Report

Gender Classification

Approach

- Load dataset
- Preprocess and split the dataset
- Build and tune a feed forward fully connected neural network model
- feed forward :- Sequential model and fully connected :- dense layers
- choose the right optimizer
- Analyze the loss and accuracy for both the training and validation datasets
- Test the model built on test dataset
- Perform calculations
- Change the optimizer and other parameters(learning rate, momentum, batch size) and perform the above steps again.

Preprocessing

The dataset is split into train and test in the ratio of 80:20

Further train data is also split into train and validation in the ratio of 80:20

Model

Feed forward model is built using keras.models.Sequential( ) and then made fully connected using keras.layers.Dense

Activation Function used: ‘softmax’ in output layer and ‘relu’ in all other layers

Dropout rate : 0.9

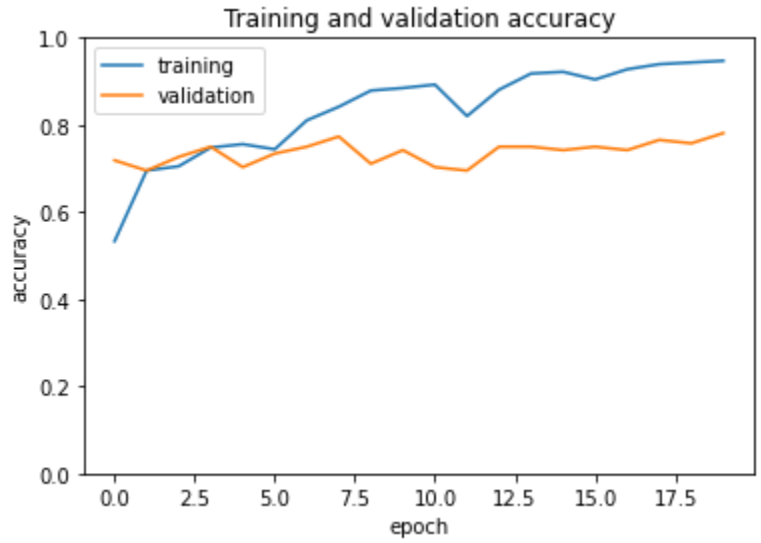
Optimizers Used

- Adam
- SGD with batch_size = maximum
- SGD with batch_size = 32
- SGD with batch_size = 16
- SGD with batch_size = 1
- RMSprop

- Adagrad
- Adadelta(learning rate = 0.01)
- Adadelta(learning rate = 1)

Plots and Evaluation Metrics

- Adam(lr=0.001)



Overall Categorical Accuracy: 75.00%

Confusion Matrix

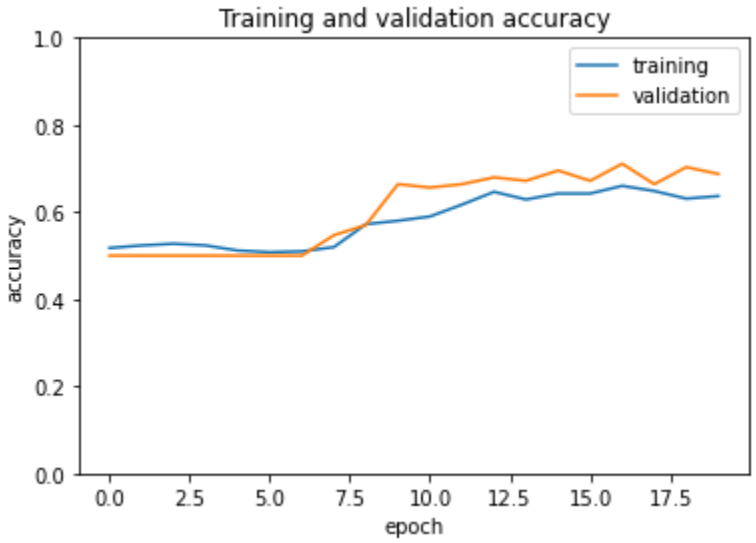
[[62 18]

