ECE471, Selected Topics in Machine Learning – Assignment 2

Submit by Sept. 19, 10PM

tldr: Perform binary classification on the spirals dataset using a multi-layer perceptron. You must generate the data yourself.

Problem Statement Consider a set of examples with two classes and distributions as in Figure 1. Given the vector $x \in \mathbb{R}^2$ infer its target class $t \in \{0, 1\}$. As a model use a multi-layer perceptron f which returns an estimate for the conditional density $p(t = 1 \mid x)$:

$$f : \mathbb{R}^2 \to [0, 1] \tag{1}$$

parametrisized by some set of values θ. All of the examples in the training set should be classified correctedly (i.e. $p(t = 1 \mid x) > 0.5$ if and only if $t = 1$). Impose an L^2 penalty on the set of parameters. Produce one plot. Show the examples and the boundary corresponding to $p(t = 1 \mid x) = 0.5$. The plot must be of suitable visual quality. It may be difficult to to find an appropriate functional form for f, write a few sentences discussing your various attempts.

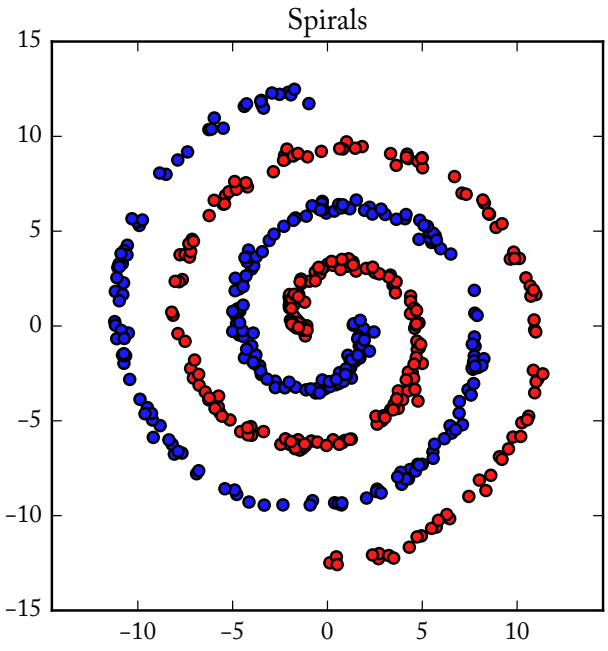

Figure 1: Sample spiral data.