Practice Problem Set I

Neural Networks

- **Perceptron:** (Recommended Readings: *Nielsen, Bishop, Goodfellow*)

  1: For a single perceptron, margin is defined as the perpendicular distance of a data point from the separating plane. Find the margin of a data point $\boldsymbol{x_i}$ with label $y_i = \{1, -1\}$ if $\boldsymbol{w}$ is the set of trained weights.

  2: A single perceptron with 3 input variables has learned weight vector $\boldsymbol{w} = [3, 2, -1]^T$. Draw the hyper-surface this weight vector defines. Is it a line?

  3: Freiburg Exercise 1, 3 and 4

  4: Nielsen Chapter 1, Exercise 1(Sigmoid Neurons)

  5: Bishop Problem 5.2, 5.4, Proof of 4.88.

- **Backprop:** (Recommended Readings: *Nielsen, Bishop, Goodfellow*)

  1: Nielsen Ch 2, Exercise 1, 2

  2: Bishop Example 5.3.2

Sources

Nielson: Neural Networks and Deep Learning by Michael Nielsen (Dec 2014).

Bishop: Pattern Recognition and Machine Learning, Christopher M Bishop, Springer 2006.

Freiburg: University of Freiburg problem set:
`http://ml.informatik.uni-freiburg.de/_media/teaching/ss11/ml_ex04_solution.pdf`