



deeplearning.ai

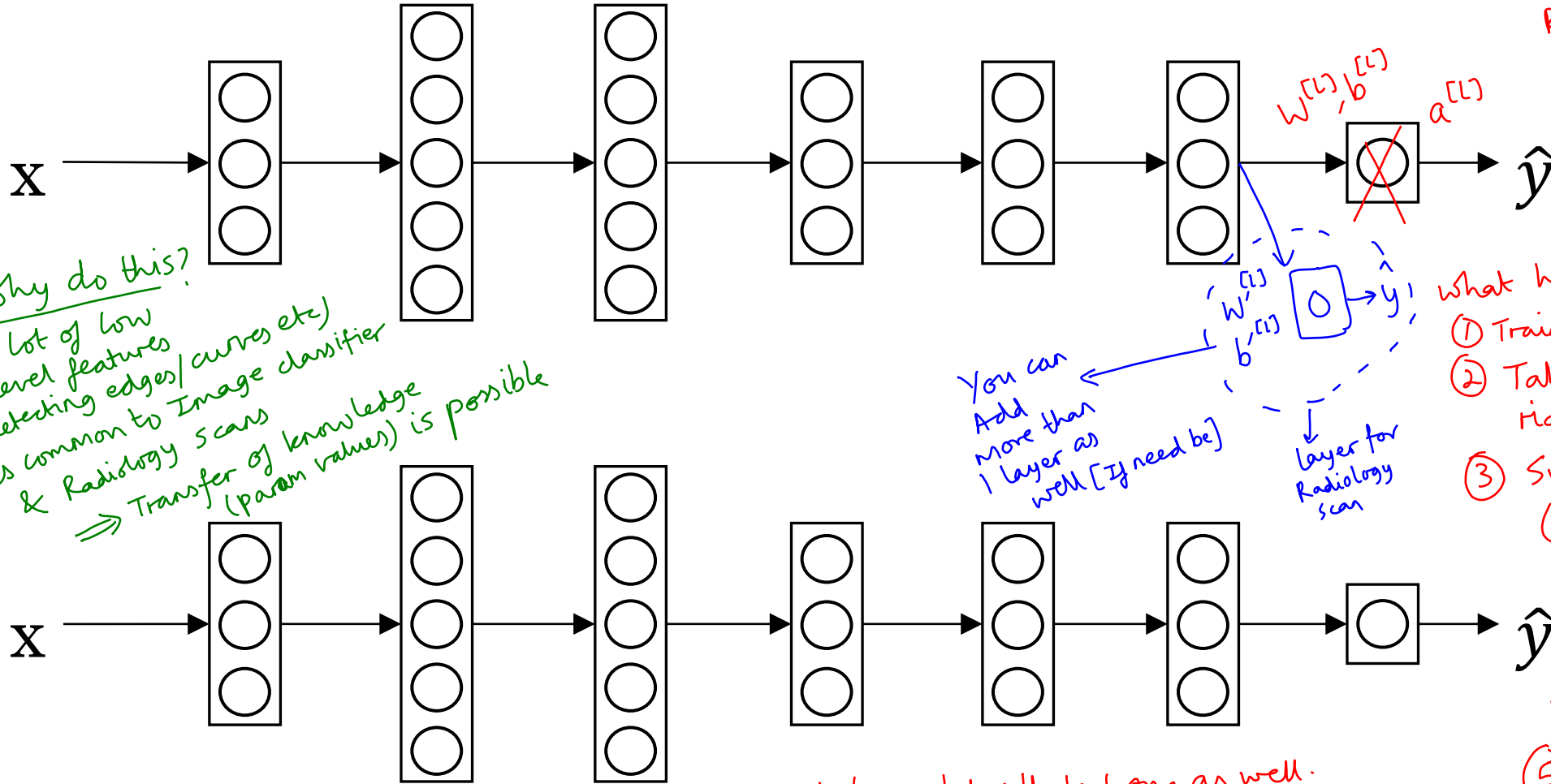
Learning from
multiple tasks

Transfer learning

Transfer learning

→ use ability for NN to learn 1 task (classify cats)
& Apply it on another (classify Xray scans)

↪ (X, Y)
↓
Radiology Images
↪ diagnosis



Why do this?

A lot of low level features (detecting edges/curves etc) is common to Image classifier & Radiology scans
⇒ Transfer of knowledge (param values) is possible

You can Add more than 1 layer as well [if need be]

↓
layer for Radiology scan

What happens is as follows

- ① Train an Image classifier
- ② Take last output layer & get rid of $a^{[L]}, W^{[L]}, b^{[L]}$
- ③ Swap in a new data set $(X, Y) = \text{radiology data}$ to feed into NN
- ④ Initialize Random weights $W^{[L]} \& b^{[L]}$ in last layer
- ⑤ Retrain NN on new data set

→ If Radiology data set is large ⇒ can train layers before the last one as well.
Training on cat Image classifier = pre-training ✓
Training on Radiology Images = Fine tuning ✓

If Radiology dataset is small
⇒ only $W^{[L]}, b^{[L]}$ can be tuned

When transfer learning makes sense

Transfer from A \rightarrow B
Another example \rightarrow use human speech to learn wake words/Triggers
(10 K Hours worth data) \rightarrow "Alexa", "Cortana" (5 hrs worth data)

- Task A and B have the same input x .

Assumption We want to do well on task B

- You have a lot more data for Task A than Task B.

(A lot more data on Image classification, less data available for Radiology)

- 1M Images is a lot to learn about low level features of Images
Maybe you have only 100 Images of Radiology scans

- Low level features from A could be helpful for learning B.

When would it not make sense?

wouldn't hurt to include but wouldn't see any gains

- \rightarrow 100 Images for cat classification
- \rightarrow 1000 Images for Radiology

- Makes more sense to just use

all layers trained on Radiology data

- Features learned from 100 normal Imgs wouldn't transfer