# Supplementary 1: Hyperparameter Tuning

In the decoder part of the CAE, different node values from 240 to 340, with a step size of 10 was tested to tune the number of nodes in the decoder layer. It was found the 300 nodes would yield the highest accuracy, as evident in Figure 1. So the number of nodes was selected as 300.

Chart, line chart

Description automatically generated

**Figure 1.** Tuning number of nodes in the decoder. For 300 nodes, it yields the highest accuracy.

We did a random search of parameters from a range of values to tune the number of epochs and learning rate. For the number of epochs, the used values are - 200, 300, 500, 1000, 1500, 2000, 2500, 3000. Similarly, for learning rate, the values are - 0.001, 0.002, 0.005, 0.0005, 0.01 and 0.05. Table 1 contains the accuracy of all different combinations of epoch and learning rate. The highest value of accuracy was 0.9507, which is found for the epoch of 300 and learning rate of 0.002.

**Table 1.** Summary of hyperparameter tuning for epoch and learning rates. For different values of epoch and learning rate, there are different accuracies for the SVM model and by the features selected by CAE.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Epoch** | **Learning Rate** | **Accuracy** | **Epoch** | **Learning Rate** | **Accuracy** |
| 200 | 0.0005 | 0.9256 | 500 | 0.005 | 0.9371 |
| 300 | 0.0005 | 0.9203 | 1000 | 0.005 | 0.9403 |
| 1000 | 0.0005 | 0.9340 | 1500 | 0.005 | 0.9266 |
| 1500 | 0.0005 | 0.9308 | 2000 | 0.005 | 0.9224 |
| 2000 | 0.0005 | 0.9277 | 2500 | 0.005 | 0.9308 |
| 2500 | 0.0005 | 0.9340 | 2500 | 0.005 | 0.9235 |
| 3000 | 0.0005 | 0.9434 | 3000 | 0.005 | 0.9224 |
| 200 | 0.001 | 0.9256 | 200 | 0.01 | 0.2296 |
| 300 | 0.001 | 0.9382 | 300 | 0.01 | 0.2180 |
| 500 | 0.001 | 0.9361 | 500 | 0.01 | 0.2317 |
| 1000 | 0.001 | 0.9444 | 1000 | 0.01 | 0.3071 |
| 1500 | 0.001 | 0.9476 | 1500 | 0.01 | 0.2453 |
| 2000 | 0.001 | 0.9340 | 2000 | 0.01 | 0.4130 |
| 2500 | 0.001 | 0.9497 | 2500 | 0.01 | 0.2233 |
| 3000 | 0.001 | 0.9413 | 3000 | 0.01 | 0.2914 |
| 200 | 0.002 | 0.9266 | 200 | 0.05 | 0.2421 |
| 300 | 0.002 | 0.9507 | 300 | 0.05 | 0.2411 |
| 500 | 0.002 | 0.9444 | 500 | 0.05 | 0.2254 |
| 1000 | 0.002 | 0.9486 | 1000 | 0.05 | 0.2222 |
| 1500 | 0.002 | 0.9392 | 1500 | 0.05 | 0.2379 |
| 2000 | 0.002 | 0.9434 | 2000 | 0.05 | 0.2254 |
| 2500 | 0.002 | 0.9319 | 2500 | 0.05 | 0.2285 |
| 3000 | 0.002 | 0.9403 | 2500 | 0.05 | 0.2159 |
| 200 | 0.005 | 0.9361 | 3000 | 0.05 | 0.2170 |