

Recap & Lab Assignment 2

CMPUT 328 Visual Recognition

Gradient Descent

initial guess: \mathbf{x}_0

repeat:

$$\mathbf{x}^{t+1} = \mathbf{x}^t - \alpha \nabla f(\mathbf{x}^t)$$

until convergence

α is called the step-length

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until convergence \Rightarrow gradient magnitude is small

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~~until convergence \Rightarrow gradient magnitude is small~~

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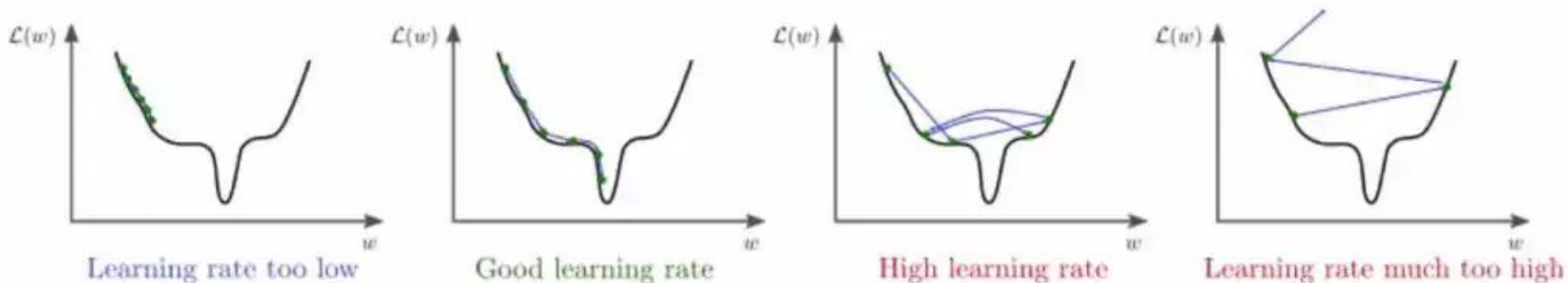
step size

learning rate

η, α, \dots

gain

Gradient Descent

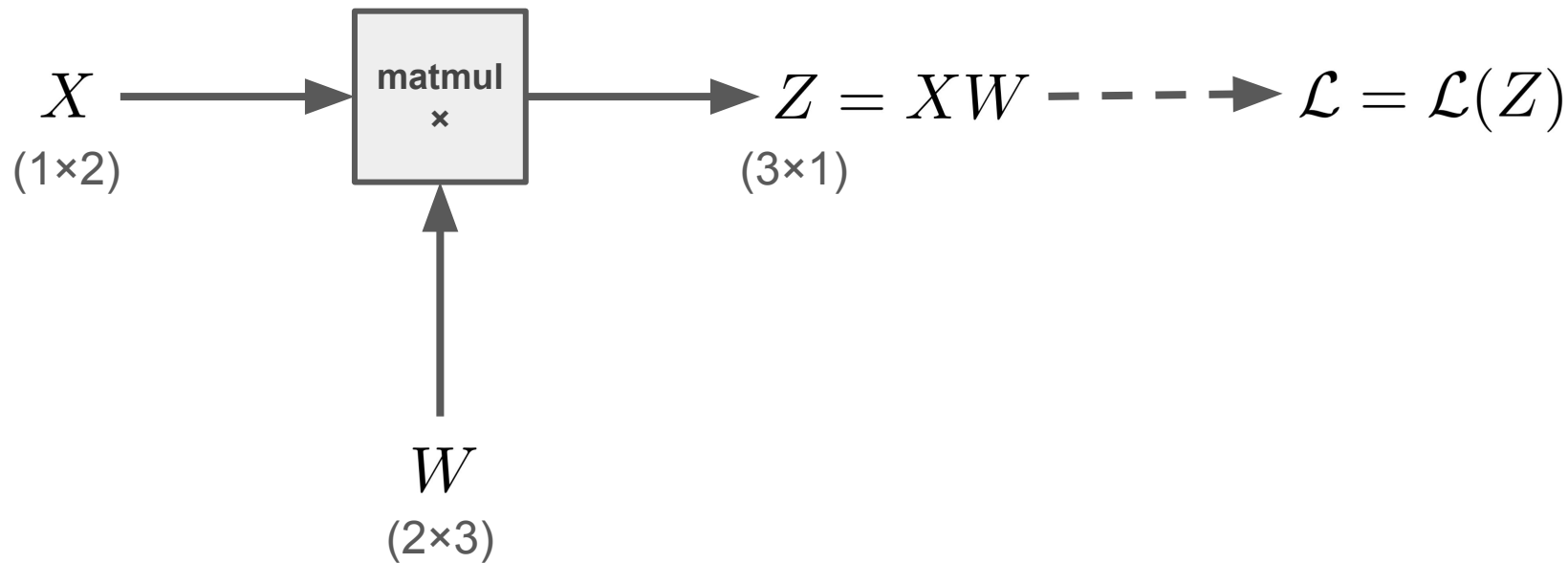


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step size
learning rate
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gain

