Assignment 2 — Due: Sept. 18 at 10 PM

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 2. 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 $p(t = 1 \mid x)$:

$$f \colon \mathbb{R}^2 \to [0, 1] \tag{5}$$

parametrisized by some set of values θ. All of the examples in the training set should be classified correctly (i.e. $p(t = 1 \mid x) > 0.5$ if and only if $t = 1$). 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.

Requirements

1. Generate data using an instance of `numpy.random.Generator`. Not how many times my spirals lap the origin.

2. Create an `MLP` class. The `MLP` class should inherit from `tf.Module` and can use the `Linear` class from the previous assignment. It should have the following interface:

   ```
   MLP(
       num_inputs,
       num_outputs,
       num_hidden_layers,
       hidden_layer_width,
       hidden_activation=tf.identity,
       output_activation=tf.identity,
   )
   ```

3. Learn how to use `sklearn.inspection.DecisionBoundaryDisplay`

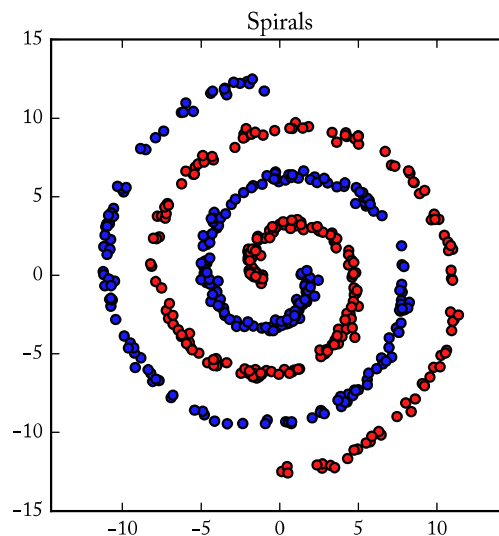4. Your network must operate on Cartesian coordinates. Do not transform the coordinates to be polar.

Figure 2: Sample spiral data.