ECS 170 Winter 2017
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Assignment 3

Problem 1

We are using 1 hidden layer with 4 hidden nodes in it, and a single output node. We don't use any bias node in our Neural Network. We are using 500 and 0.12 as our number of epochs and learning rate respectively. We set our initial weights to a random number between 0.1 and 0.3. The Neural Network is fully connected.

The reason why are using 4 hidden nodes is the model has a large error rate if the number of hidden nodes is less than 4. This means that a Neural Network with less than 4 hidden nodes are not complex enough to compute the data. We initially set the weights to 0.1 and 0.3 because we thought it would be good and we wanted to avoid the weight to be initialized as 0.

Problem 2

Exp	1	2	3	4	5	6	7	8	9	10
Fold 1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Fold 2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Fold 3	0.945	.630	1.0	1.0	1.0	1.0	.981	.981	.796	.981
Fold 4	1.0	.963	1.0	.981	.981	.926	1.0	.981	.981	1.0
Fold 5	0.926	.926	.981	.981	.945	.926	.926	.981	.945	.926
Mean	.974	.904	.996	.992	.985	.970	.981	.989	.945	.981
SD	.036	.156	.009	.010	.024	.041	.032	.010	.086	.032

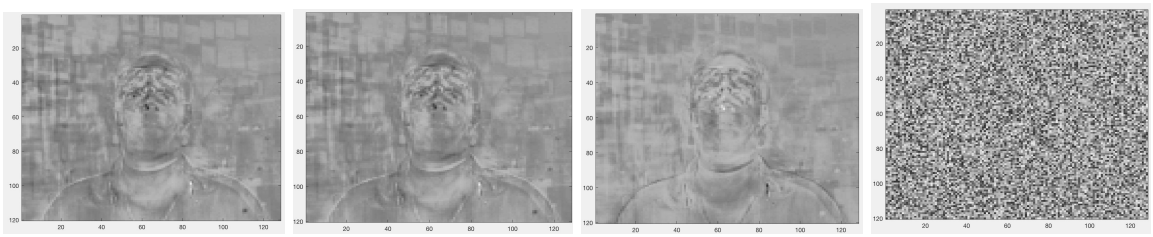
The approximation of learner, which is the mean of the 10 experiments, is .972.

Problem 3

The confidence interval has two cases. If the prediction is a MALE, then the confidence interval is the final output layer value. If the prediction is a FEMALE, then the confidence interval is one minus the final output layer value. Therefore, the closer the output value to either 1 or 0, the more confident the prediction on its accuracy. A text file has been attached to show the predictions based on the Test file and also their confidence interval.

We can treat the output value as some kind of probability because the value is always between 0 and 1, due to the sigmoid activation function that we are using on our Neural Network.

Problem 4



The 4 pictures are the visualization of the set of weights going to the first, second, third and fourth hidden nodes. They show what each neuron "wants to see", and thus what each neuron has learned to look for before determining whether the given image is an image of a male or female. The fourth picture looks different than the rest and it means that the weights that are going into the fourth hidden node need to be trained further. The brighter a pixel is, the more it contributes to the corresponding hidden node.