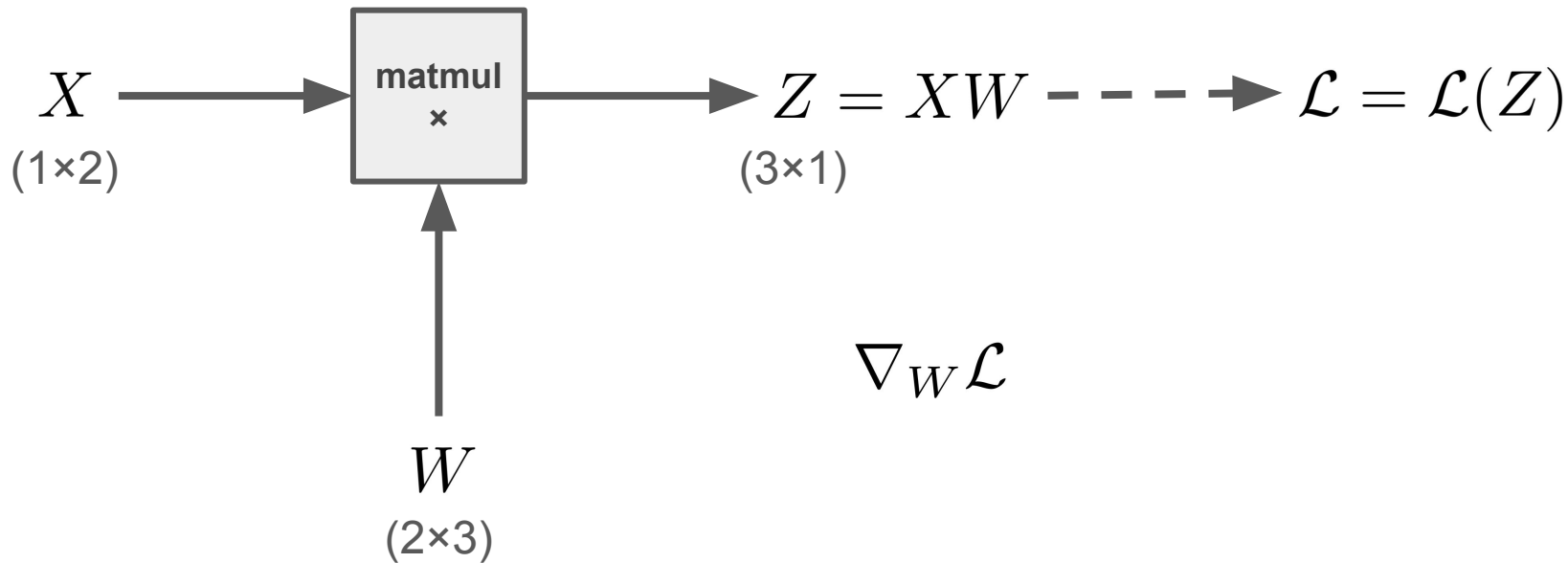
XOR with a Linear Function

Whiteboard

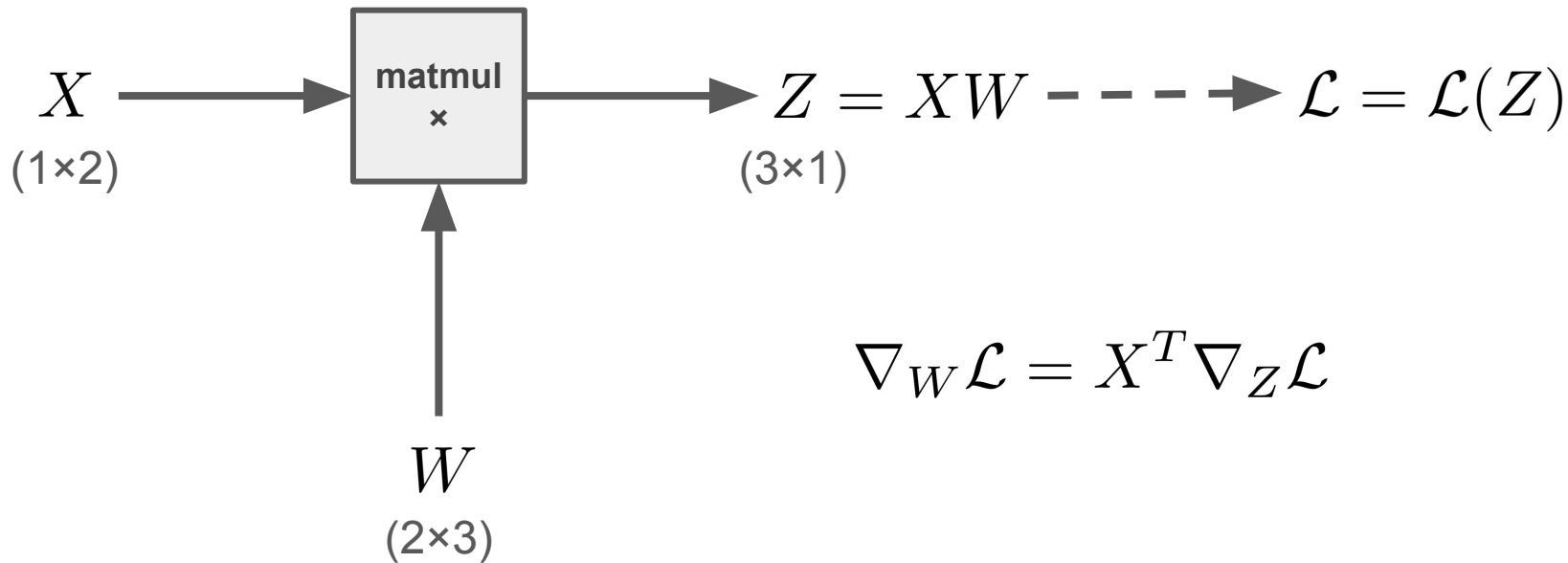
Backpropagation



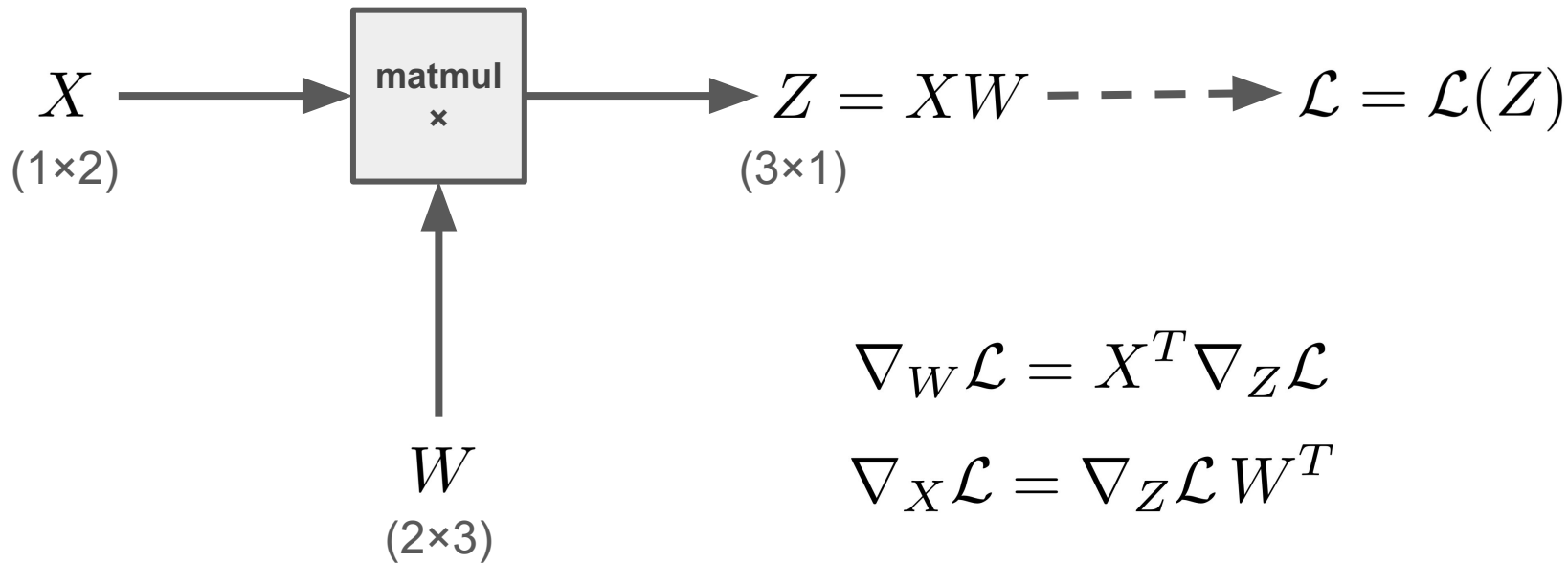
Backpropagation



Backpropagation



Backpropagation