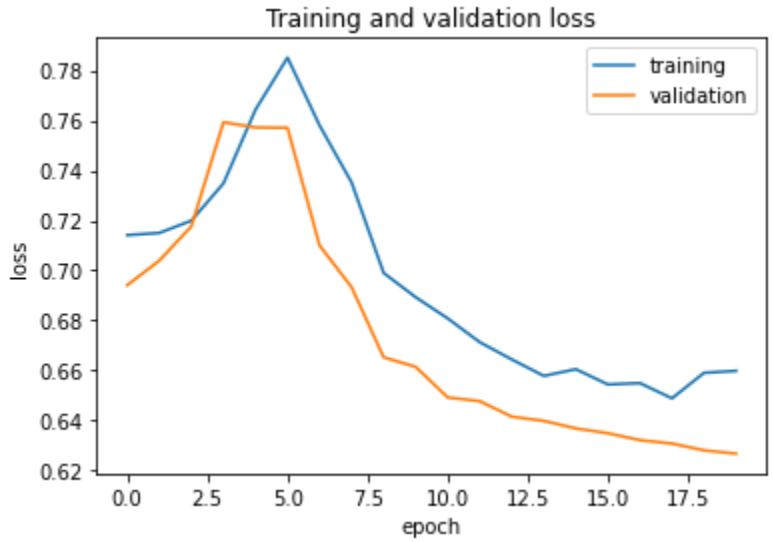
[22 58]]

AUC: 0.750

	Precision	Recall	F-Score	Support	Specificity
male	0.738095	0.775	0.756098	80.0	0.763158
female	0.763158	0.725	0.743590	80.0	0.775000

- SGD with batch_size = Maximum





Overall Categorical Accuracy: 62.50%

Confusion Matrix

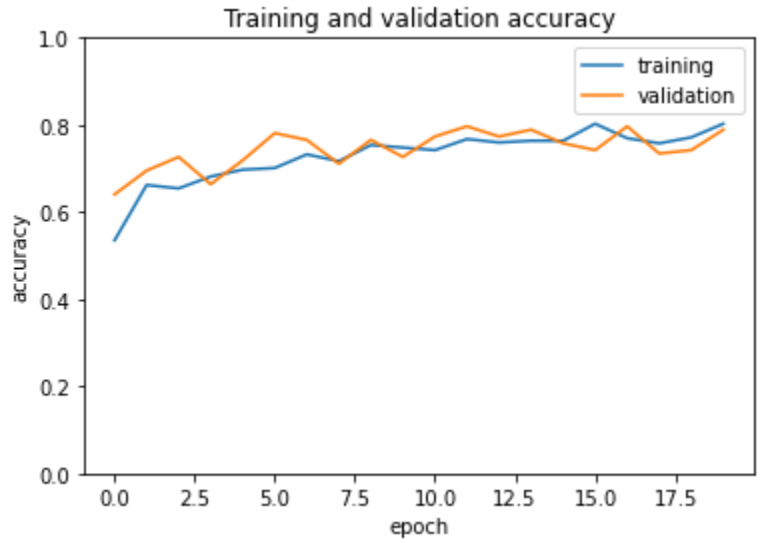
[[54 26]

[34 46]]

AUC: 0.625

	Precision	Recall	F-Score	Support	Specificity
male	0.613636	0.675	0.642857	80.0	0.638889
female	0.638889	0.575	0.605263	80.0	0.675000

