Prediction Error on Face Test Data (Trained on Training + Validation Data): 12%

Prediction Error on Digit Test Data (Trained on Training + Validation Data): 21.4%

Faces results:

(image(s) attached)

Digit Results:

(image(s) attached)

**Details and Learned Lessons:** This algorithm is a simple Perceptron. Perceptron is an algorithm that we can express as the function f(xi, w) = w0 + w1{feature1}(xi) + w2{feature2}(xi)+…. wl{featurel}(xi). The Perceptron algorithm ‘tunes’ the weights that are assigned to each feature each time it encounters a new image so that eventually, they will come to the right ‘position’ or value. For faces, the best validation accuracy was found to have a .9 weight value initially while for digits, the best initial value was .5. We determined that the algorithm has found the correct face if the value of f(xi, w) matched the given y (expected value) for that image, either positive for true or negative for false since the relationship is binary. However, for digits we had to calculate the f(xi,w) for each number 0 through 9 and take the max of those values. Then, the index of the max would be the number that the algorithm guessed, and we would compare that number to the given y value for that image. We found that faces were much more accurate than digits, most likely due to the binary relationship that limits the probability of mislabeling the picture. Digits were less accurate with the Perceptron algorithm, but with a validation accuracy of around 80% (error of 20%), it was still a strong predictor of the value of a digit image.