Backpropagation



X



Y

Backpropagation

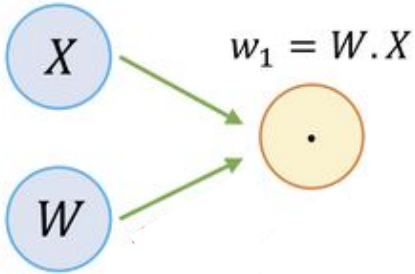
$$Y_p = \text{model}(X)$$

X

Y

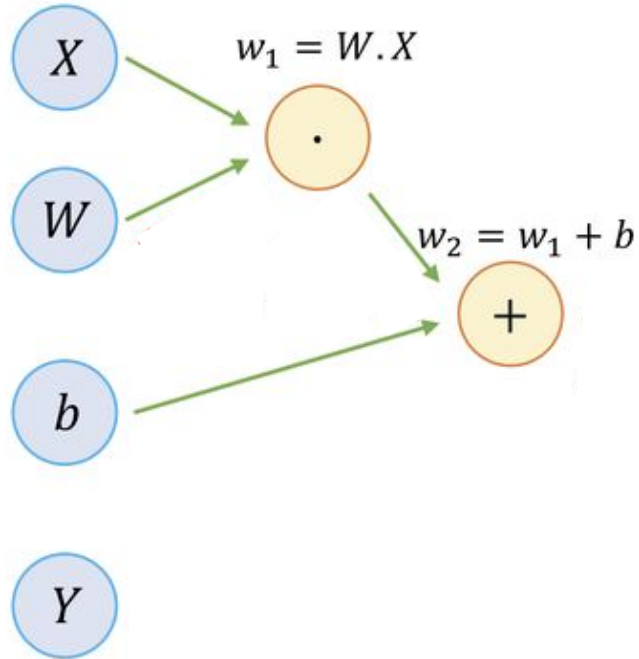
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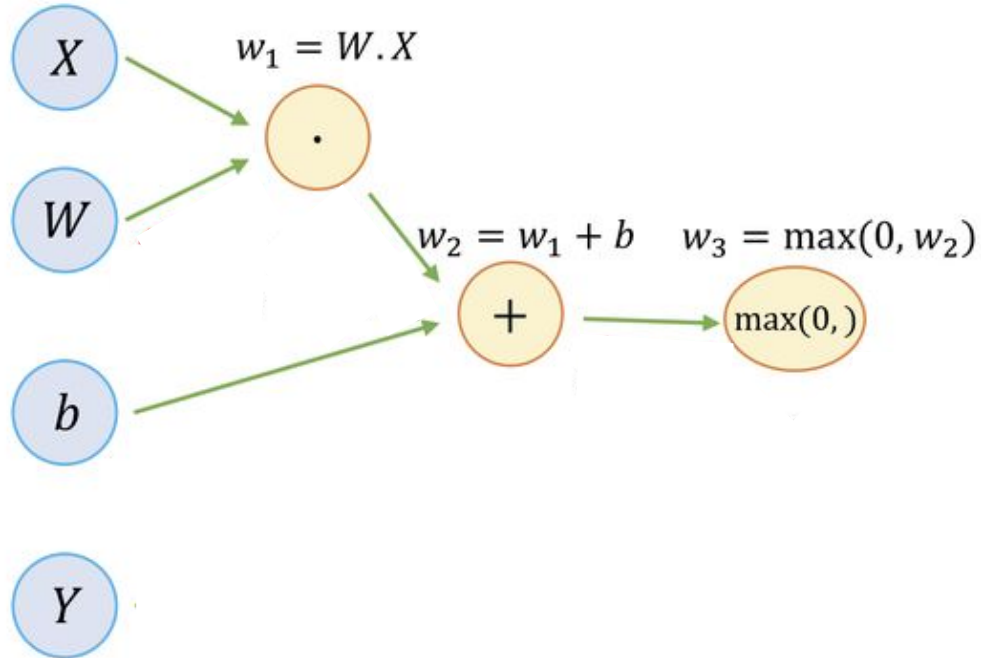