- SGD with batch_size = 32



Overall Categorical Accuracy: 75.62%

Confusion Matrix

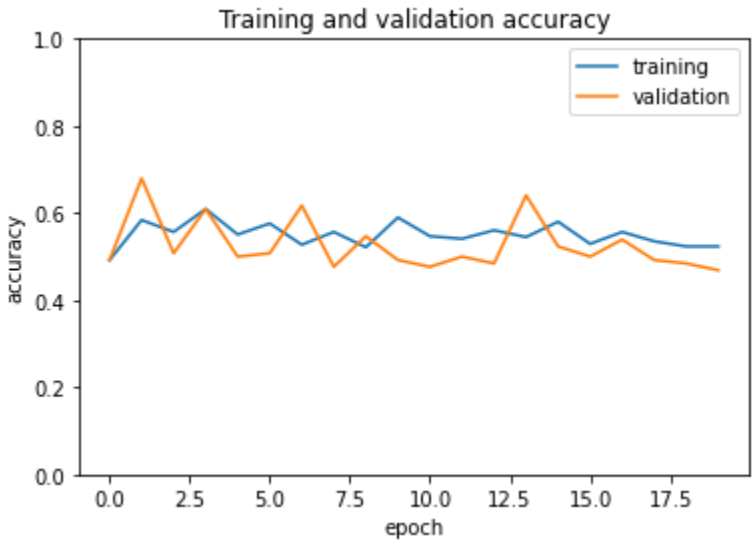
[[64 16]

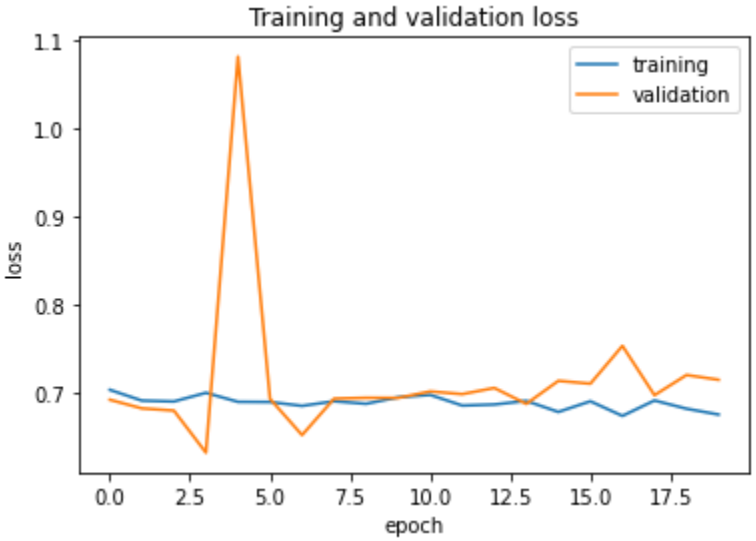
[23 57]]

AUC: 0.756

	Precision	Recall	F-Score	Support	Specificity
male	0.735632	0.8000	0.766467	80.0	0.780822
female	0.780822	0.7125	0.745098	80.0	0.800000

- SGD with batch_size = 1





Overall Categorical Accuracy: 57.50%

Confusion Matrix

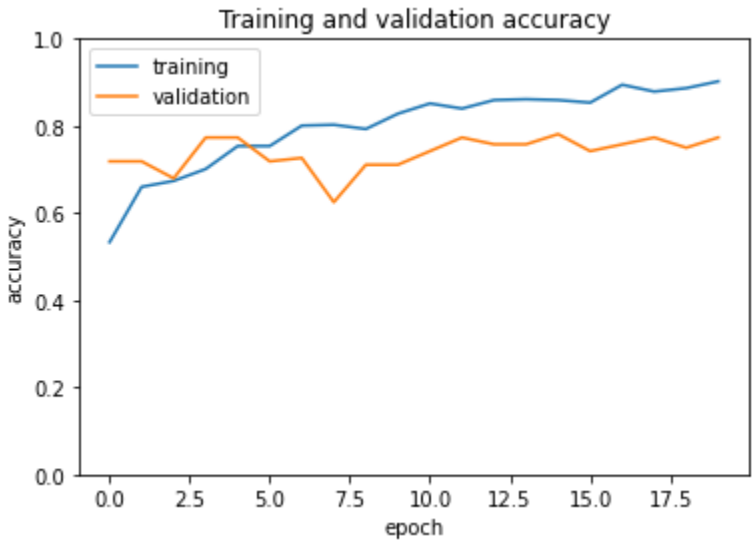
[[29 51]

