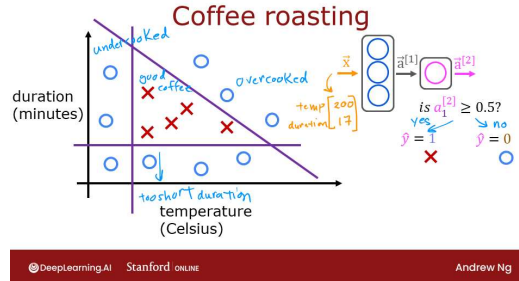




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## Optional Lab - Simple Neural Network

In this lab we will build a small neural network using Tensorflow.



```
In [1]: import numpy as np
import matplotlib.pyplot as plt
plt.style.use('./deeplearning.mplstyle')
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
from lab_utils_common import dlc
from lab_coffee_utils import load_coffee_data, plt_roast, plt_prob, plt_layer, plt_network, plt_output_unit
import logging
logging.getLogger("tensorflow").setLevel(logging.ERROR)
tf.autograph.set_verbosity(0)
```

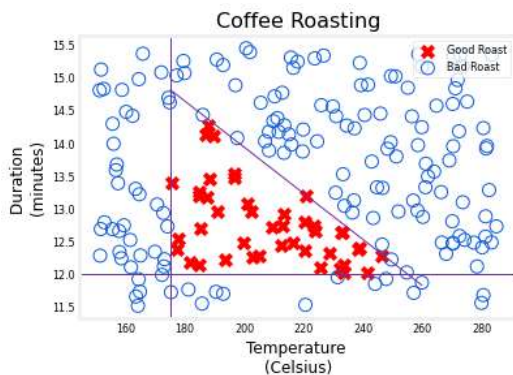
### DataSet

```
In [2]: X,Y = load_coffee_data();
print(X.shape, Y.shape)

(200, 2) (200, 1)
```

Let's plot the coffee roasting data below. The two features are Temperature in Celsius and Duration in minutes. [Coffee Roasting at Home](https://www.merchantsofgreencoffee.com/how-to-roast-green-coffee-in-your-oven/) (<https://www.merchantsofgreencoffee.com/how-to-roast-green-coffee-in-your-oven/>) suggests that the duration is best kept between 12 and 15 minutes while the temp should be between 175 and 260 degrees Celsius. Of course, as temperature rises, the duration should shrink.

```
In [3]: plt_roast(X,Y)
```



### Normalize Data

Fitting the weights to the data (back-propagation, covered in next week's lectures) will proceed more quickly if the data is normalized. This is the same procedure you used in Course 1 where features in the data are each normalized to have a similar range. The procedure below uses a Keras [normalization layer](https://keras.io/api/layers/preprocessing_layers/numerical/normalization/) ([https://keras.io/api/layers/preprocessing\\_layers/numerical/normalization/](https://keras.io/api/layers/preprocessing_layers/numerical/normalization/)). It has the following steps:

- create a "Normalization Layer". Note, as applied here, this is not a layer in your model.
- 'adapt' the data. This learns the mean and variance of the data set and saves the values internally.
- normalize the data.

It is important to apply normalization to any future data that utilizes the learned model.