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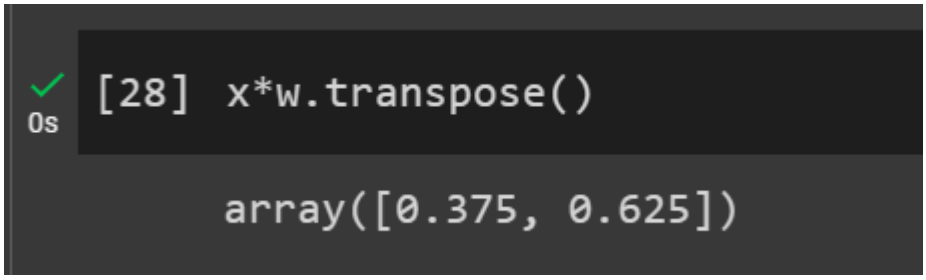
Colab Link: Vectors_and_Perceptron.ipynb

1. What is the magnitude of $\vec{w} = [0.5, 0.5]$?

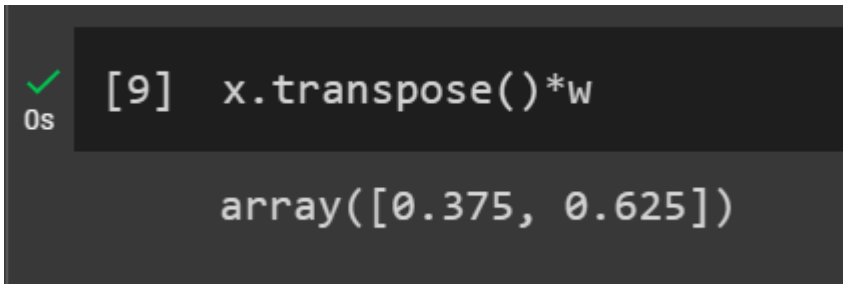
0.707

2. Multiple the following two vectors $(\vec{x} * \vec{w}^T)$, where $\vec{x} = [0.5, 0.5]$ and $\vec{w} = [0.75, 1.25]$



[0.375, 0.625]

3. Multiple the following two vectors $(\vec{x}^T * \vec{w})$ using the vectors from the previous problem.



[0.375, 0.625]

