Hands-on Exercise 1: The Perceptron

In this hands-on exercise you use Python code to experiment with the Perceptron. You can check out this site (which focusses on the visualisation of the decision boundary in a perceptron) or this one (that includes cross validation).

- Implement the Perceptron and train it on the sonar dataset

1. What are the features of the dataset and what do they represent?
2. What performance do you achieve as a function of the learning rate?
3. Can you interpret the weights of the perceptron in terms of the classification task at hand?

The perceptron takes vectors as inputs, but these vectors may correspond to images by just concatenating the columns (or rows) of the image.

- Create a small-sized dataset (10-100 images per class) for a binary decision task. For instance, using (grey-value) images of frontal faces, your task may be gender classification. Two important things to note: (1) don't make the image too large in terms of resolution (32x32 pixels seems fine), and (2) all images should be normalised as much as possible, so that noses and eyes are all aligned. Instead of faces, you may also come up with other image sets that have two clear distinct classes.
- Train your perceptron on the binary decision task. Just use a single train and test set (1-fold cross validation).

4. Try to interpet the acquired weights by visualising them as images. Perform multiple experiments with different learning rate settings to assess its effect.