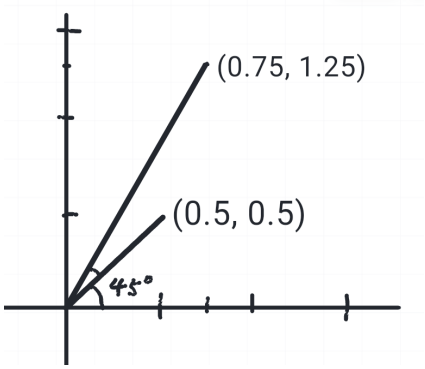
1
Sqrt(0.5^2 + 0.5^2) = 0.707

2
[0.5, 0.5] × [0.75, 1.25]^T =0.5×0.75 + 0.5×1.25 = 1

3
[0.5, 0.5]^T · [0.75, 1.25] =
[0.375, 0.625
 0.375, 0.625]

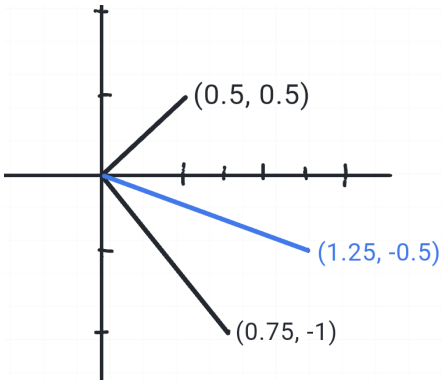
4
[0.5, 0.5] × [0.75, 1.25] =0.5×0.75 + 0.5×1.25 = 1

5



atan(1.25/0.75) - atan(0.45/0.45) = 14.036°

6
[0.5, 0.5] + [0.75, -1] = [0.5+0.75, 0.5+(-1)] = [1.25, -0.5]



7
The difference between prediction and classification is that prediction is used to predict continuous values while prediction is used to predict categorical labels.

8.
Iteration: 1
y = w0x0 + w1x1 + w2x2 = 0×1 + 0.5×0 + -0.5×0 = 0 = 0
y = w0x0 + w1x1 + w2x2 = 0×1 + 0.5×0 + -0.5×1 = -0.5 = 0 (Incorrect)
w0 = 0 - 0.25×(0-1)×1 = 0.25
w1 = 0.5 - 0.25×(0-1)×0 = 0.5
w2 = -0.5 - 0.25×(0-1)×1 = -0.25
y = w0x0 + w1x1 + w2x2 = 0.25×1 + 0.5×1 + -0.25×0 = 0.75 = 1
y = w0x0 + w1x1 + w2x2 = 0.25×1 + 0.5×1 + -0.25×1 = 0.5 = 1
Weights: w0 = 0.25, w1 = 0.5, w2 = -0.25

Iteration: 2
y = w0x0 + w1x1 + w2x2 = 0.25×1 + 0.5×0 + -0.25×0 = 0.25 = 1 (Incorrect)
w0 = 0.25 - 0.25×(1-0)×1 = 0
w1 = 0.5 - 0.25×(1-0)×0 = 0.5
w2 = -0.25 - 0.25×(1-0)×0 = -0.25
y = w0x0 + w1x1 + w2x2 = 0×1 + 0.5×0 + -0.25×1 = -0.25 = 0 (Incorrect)
w0 = 0 - 0.25×(0-1)×1 = 0.25
w1 = 0.5 - 0.25×(0-1)×0 = 0.5
w2 = -0.25 - 0.25×(0-1)×1 = 0
y = w0x0 + w1x1 + w2x2 = 0.25×1 + 0.5×1 + 0×0 = 0.75 = 1
y = w0x0 + w1x1 + w2x2 = 0.25×1 + 0.5×1 + 0×1 = 0.75 = 1
Weights: w0 = 0.25, w1 = 0.5, w2 = 0

Iteration: 3
y = w0x0 + w1x1 + w2x2 = 0.25×1 + 0.5×0 + 0×0 = 0.25 = 1 (Incorrect)
w0 = 0.25 - 0.25×(1-0)×1 = 0
w1 = 0.5 - 0.25×(1-0)×0 = 0.5
w2 = 0 - 0.25×(1-0)×0 = 0
y = w0x0 + w1x1 + w2x2 = 0×1 + 0.5×0 + 0×1 = 0 = 0 (Incorrect)
w0 = 0 - 0.25×(0-1)×1 = 0.25
w1 = 0.5 - 0.25×(0-1)×0 = 0.5
w2 = 0 - 0.25×(0-1)×1 = 0.25
y = w0x0 + w1x1 + w2x2 = 0.25×1 + 0.5×1 + 0.25×0 = 0.75 = 1
y = w0x0 + w1x1 + w2x2 = 0.25×1 + 0.5×1 + 0.25×1 = 1 = 1
Weights: w0 = 0.25, w1 = 0.5, w2 = 0.25

Iteration: 4
y = w0x0 + w1x1 + w2x2 = 0.25×1 + 0.5×0 + 0.25×0 = 0.25 = 1 (Incorrect)
w0 = 0.25 - 0.25×(1-0)×1 = 0
w1 = 0.5 - 0.25×(1-0)×0 = 0.5
w2 = 0.25 - 0.25×(1-0)×0 = 0.25
y = w0x0 + w1x1 + w2x2 = 0×1 + 0.5×0 + 0.25×1 = 0.25 = 1
y = w0x0 + w1x1 + w2x2 = 0×1 + 0.5×1 + 0.25×0 = 0.5 = 1

$y = w0x0 + w1x1 + w2x2 = 0 \times 1 + 0.5 \times 1 + 0.25 \times 1 = 0.75 = 1$
Weights: $w0 = 0$, $w1 = 0.5$, $w2 = 0.25$

$y = w0x0 + w1x1 + w2x2 = 0 \times 1 + 0.5 \times 0 + 0.25 \times 0 = 0 = 0$
$y = w0x0 + w1x1 + w2x2 = 0 \times 1 + 0.5 \times 0 + 0.25 \times 1 = 0.25 = 1$
$y = w0x0 + w1x1 + w2x2 = 0 \times 1 + 0.5 \times 1 + 0.25 \times 0 = 0.5 = 1$
$y = w0x0 + w1x1 + w2x2 = 0 \times 1 + 0.5 \times 1 + 0.25 \times 1 = 0.75 = 1$