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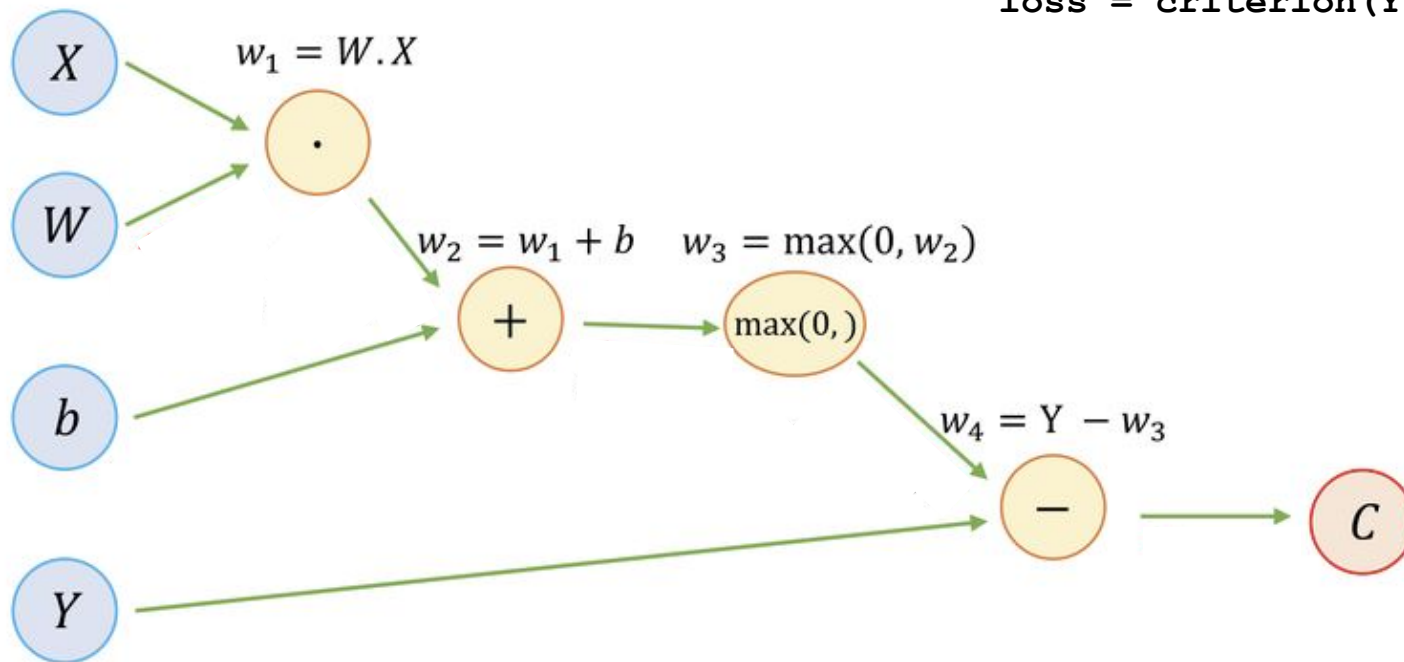
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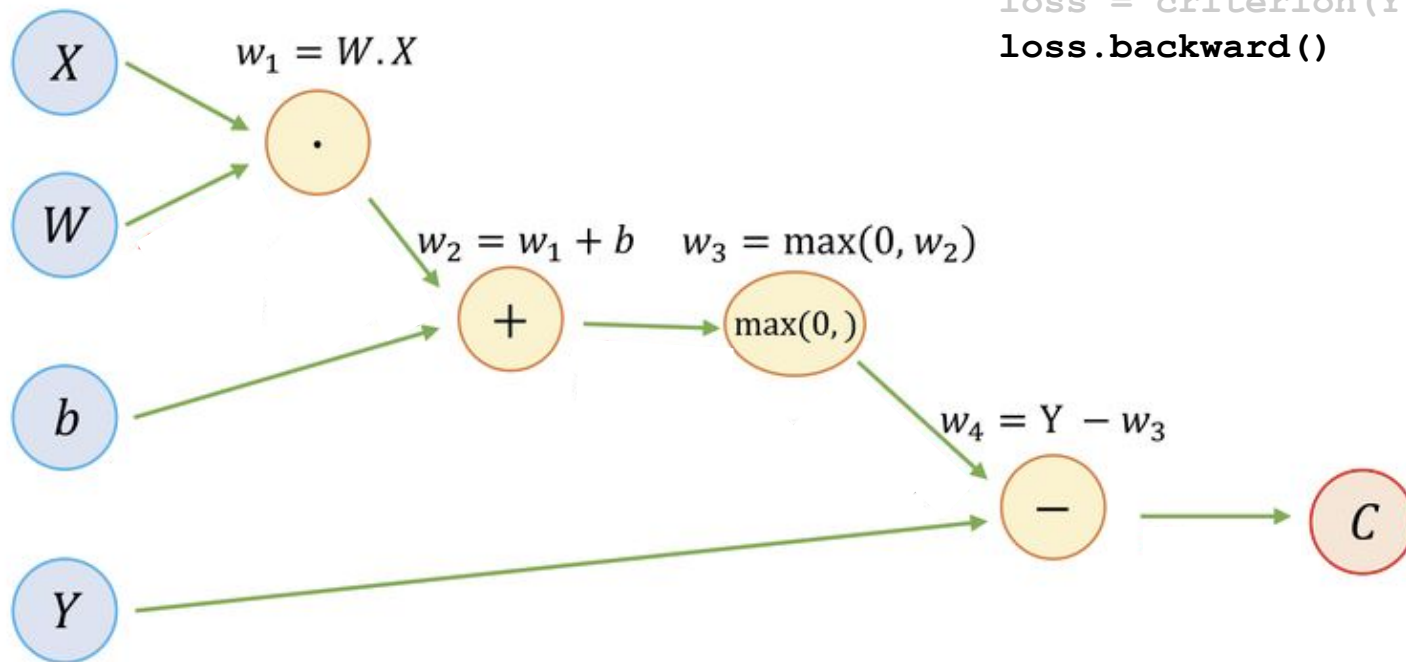
Backpropagation

