**Project 4**

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**Phase 1 – User dependent Analysis**

**Steps:**

1. The new set of features that was obtained by multiplying the PCA output with the feature set in project 3 serves as input to project 4. There are two files: eating\_proj4\_input.csv and noneating\_proj4\_input.csv

2. We implemented splitdata(filename) which will divide 60% of the data as training data and 40% data as test data.

3. Machines namely Decision tree, SVM and Neural networks are trained using the train data. Then we provided test data and evaluated the performance of the machine using metrics such as precision, recall, f1score and ROC values. Implementation details as follows:

Decision Tree:

Fitted binary classification decision tree has been used. The machine is trained by providing the training data and its labels. E.g. tc = fitctree(X, y). Then test data is passed to the machine to predict its labels.

SVM:

We used MATLAB’s fitcsvm() to train a SVM model for two-class classification. E.g. tc = fitcsvm(X, y). Then the test data is passed, and prediction is made.

Neural network:

Feedforward neural network has been used to make the prediction.

E.g.

net = feedforwardnet(1);

net = train(net,X',y');

predicted = net(X2');

predicted = round(predicted);

predicted = predicted';

Evaluation metrics:

To calculate the evaluation metrics, we calculated the confusion matrix from the prediction.

E.g. confusionMat = confusionmat(y2, predicted). Using the values in the confusion matrix, precision, recall, f1score and ROC are calculated using the formula:

precision = confusionMat(1,1) / (confusionMat(1,1) + confusionMat(2,1));

recall = confusionMat(1,1) / (confusionMat(1,1) + confusionMat(1,2));

f1score = 2 \* (precision \* recall)/(precision + recall);

[tpr,fpr,th] = roc(y2',predicted');

**Results:**

Filename : proj4\_phase1.m

Input : eating\_proj4\_input.csv, noneating\_proj4\_input.csv

Output : See below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Machines** | **Precision** | **Recall** | **F1score** | **ROC** | |
| **TPR** | **FPR** |
| Decision Tree | 0.9691 | 0.8698 | 0.9167 | 97.2222 | 13.0208 |
| SVM | 0.8326 | 0.9931 | 0.9058 | 80.0347 | 0.69444 |
| Neural network | 0.9682 | 0.8993 | 0.9325 | 97.0486 | 10.0694 |

**Phase 2 – User Independent Analysis**

**Steps:**

For this, first 10 teams data are used for training and the other 23 teams data are for testing. Implementation for decision tree, SVM, Neural network and evaluation metrics are same as mentioned in phase 1.

**Results:**

Filename : proj4\_phase2.m

Input : Copy all files from this [link](https://drive.google.com/open?id=1MnIbittnm1WlHu99PBeihcdfI8Wy8TU1) to the working directory

Output : See below

Decision Tree

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Team** | **Precision** | **Recall** | **F1score** | **ROC** | |
| **TPR** | **FPR** |
| Team11 | 0.58075 | 0.24722 | 0.34681 | 82.153 | 75.278 |
| Team12 | 0.77543 | 0.40764 | 0.53437 | 88.194 | 59.236 |
| Team13 | 0.7694 | 0.24097 | 0.367 | 92.778 | 75.903 |
| Team14 | 0.87766 | 0.22917 | 0.36344 | 96.806 | 77.083 |
| Team15 | 0.83333 | 0.62153 | 0.71201 | 87.569 | 37.847 |
| Team16 | 0.48411 | 0.275 | 0.35075 | 70.694 | 72.5 |
| Team17 | 0.51587 | 0.27083 | 0.35519 | 74.583 | 72.917 |
| Team18 | 0.56863 | 0.24167 | 0.33918 | 81.667 | 75.833 |
| Team19 | 0.76471 | 0.25278 | 0.37996 | 92.222 | 74.722 |
| Team20 | 0.41242 | 0.17986 | 0.25048 | 74.375 | 82.014 |
| Team21 | 0.77377 | 0.32778 | 0.46049 | 90.417 | 67.222 |
| Team22 | 0.19048 | 0.030556 | 0.052663 | 87.014 | 96.944 |
| Team23 | 0.71201 | 0.34167 | 0.46176 | 86.181 | 65.833 |
| Team24 | 0.81836 | 0.58194 | 0.68019 | 87.083 | 41.806 |
| Team25 | 0.86364 | 0.34306 | 0.49105 | 94.583 | 65.694 |
| Team26 | 0.38287 | 0.10556 | 0.16549 | 82.986 | 89.444 |
| Team27 | 0.51469 | 0.32847 | 0.40102 | 69.028 | 67.153 |
| Team28 | 0.46076 | 0.28542 | 0.35249 | 66.597 | 71.458 |
| Team29 | 0.84416 | 0.36111 | 0.50584 | 93.333 | 63.889 |
| Team30 | 0.50539 | 0.22778 | 0.31403 | 77.708 | 77.222 |
| Team31 | 0.64228 | 0.16458 | 0.26202 | 90.833 | 83.542 |
| Team32 | 0.86977 | 0.50556 | 0.63944 | 92.431 | 49.444 |
| Team33 | 0.6793 | 0.62222 | 0.64951 | 70.625 | 37.778 |

