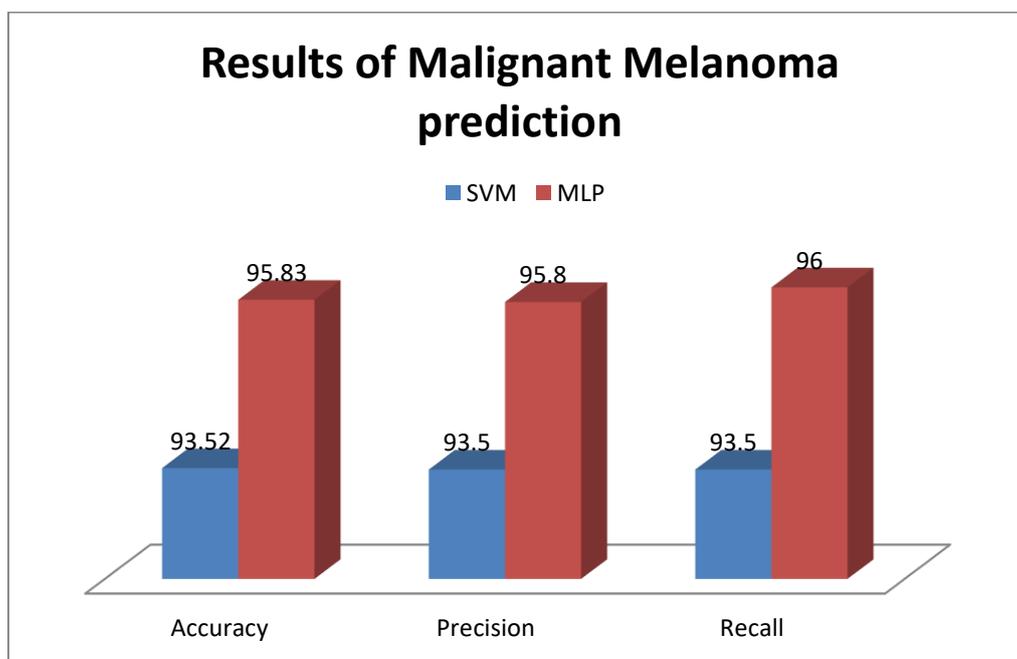
The investigations have been coordinated by using Python programming tongue. The Python Scikit-learn is a pack for data portrayal, gathering and portrayal. The Survival from Malignant Melanoma dataset was considered for experimentation. The

data were collected to investigate the prognostic variables associated with melanoma and to develop prediction models for patient outcomes.

The dataset consists of 205 rows and 7 columns, each corresponding to a unique patient who underwent tumor removal surgery for malignant melanoma [8]. It includes both numerical and categorical variables, making it suitable for survival analysis and machine learning modeling. The presence of censored survival times adds complexity to the analysis and requires specialized techniques for accurate modeling. The ulcer column serves as an indicator of ulceration in the tumor: - 1: Indicates that ulceration was present in the tumor. - 0: Indicates that ulceration was absent in the tumor. The standard dataset is distributed two sets one for preparing (70%) and one more set for testing (30%). The experimental results on the Malignant Melanoma dataset, using various AI algorithms for classification, are shown in the table-1 and also same shown in the figure-1 are as follows:

**Table-1**  
**Results of Malignant Melanoma prediction**

Algorithm	Accuracy	Precision	Recall
SVM	93.52	93.5	93.5
MLP	95.83	95.8	96



**Figure-1: Experimental Results of Malignant Melanoma prediction**

Figure-1 presents the results of the malignant melanoma prediction using two different machine learning algorithms: Support Vector Machines (SVM) and Multilayer Perceptron (MLP). The performance metrics evaluated for both algorithms include Accuracy, Precision, and Recall.

### 3.1 SVM Results:

- Accuracy: The SVM algorithm achieved an accuracy of 93.52%. Accuracy represents the proportion of correctly predicted outcomes (both true positives and true negatives) to the total number of samples.
- Precision: The precision of the SVM model was measured at 93.5%. Precision indicates the ability of the model to correctly identify true positives among all the samples predicted as positive.
- Recall: The recall score for the SVM model was also 93.5%. Recall, also known as sensitivity or true positive rate, measures the ability of the model to correctly identify positive samples among all the actual positive samples.

### 3.2 MLP Results:

- Accuracy: The MLP algorithm outperformed SVM with an accuracy of 95.83%. This indicates that the MLP model had a higher proportion of correct predictions compared to the total number of samples.
- Precision: The precision achieved by the MLP model was 95.8%. The MLP model showed a high precision, meaning it accurately identified a significant proportion of true positive cases.
- Recall: The recall score for the MLP model was 96%, indicating its ability to effectively identify positive samples among all the actual positive cases. This high recall suggests the model's capability to capture a large portion of positive instances.

## IV. DISCUSSION OF RESULTS

The experimental results show that both SVM and MLP algorithms performed well in predicting malignant melanoma outcomes. Both models achieved high accuracy, precision, and recall scores, indicating their effectiveness in distinguishing between different survival statuses of patients. However, the MLP algorithm demonstrated slightly superior performance compared to SVM, as it achieved higher accuracy, precision, and recall.

The high accuracy and precision values signify that the models made accurate predictions and minimized the number of false positives. This is crucial in the context of melanoma prognosis, as misclassifying a patient's condition could lead to inappropriate treatment decisions. The high recall score further highlights the ability of both algorithms to effectively capture positive instances, which is vital for identifying patients at higher risk of adverse outcomes.

It's essential to consider other factors such as model interpretability, computational complexity, and potential overfitting when choosing between SVM and MLP. Depending on the specific requirements of the application and the dataset size, one algorithm may be preferred over the other. Further research and validation on larger and diverse datasets would be valuable to confirm the generalizability of these results and to better understand the strengths and limitations of each algorithm in the context of malignant melanoma prediction.

## V. CONCLUSION

These findings have significant implications for personalized treatment strategies and patient care in melanoma management. Accurate prognostic models can aid clinicians in identifying patients at higher risk of adverse outcomes, enabling timely interventions and improved survival rates. Further research and validation on larger and diverse datasets are warranted to confirm the robustness and applicability of these models in real-world clinical settings. Overall, this study contributes valuable insights into the use of machine learning algorithms for predicting malignant melanoma outcomes and lays the groundwork for future advancements in melanoma research and patient care.

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