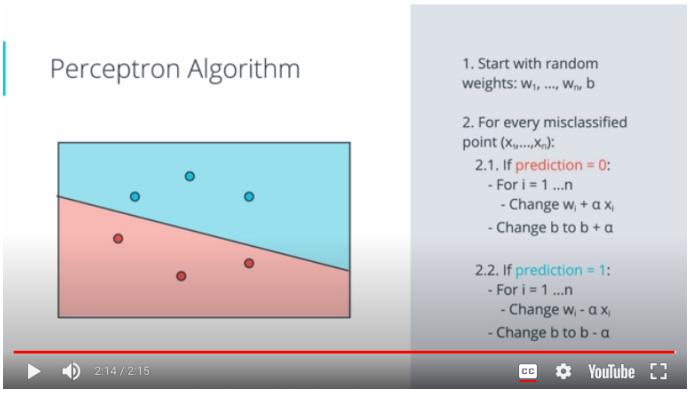
Perceptron Algorithm

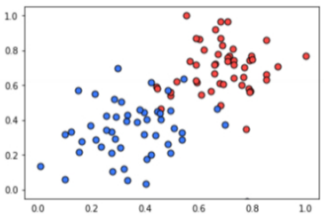
And now, with the perceptron trick in our hands, we can fully develop the perceptron algorithm! The following video will show you the pseudocode, and in the quiz below, you'll have the chance to code it in Python.



There's a small error in the above video in that W_i should be updated to $W_i = W_i + \alpha x_i$ (plus or minus depending on the situation).

Coding the Perceptron Algorithm

Time to code! In this quiz, you'll have the chance to implement the perceptron algorithm to separate the following data (given in the file data.csv).



Recall that the perceptron step works as follows. For a point with coordinates (p, q), label y, and prediction given by the equation $\hat{y} = step(w_1x_1 + w_2x_2 + b)$:

- If the point is correctly classified, do nothing.
- If the point is classified positive, but it has a negative label, subtract $\alpha p, \alpha q$, and α from w_1, w_2, and b respectively.
- If the point is classified negative, but it has a positive label, add $\alpha p, \alpha q$, and α to w_1, w_2, and b respectively.

Then click on `test run` to graph the solution that the perceptron algorithm gives you. It'll actually draw a set of dotted lines, that show how the algorithm approaches to the best solution, given by the black solid line.

Feel free to play with the parameters of the algorithm (number of epochs, learning rate, and even the randomizing of the initial parameters) to see how your initial conditions can affect the solution!

perceptron.py | data.csv | solution.py

```
import numpy as np
# Setting the random seed, feel free to change it and see different solutions.
np.random.seed(42)

def stepFunction(t):
    if t >= 0:
        return 1
    return 0

def prediction(X, W, b):
    return stepFunction((np.matmul(X,W)+b)[0])

# TODO: Fill in the code below to implement the perceptron trick.
# The function should receive as inputs the data X, the labels y,
# the weights W (as an array), and the bias b,
# update the weights and bias W, b, according to the perceptron algorithm,
# and return W and b.
def perceptronStep(X, y, W, b, learn_rate = 0.01):
    # Fill in code
    return W, b

# This function runs the perceptron algorithm repeatedly on the dataset,
# and returns a few of the boundary lines obtained in the iterations,
# for plotting purposes.
# Feel free to play with the learning rate and the num_epochs,
# and see your results plotted below.
```

RESET QUIZ TEST RUN SUBMIT ANSWER

NEXT