Chapter_4_Section_1_Logistic_Regression

February 2, 2019

1 Ch 04: Concept 02

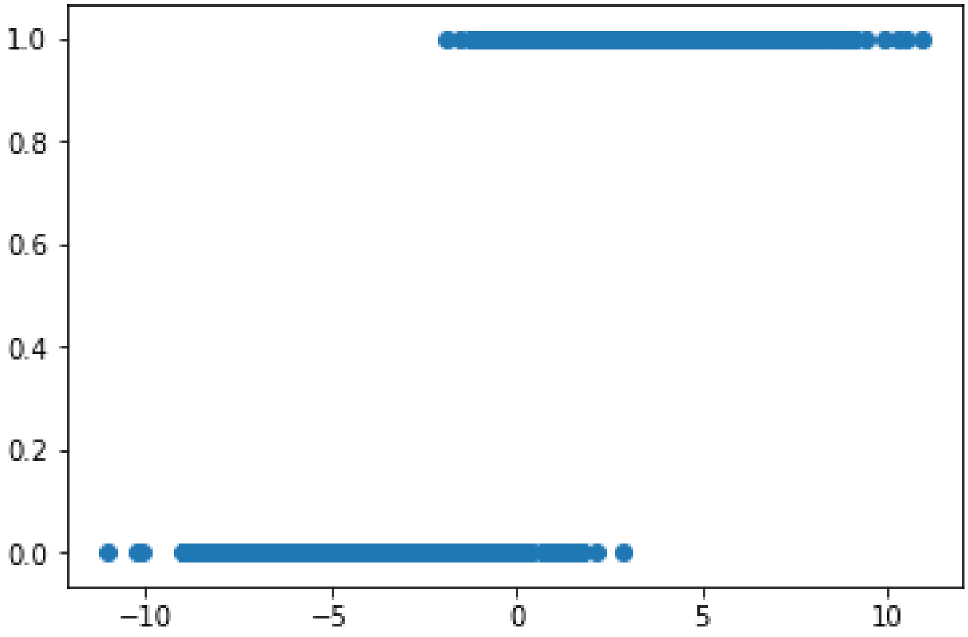
1.1 Logistic regression

Import the usual libraries, and set up the usual hyper-parameters:

```
In [1]: %matplotlib inline
        import numpy as np
        import tensorflow as tf
        import matplotlib.pyplot as plt

        learning_rate = 0.01
        training_epochs = 1000
```

Set up some data to work with:

```
In [2]: x1 = np.random.normal(-4, 2, 1000)
        x2 = np.random.normal(4, 2, 1000)
        xs = np.append(x1, x2)
        ys = np.asarray([0.] * len(x1) + [1.] * len(x2))

        plt.scatter(xs, ys)

Out[2]: <matplotlib.collections.PathCollection at 0x7fc820f91be0>
```



Define the placeholders, variables, model, cost function, and training op:

```
In [3]: X = tf.placeholder(tf.float32, shape=(None,), name="x")
        Y = tf.placeholder(tf.float32, shape=(None,), name="y")
        w = tf.Variable([0., 0.], name="parameter", trainable=True)
        y_model = tf.sigmoid(w[1] * X + w[0])
        cost = tf.reduce_mean(-Y * tf.log(y_model) - (1 - Y) * tf.log(1 - y_model))

        train_op = tf.train.GradientDescentOptimizer(learning_rate).minimize(cost)
```

Train the logistic model on the data:

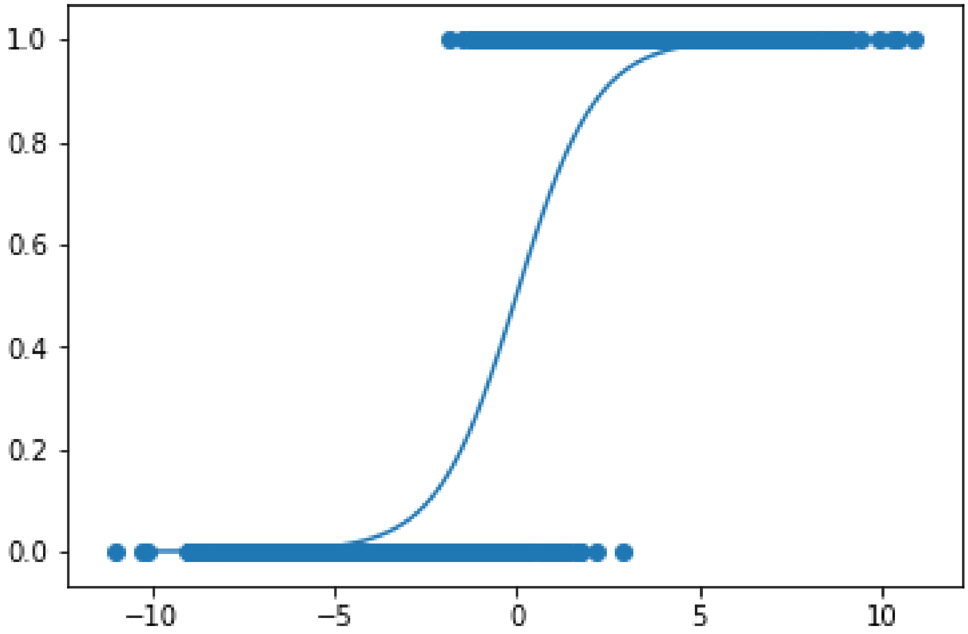
```
In [4]: sess = tf.Session()
        init = tf.global_variables_initializer()
        sess.run(init)

        prev_err = 0
        for epoch in range(training_epochs):
            err, _ = sess.run([cost, train_op], {X: xs, Y: ys})
            if epoch % 100 == 0:
                print(epoch, err)
            if abs(prev_err - err) < 0.0001:
                break
            prev_err = err
        w_val = sess.run(w, {X: xs, Y: ys})
```

```
0 0.6931461
100 0.14921466
```

```
200 0.113231644
```

Now let's see how well our logistic function matched the training data points:

```
In [5]: all_xs = np.linspace(-10, 10, 100)
        with tf.Session() as sess:
            predicted_vals = sess.run(tf.sigmoid(all_xs * w_val[1] + w_val[0]))
        plt.plot(all_xs, predicted_vals)
        plt.scatter(xs, ys)
        plt.show()
```



1.0
0.8
0.6
0.4
0.2
0.0
−10
−5
0
5
10