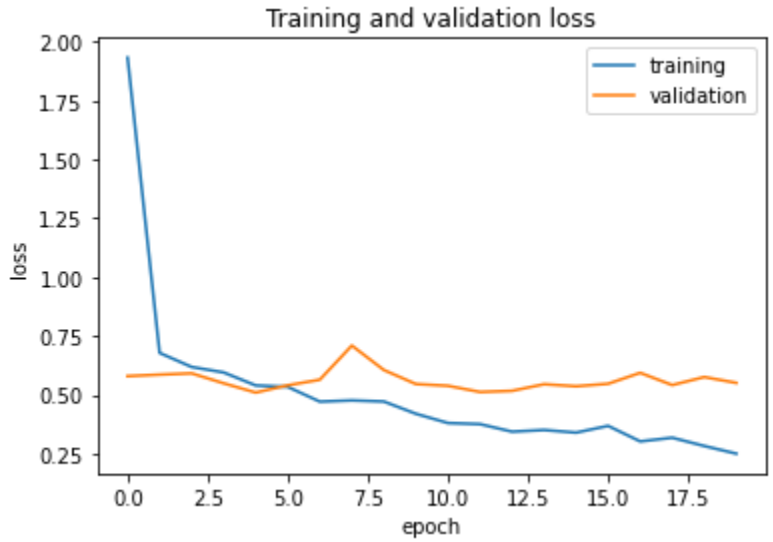
[17 63]]

AUC: 0.575

	Precision	Recall	F-Score	Support	Specificity
female	0.552632	0.7875	0.649485	80.0	0.362500
male	0.630435	0.3625	0.460317	80.0	0.552632

- RMSprop





Overall Categorical Accuracy: 67.50%

Confusion Matrix

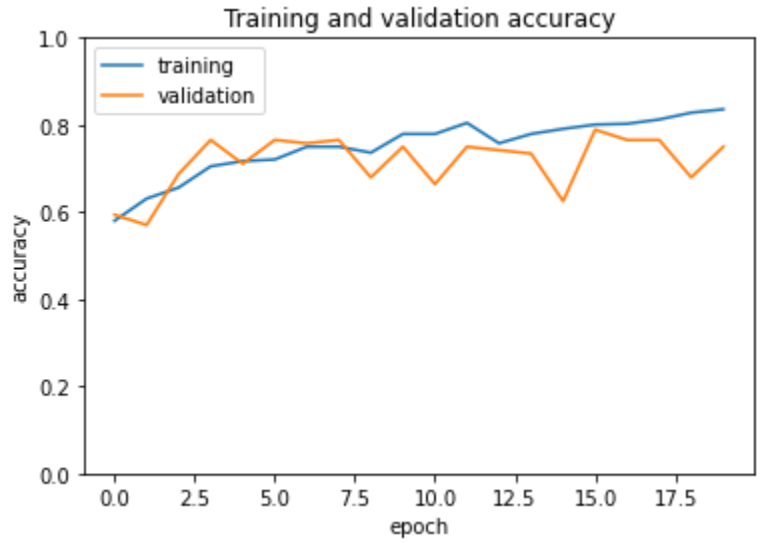
[[48 32]

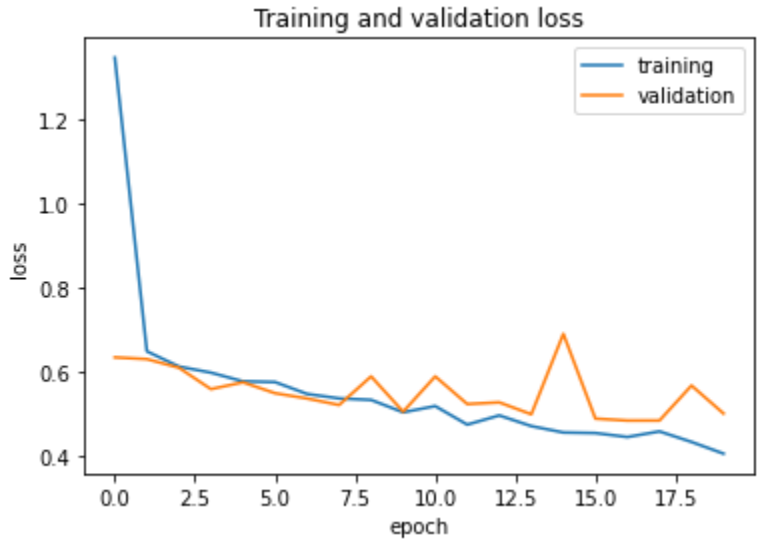
[20 60]]