$Y_p = \text{model}(X)$
 $\text{loss} = \text{criterion}(Y, Y_p)$



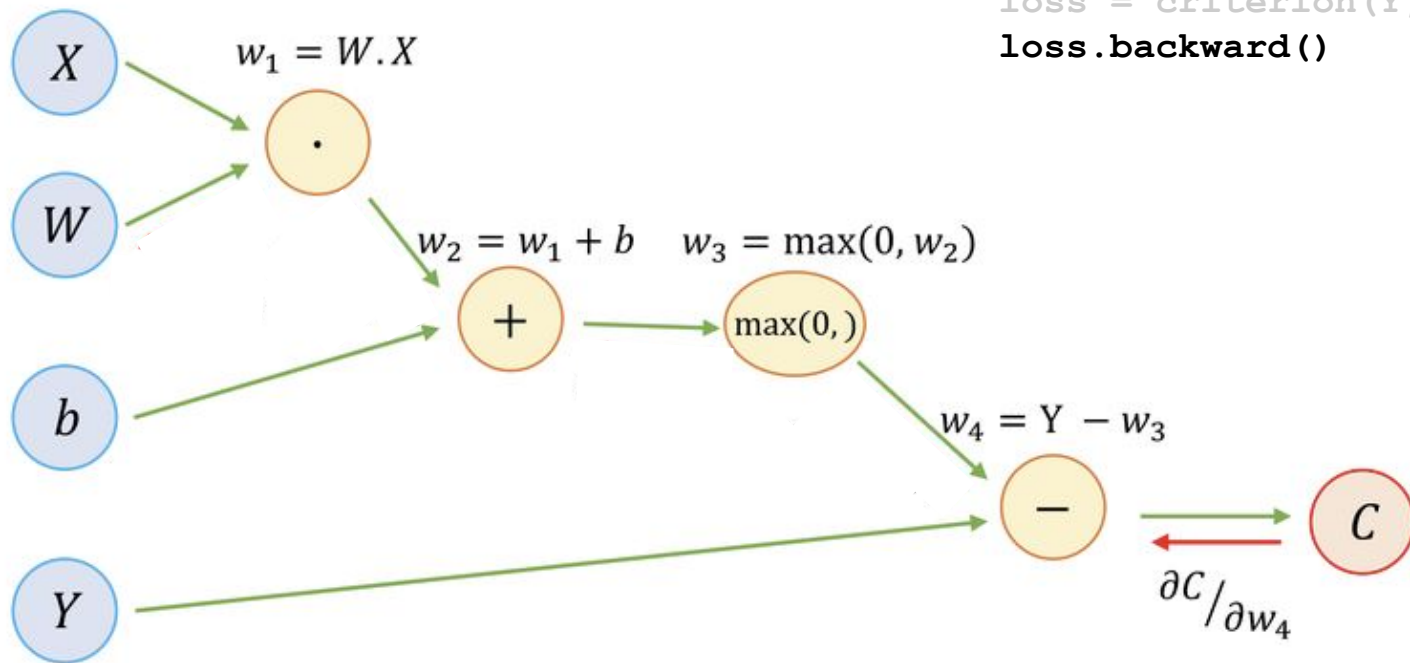
Backpropagation

```
Y_p = model(X)  
loss = criterion(Y, Y_p)  
loss.backward()
```



