

Perceptron Pseudocode

The goal of your perceptron algorithm is to obtain a weight vector \mathbf{w} that will define a hyperplane that will separate the data. To do so, you must write code that will find such a hyperplane. Below, you will find pseudocode that illustrates the steps necessary to accomplish the task of finding such a hyperplane.

Pseudocode

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procedure PERCEPTRON( $D = \{(\mathbf{x}_i, y_i)\}_{i=1}^n$ )  ▷ Given a dataset  $D$ 
   $\mathbf{w} \leftarrow \mathbf{0}$   ▷ Initialize weight vector
   $\text{iter} \leftarrow 0$ 
  while TRUE do
     $\text{iter} \leftarrow \text{iter} + 1$   ▷ Increment iteration counter
     $m \leftarrow 0$   ▷ Count the number of misclassified points
    for  $(\mathbf{x}_i, y_i) \in D$  do  ▷ Loop over dataset
      if  $y_i (\mathbf{w}^\top \mathbf{x}_i) \leq 0$  then  ▷ If the pair is misclassified
         $\mathbf{w} \leftarrow \mathbf{w} + y_i \mathbf{x}_i$   ▷ Update weight vector
         $m \leftarrow m + 1$   ▷ Update the misclassification count
    if  $m = 0$  then  ▷ If  $\mathbf{w}$  from before the for-loop correctly classifies all points
      break  ▷ Training complete! Break out of while loop
    else if  $\text{iter} = \text{max}$  then  ▷ If iteration count is equal to max
      break  ▷ Convergence not met. Break out of while loop
  return  $\mathbf{w}$ 

```