AUC: 0.675

	Precision	Recall	F-Score	Support	Specificity
female	0.652174	0.75	0.697674	80.0	0.600000
male	0.705882	0.60	0.648649	80.0	0.652174

- Adagrad





Overall Categorical Accuracy: 77.50%

Confusion Matrix

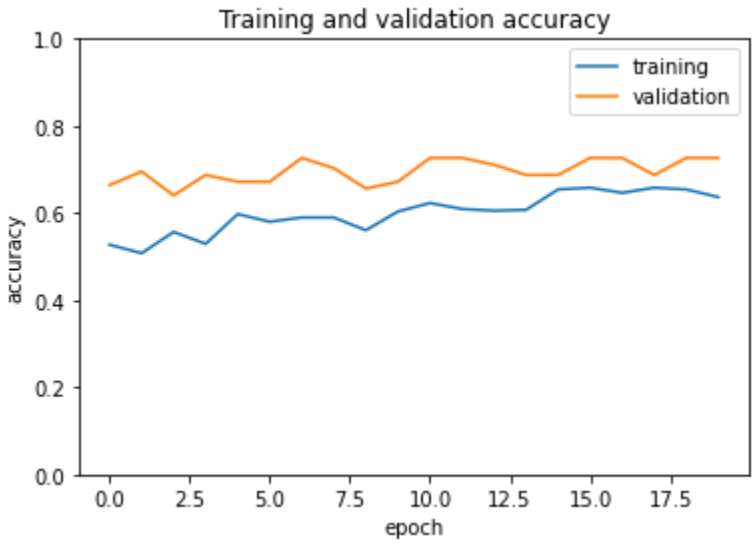
[[64 16]

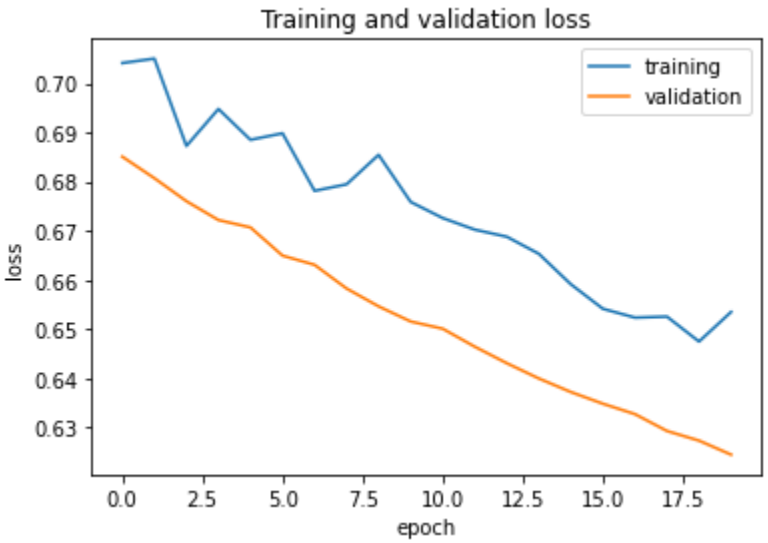
[20 60]]

AUC: 0.775

	Precision	Recall	F-Score	Support	Specificity
male	0.761905	0.80	0.780488	80.0	0.789474
female	0.789474	0.75	0.769231	80.0	0.800000

- Adadelta (learning rate = 0.01)





