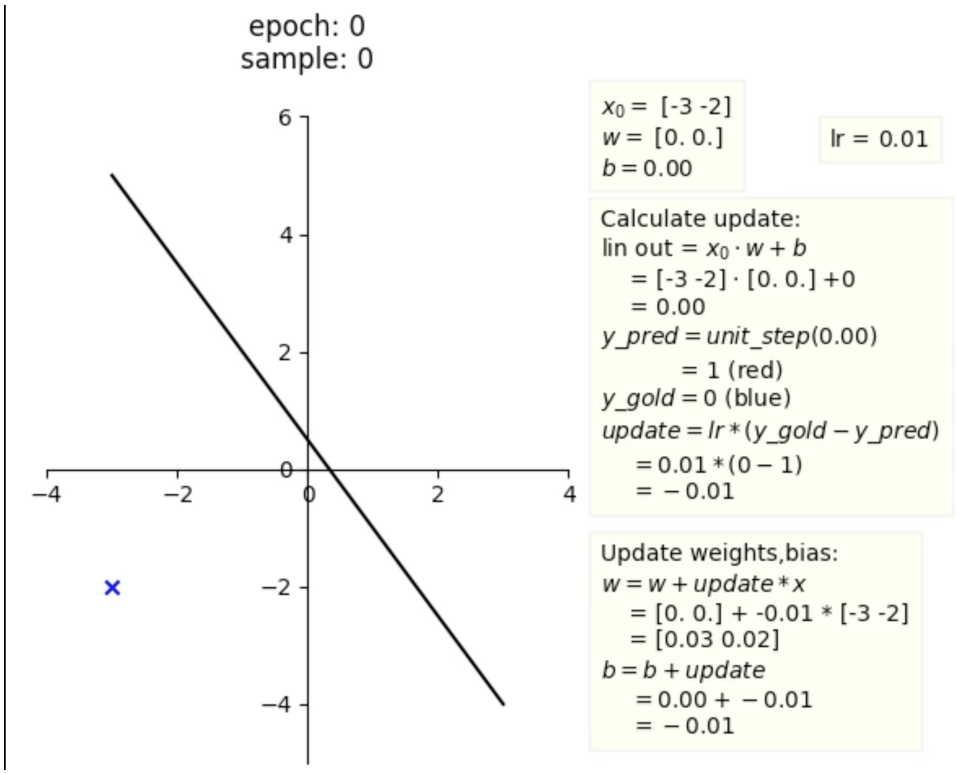
Perceptron Linear Decision Boundary

Calculating the Linear Decision Boundary

For demonstration, epoch 0, sample 0 from the perceptron clip is used as an example.



The equation for a line with 2 variables is:

$ax + by + c = 0$

The linear equation used by perceptron models is written:

$\boldsymbol{w} \cdot \boldsymbol{x} + b$

Expand the dot product to get:

$w_1x_1 + w_2x_2 + b$ where $\begin{cases} x_1 \text{ is feature 1 of sample x} \\ x_2 \text{ is feature 2 of sample x} \end{cases}$

Since we plot feature 1 on the x-axis, and feature 2 on the y-axis, we replace x_1 with x and x_2 with y, to get the linear equation:

$w_1x + w_2y + b = 0$

Solve for y:

$$y = \frac{-w_1x - b}{w_2}$$

In the movie, the linear decision boundary runs from -3 to 3 on the x-axis.

Solve for y, where $x = -3$ (using updated weights and bias):

$$y = \frac{-.03 * -3 - -.01}{.02} = 5 \ \# \ \text{point}(-3,5)$$

Solve for y, where $x = 3$ (using updated weights and bias):

$$y = \frac{-.03 * 3 - -.01}{.02} = -4 \ \# \ \text{point}(3,-4)$$

Plot the decision boundary line between points $(-3,5)$ and $(3,-4)$