4. What is the dot product of X and W using the values from the previous problem?

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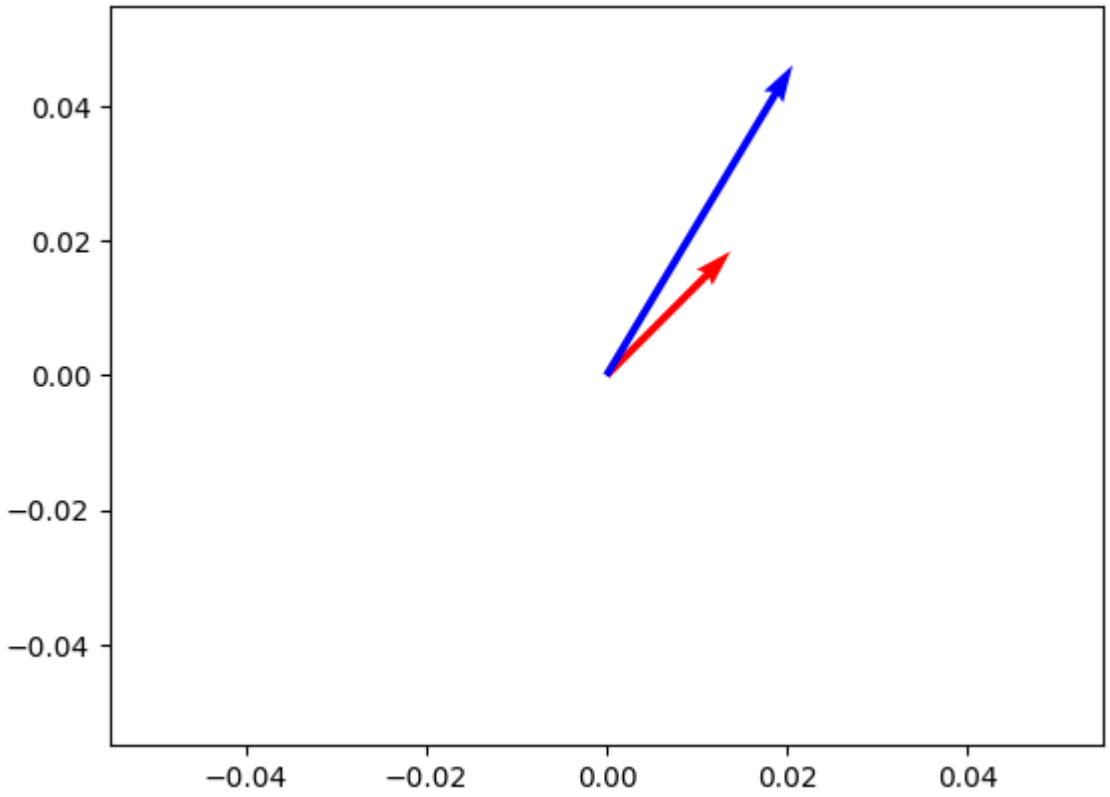
0s
np.dot(x,w)
1.0
```

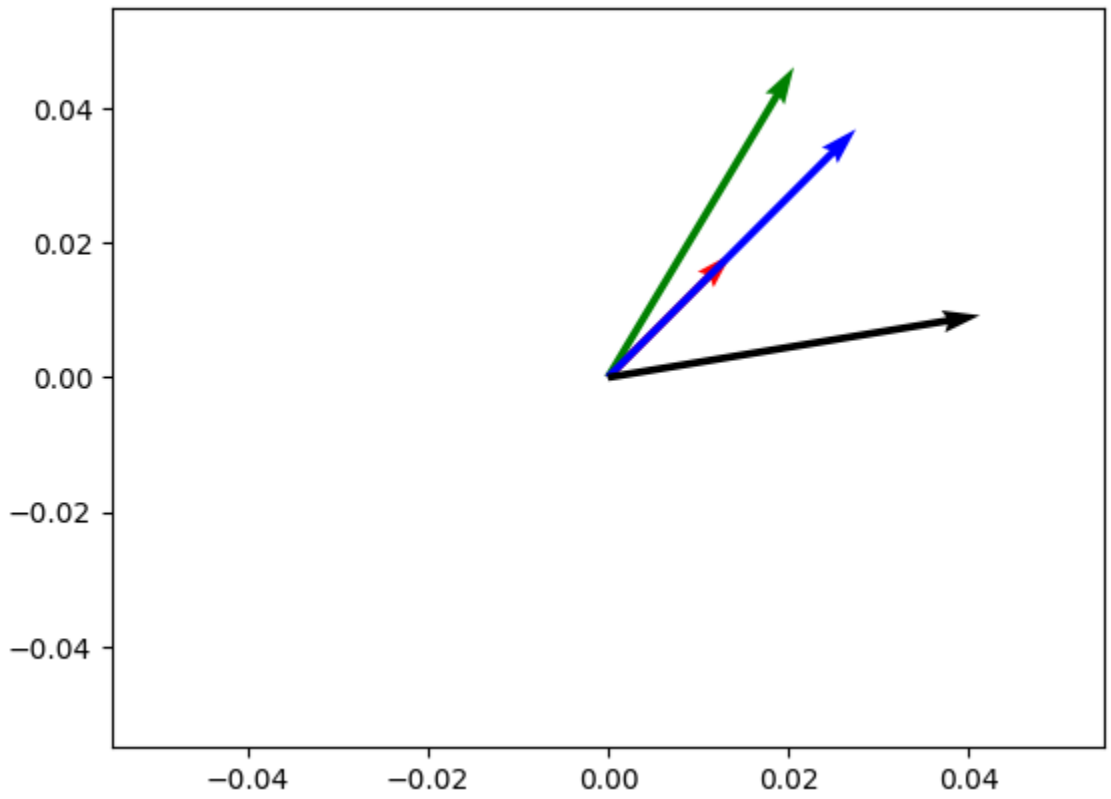
1.0

5. What is the angle between X and W using the values from the previous problem? Draw the vectors and label the angle that you found.



Red is **X** and **Blue** is **W**. The angle between them is 14 degree

6. Add the following vectors, and draw the resultant and the original vectors. $\vec{x} = [0.5, 0.5]$ and $\vec{w} = [0.75, -1]$



Red and **Green** vectors are the original vectors.
Blue and **Black** vectors are the resultant vectors.

7. What is the difference between prediction and classification?

Prediction is the process of estimating a value based on previous data.
While classification is the process of assigning a label to an input based on its features

8. Using the perceptron learning algorithm and a single neuron, find the weights that correctly predict the "OR" function. Continue updating the weights using the algorithm discussed in class until you converge on a correct solution. Show all of your work. The initial weights are w_0 = 0, w_1 = 0.5, w_2 = -0.5 and the learning parameter v = 0.25. You may also assume that x_0 = 1.

x_1	x_2	OR
0	0	0
0	1	1
1	0	1
1	1	1

1st $\bar{y} = f(0x1 + 0.5 \times 0 + -0.5 \times 0) = f(0) = 0 = y$

2nd $\bar{y} = f(0x1 + 0.5x0 + -0.5 \times 1) = f(-0.5) = 0 \neq y$

$w_0 = w_0 + v(0-1)1 = -0.25$

$w_1 = w_1 + v(0-1)0 = 0.5$

$w_2 = w_2 + v(0-1)1 = -0.75$

3rd $\bar{y} = f(0x1 + 0.5x1 + -0.5x0) = f(0.5) = 1 = y$

$w_0 = w_0,\ w_1 = w_1,\ w_2 = w_2$

4th $\bar{y} = f(0x1 + 0.5x1 + -0.5 \times 1) = f(0) = 0 \neq y$

$w_0 = w_0 + v(0-1)1 = -0.5$

$w_1 = w_1 + v(0-1)1 = 0.25$

$w_2 = w_2 + v(0-1)1 = -1$