Overall Categorical Accuracy: 64.38%

Confusion Matrix

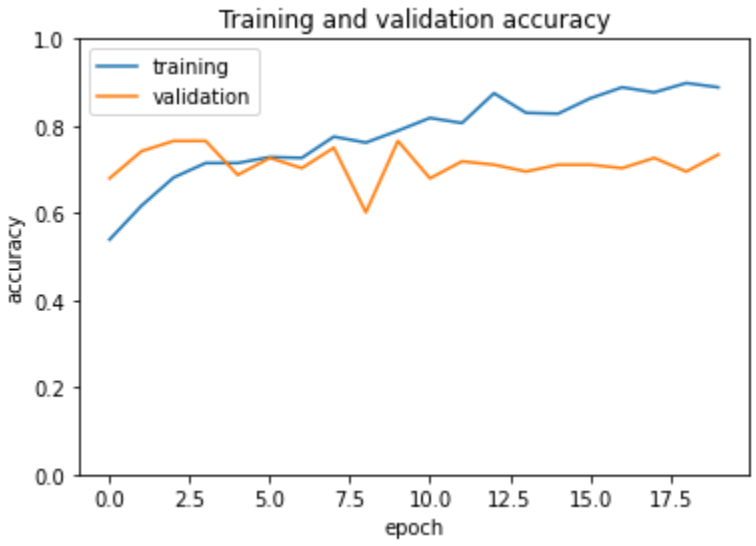
[[56 24]

[33 47]]

AUC: 0.644

	Precision	Recall	F-Score	Support	Specificity
male	0.629213	0.7000	0.662722	80.0	0.661972
female	0.661972	0.5875	0.622517	80.0	0.700000

- Adadelta(learning rate = 1)



Overall Categorical Accuracy: 70.00%

Confusion Matrix

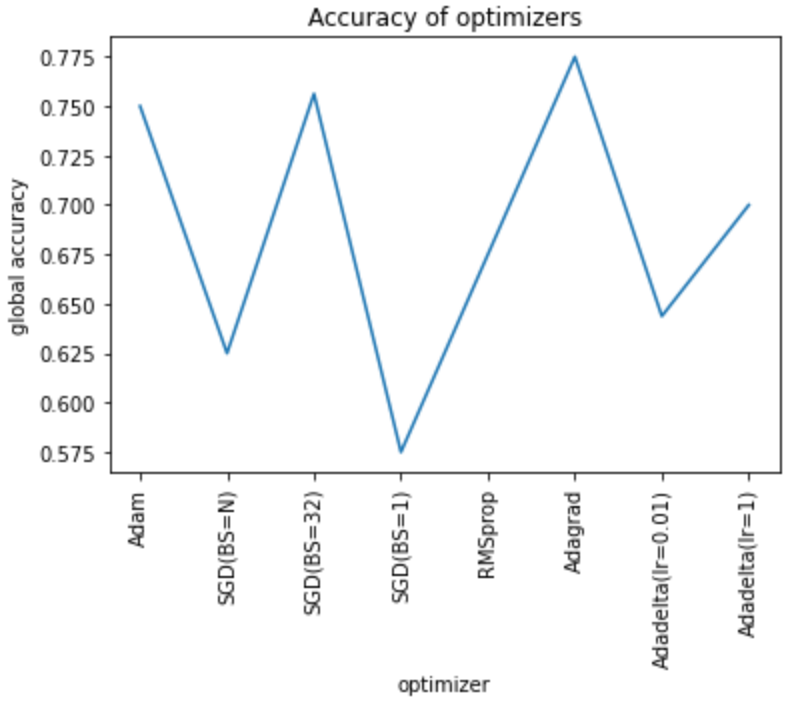
[[50 30]

[18 62]]

AUC: 0.700

	Precision	Recall	F-Score	Support	Specificity
female	0.673913	0.775	0.720930	80.0	0.625000
male	0.735294	0.625	0.675676	80.0	0.673913

Accuracy Results



Observations

- If the batch size is sufficiently small or very large then accuracy is lower in SGD. Maxima of SGD can be observed when batch size is smaller(e.g. 32) but not significantly small.
- As observed with the Adadelta optimizer, with increase in learning rate, the accuracy increases.
- As observed, SGD with batch size = 1 resulted in the least accuracy among all optimizers used and Adagrad showed maximum accuracy.