

| Algorithm type                                   | Algorithm   | AUC  | Accuracy | F1 Score Micro | F1 Score Macro |
|--|---|------|----------|----------------|----------------|
| Deep Learning without Nature Inspired Algorithms | Long Short Term Memory                                    | 0.88 | 78.84%   | 0.80           | 0.76           |
|  | Long Short Term Memory Auto-Encoders                      | 0.73 | 70.00%   | 0.70           | 0.62           |
|  | Convolution Long Short Term Memory                        | 0.75 | 70.98%   | 0.71           | 0.66           |
|  | Convolution Long Short Term Memory Auto-Encoders          | 0.87 | 80.32%   | 0.80           | 0.78           |
|  | Bi-Directional Long Short Term Memory Auto-Encoders       | 0.85 | 77.99%   | 0.78           | 0.75           |
| Deep Learning with Nature Inspired Algorithms    | Long Short Term Memory with Bat Algorithm                 | 0.75 | 70.42%   | 0.70           | 0.63           |
|  | Long Short Term Memory with Grey Wolf optimizer Algorithm | 0.85 | 81.57%   | 0.79           | 0.76           |

TABLE IV  
Comparison among different Models implemented

| Methods                 | Area Under ROC Curve | Accuracy |
|-------------------------|----------------------|----------|
| Logistic Regression     | 0.54                 | 58.09%   |
| Support Vector Machines | 0.54                 | 59.37%   |
| Decision Tree           | 0.52                 | 55.68%   |
| Random Forest           | 0.53                 | 60.49%   |

TABLE V  
Comparison with Baseline Models