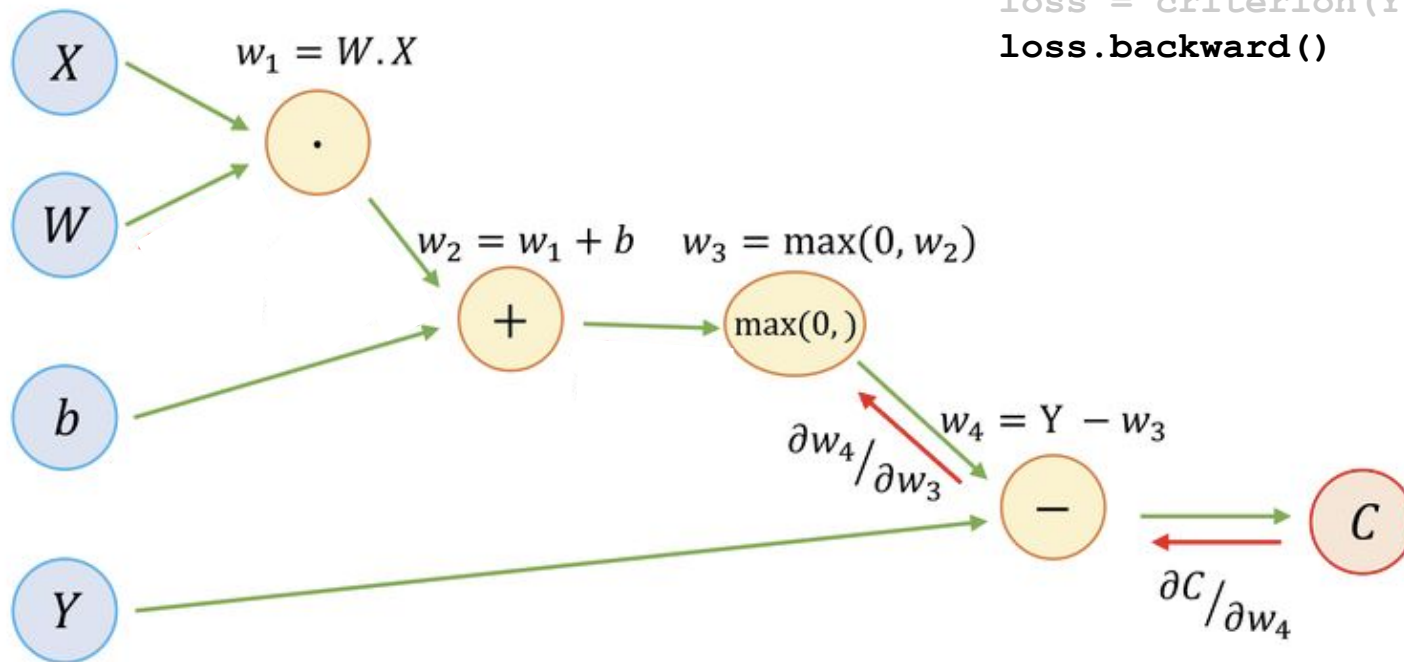
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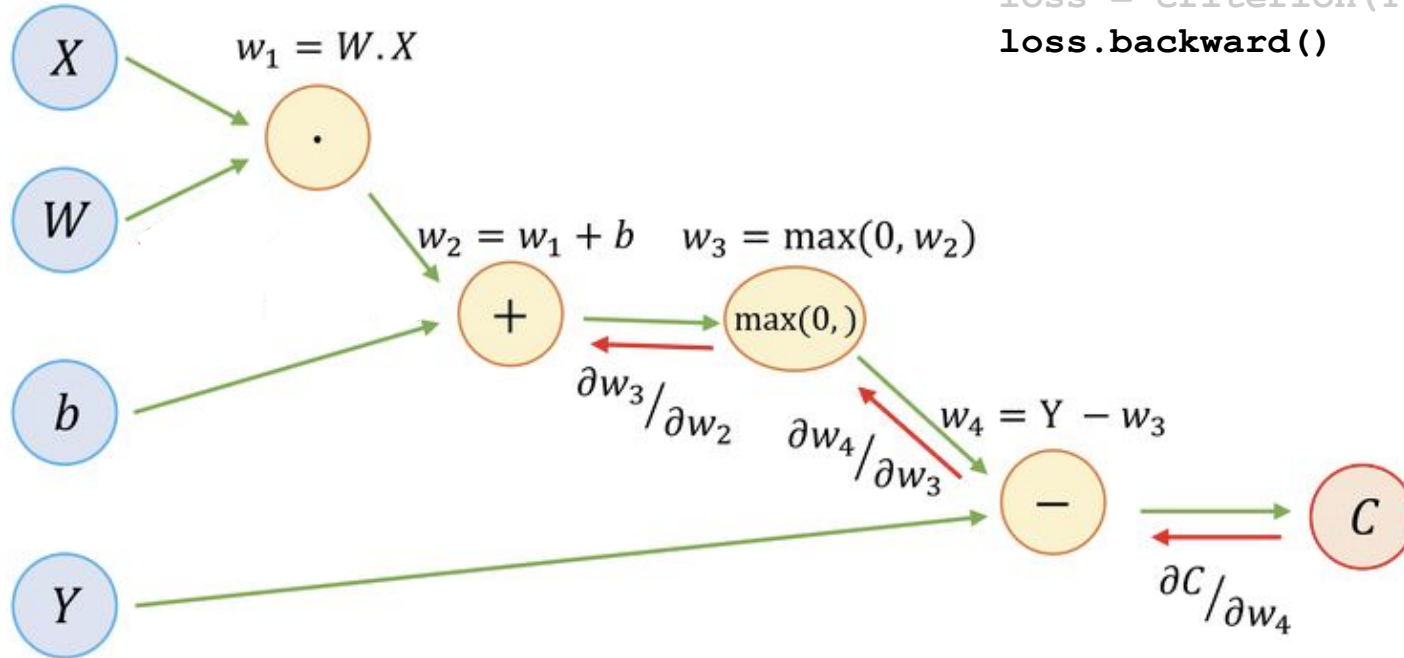
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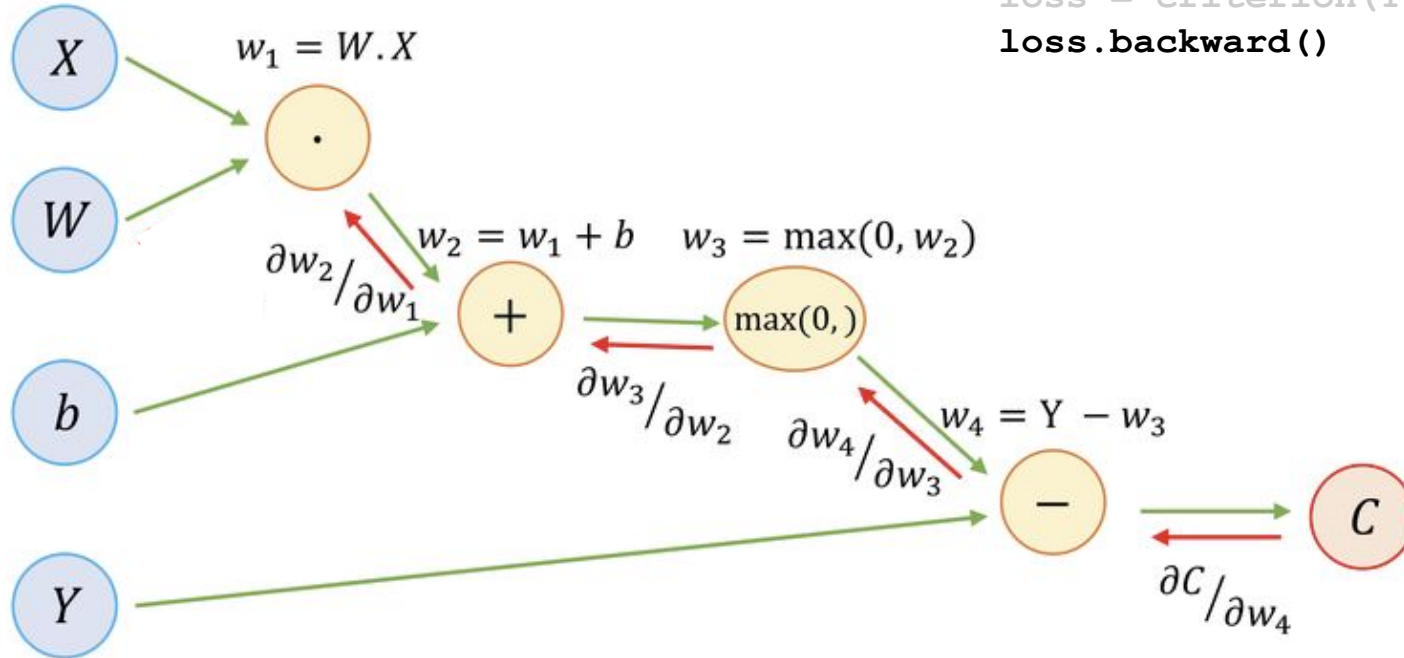
Backpropagation