SVM

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Team** | **Precision** | **Recall** | **F1score** | **ROC** | |
| **TPR** | **FPR** |
| Team11 | 0.48784 | 0.93333 | 0.64076 | 2.0139 | 6.6667 |
| Team12 | 0.46785 | 0.87917 | 0.61071 | 0 | 12.083 |
| Team13 | 0.5 | 1 | 0.66667 | 0 | 0 |
| Team14 | 0.5 | 1 | 0.66667 | 0 | 0 |
| Team15 | 0.47674 | 0.91111 | 0.62595 | 0 | 8.8889 |
| Team16 | 0.50227 | 1 | 0.66868 | 0.90278 | 0 |
| Team17 | 0.46607 | 0.86806 | 0.6065 | 0.55556 | 13.194 |
| Team18 | 0.47636 | 0.90972 | 0.6253 | 0 | 9.0278 |
| Team19 | 0.47823 | 0.91528 | 0.62822 | 0.13889 | 8.4722 |
| Team20 | 0.4764 | 0.90417 | 0.62401 | 0.625 | 9.5833 |
| Team21 | 0.49983 | 0.99931 | 0.66636 | 0 | 0.069444 |
| Team22 | 0.5 | 1 | 0.66667 | 0 | 0 |
| Team23 | 0.48288 | 0.93056 | 0.63582 | 0.34722 | 6.9444 |
| Team24 | 0.49054 | 0.95417 | 0.64796 | 0.90278 | 4.5833 |
| Team25 | 0.49491 | 0.97986 | 0.65766 | 0 | 2.0139 |
| Team26 | 0.49433 | 0.96875 | 0.65462 | 0.90278 | 3.125 |
| Team27 | 0.48252 | 0.92986 | 0.63535 | 0.27778 | 7.0139 |
| Team28 | 0.48572 | 0.93333 | 0.63894 | 1.1806 | 6.6667 |
| Team29 | 0.46765 | 0.87847 | 0.61037 | 0 | 12.153 |
| Team30 | 0.4857 | 0.94375 | 0.64134 | 0.069444 | 5.625 |
| Team31 | 0.4883 | 0.94167 | 0.64311 | 1.3194 | 5.8333 |
| Team32 | 0.48033 | 0.92431 | 0.63215 | 0 | 7.5694 |
| Team33 | 0.50761 | 0.99583 | 0.67245 | 3.4028 | 0.41667 |

Neural network

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Team** | **Precision** | **Recall** | **F1score** | **ROC** | |
| **TPR** | **FPR** |
| Team11 | 0.30399 | 0.38125 | 0.33826 | 12.708 | 61.875 |
| Team12 | 0.7419 | 0.93819 | 0.82858 | 67.361 | 6.1806 |
| Team13 | 0.511 | 0.35486 | 0.41885 | 66.042 | 64.514 |
| Team14 | 0.68863 | 0.9 | 0.78025 | 59.306 | 10 |
| Team15 | 0.77061 | 0.98681 | 0.86541 | 70.625 | 1.3194 |
| Team16 | 0.61858 | 0.86944 | 0.72286 | 46.389 | 13.056 |
| Team17 | 0.57913 | 0.93264 | 0.71455 | 32.222 | 6.7361 |
| Team18 | 0.32274 | 0.41597 | 0.36347 | 12.708 | 58.403 |
| Team19 | 0.62785 | 0.36319 | 0.46018 | 78.472 | 63.681 |
| Team20 | 0.36963 | 0.45972 | 0.40978 | 21.597 | 54.028 |
| Team21 | 0.34962 | 0.41736 | 0.3805 | 22.361 | 58.264 |
| Team22 | 0.18475 | 0.18681 | 0.18577 | 17.569 | 81.319 |
| Team23 | 0.48182 | 0.44167 | 0.46087 | 52.5 | 55.833 |
| Team24 | 0.7246 | 0.94097 | 0.81873 | 64.236 | 5.9028 |
| Team25 | 0.49913 | 0.4 | 0.4441 | 59.861 | 60 |
| Team26 | 0.6826 | 0.38681 | 0.49379 | 82.014 | 61.319 |
| Team27 | 0.50898 | 0.74792 | 0.60574 | 27.847 | 25.208 |
| Team28 | 0.5177 | 0.87361 | 0.65013 | 18.611 | 12.639 |
| Team29 | 0.65172 | 0.56528 | 0.60543 | 69.792 | 43.472 |
| Team30 | 0.555 | 0.99514 | 0.71258 | 20.208 | 0.48611 |
| Team31 | 0.52842 | 0.30347 | 0.38553 | 72.917 | 69.653 |
| Team32 | 0.75 | 0.96042 | 0.84227 | 67.986 | 3.9583 |
| Team33 | 0.52053 | 0.84514 | 0.64426 | 22.153 | 15.486 |