In the decoder part of the CAE, different node values from 240 t0 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 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

For tuning the number of epochs and learning rate, we did a random search of parameters from a range of values. 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. The 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 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 is different accuracy for 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 |