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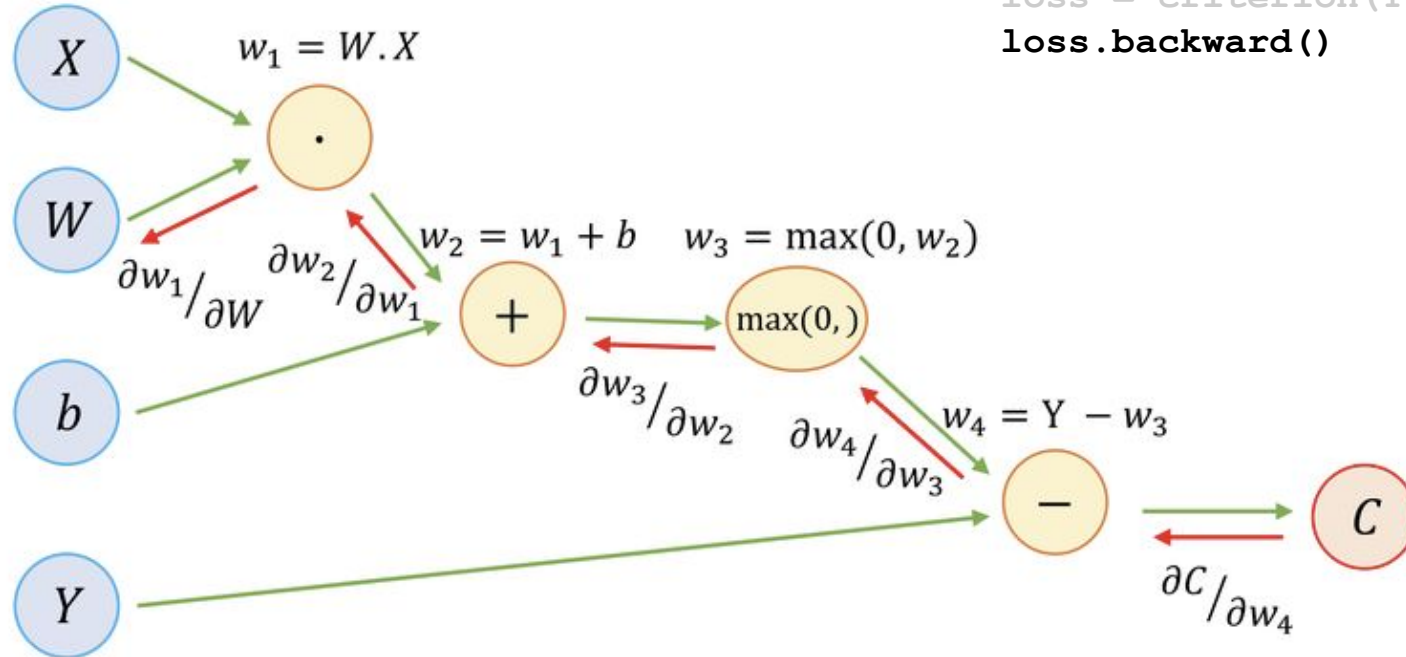
Backpropagation

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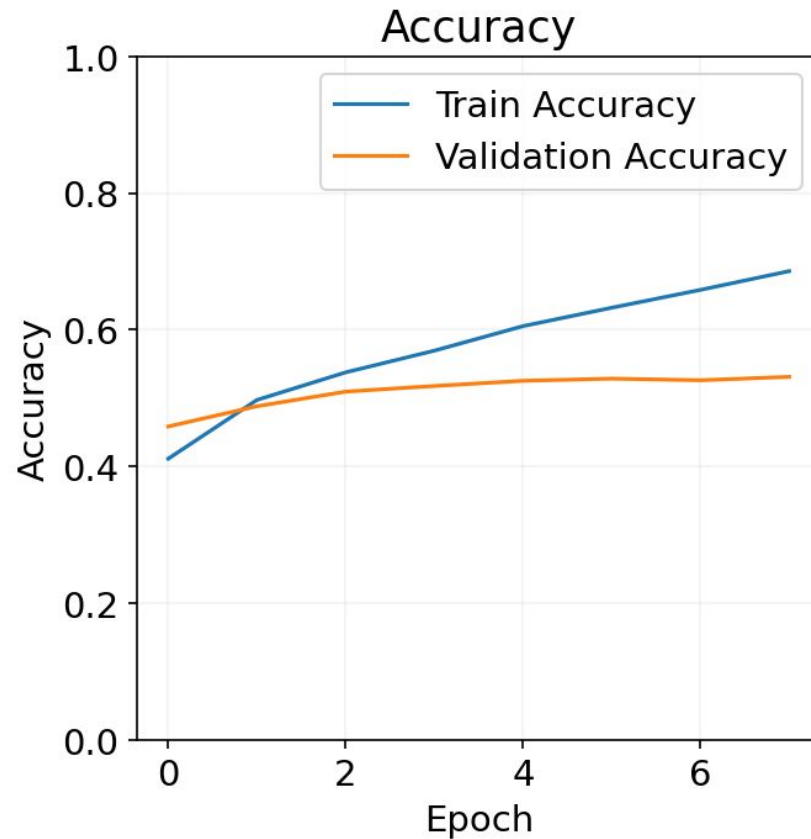
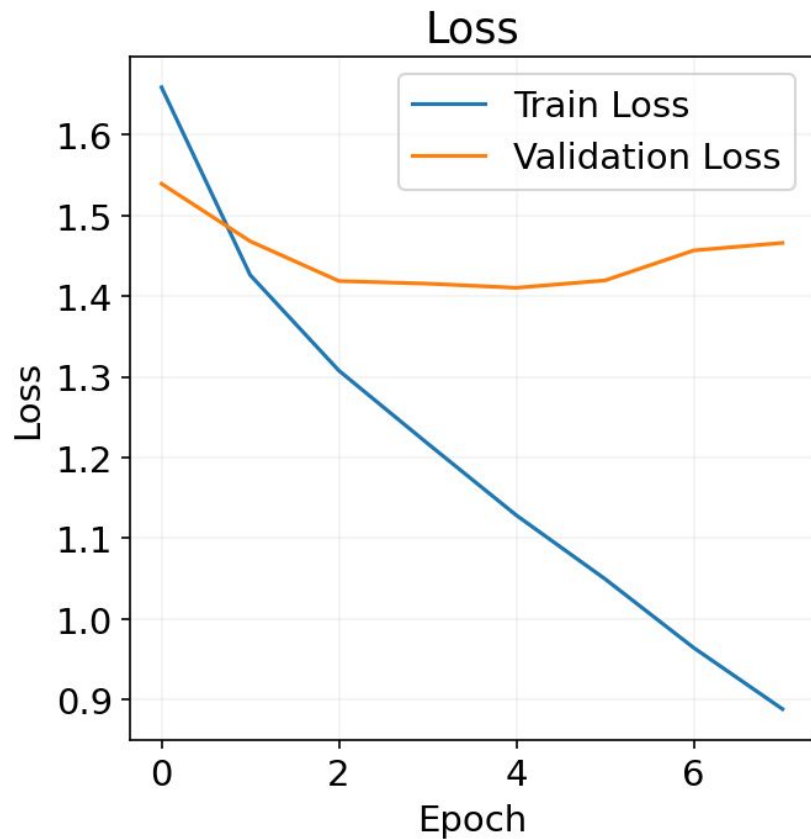
Backpropagation

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```



Lab Assignment 2

Example loss & accuracy you might obtain:



Example confusion matrix & misclassified examples:

Validation Confusion Matrix

True label \ Predicted label	airplane	automobile	bird	cat	deer	dog	frog	horse	ship	truck
airplane	292	14	23	20	17	10	4	13	44	15
automobile	37	302	8	19	6	5	11	6	38	59
bird	52	8	201	45	59	52	34	19	9	3
cat	18	9	42	228	41	76	53	24	15	15
deer	22	4	87	38	217	32	31	33	25	9
dog	10	2	51	118	29	209	20	26	11	13
frog	10	9	42	59	64	38	271	10	8	11
horse	18	7	37	53	41	25	11	318	4	13
ship	56	29	6	15	7	1	7	5	303	31
truck	39	62	16	28	11	6	19	19	43	315

Example Misclassifications (Validation)

pred:truck
true:automobile



pred:ship
true:automobile



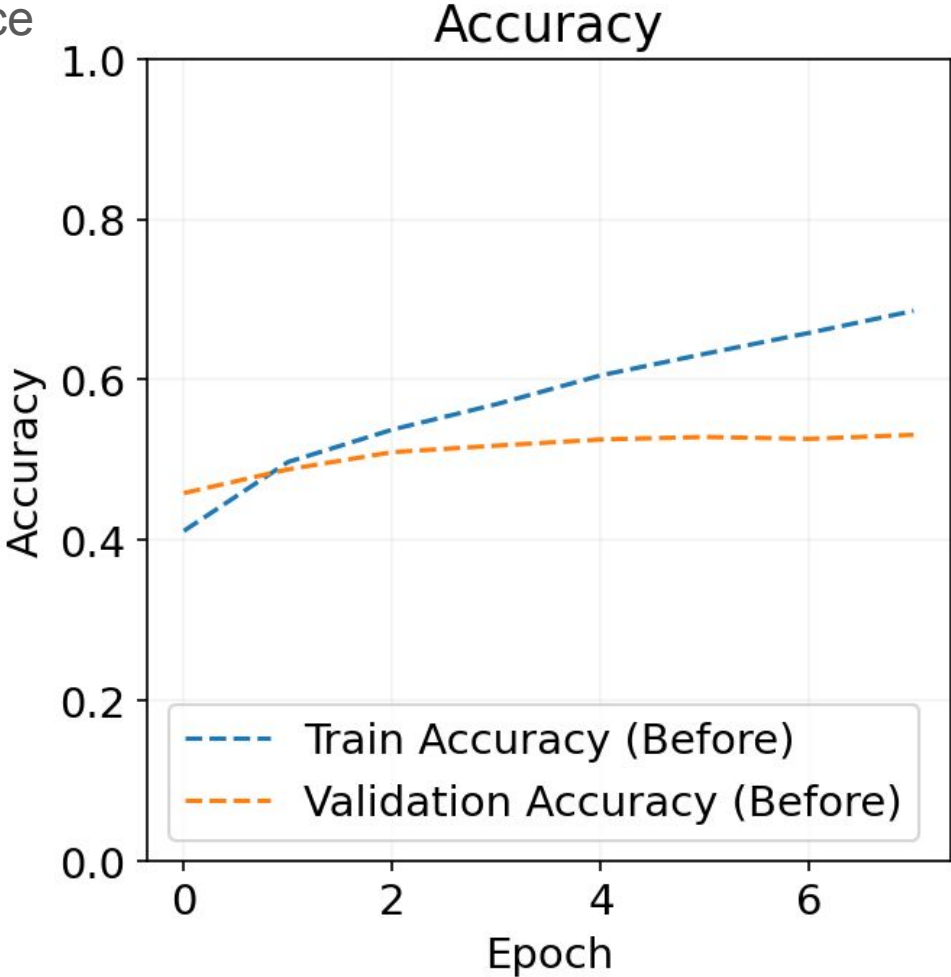
pred:dog
true:cat



pred:cat
true:bird



Example performance
you achieved in-lab:



Example improvement
you achieved
take-home:

