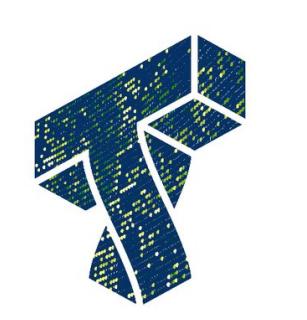


# Neural Nets for Music

Workshop Day 1



David Goedicke and Wendy Ju

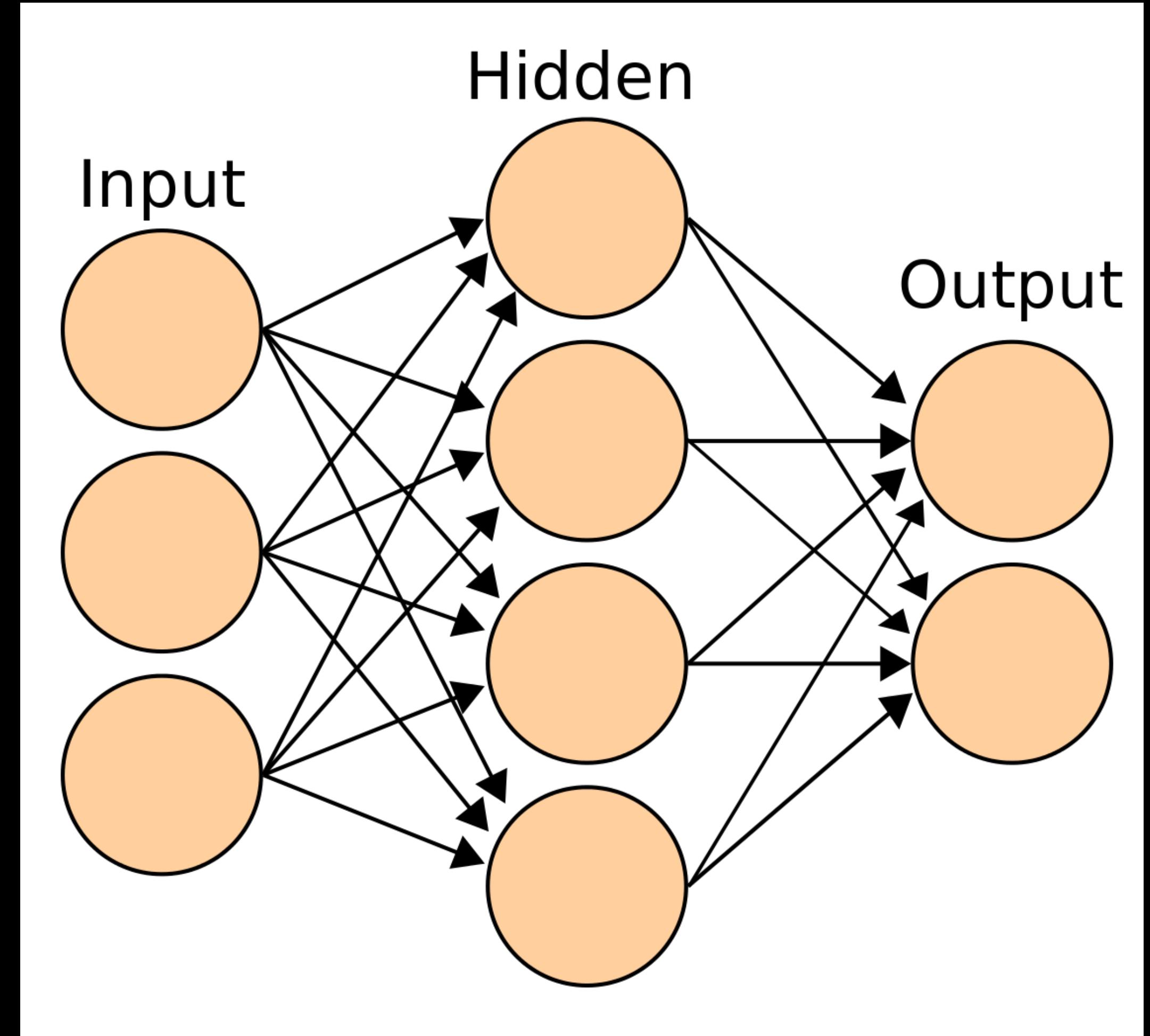


# Provisional Workshop Schedule

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9am	Introductions	Review/Q&A	Review/Q&A	Review/Q&A	Review/Q&A
10-noon	Neural Nets	Collecting & Analyzing Sounds	Designing Interaction	Generative Models	Project time
noon-1:30	Lunch	Lunch	Lunch	Lunch	Lunch
1:30-3:30	Lab Setup	Stanford Sounds Dataset Activity	Urban Sounds Dataset Lab	Final Project	Project Time/ Show and Tell
3:30-5pm	Cats & Dogs Lab	Stanford Sounds Dataset Activity	Plotting Final Project	Final Project	Happy Hour

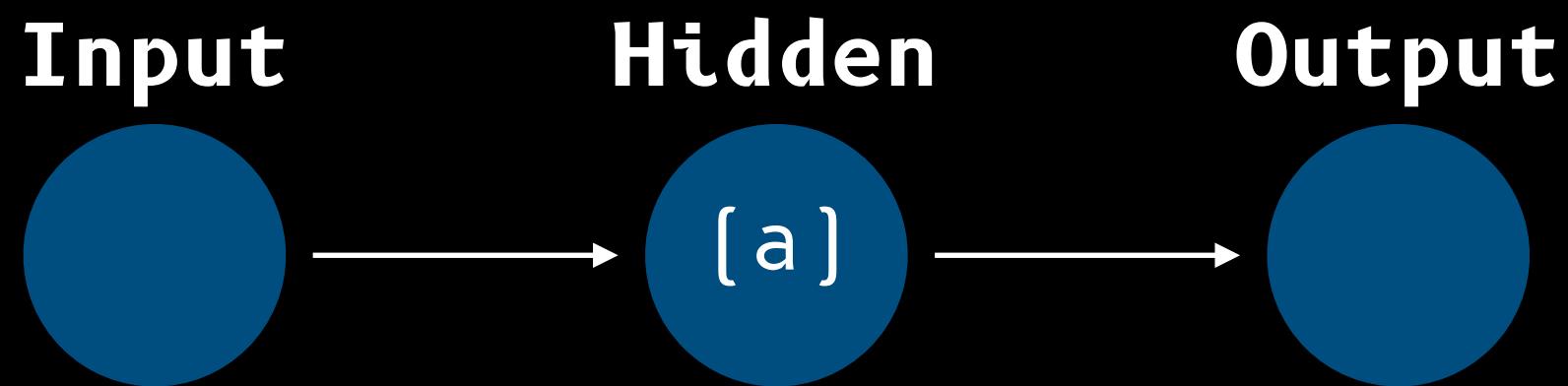
# What is a neural net?

- A network of connected “neurons” that perform “simple” input on a number input.



# How does it learn?

**Network:**



**Data:**

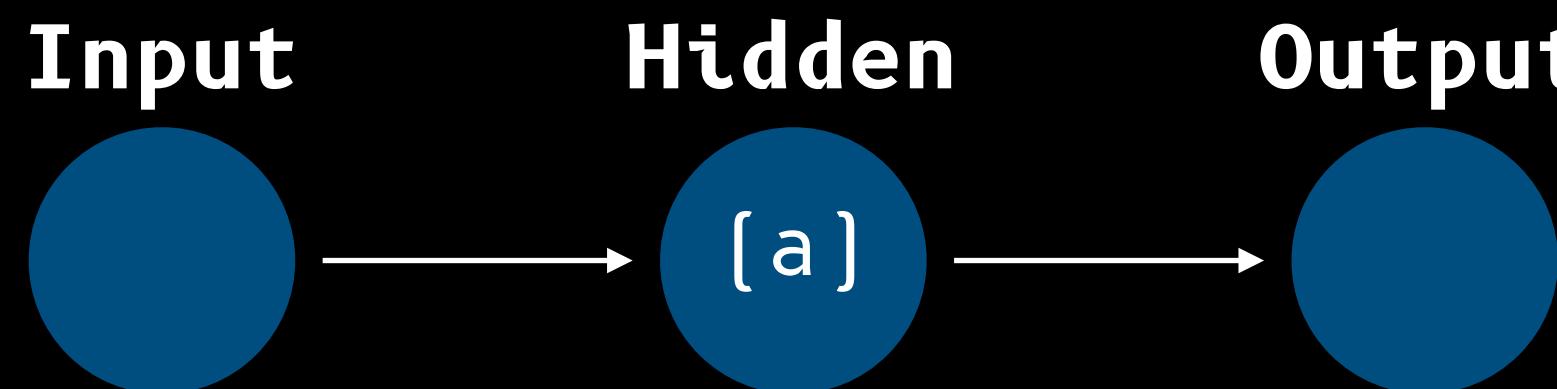
Input	Output
1	0.5
2	1
3	1.5
4	2

# How does it learn?

Input	Output	( a )	Est.Out	Error
1	0.5	0.6	0.6	0.1
2	1	0.6	1.2	0.2
3	1.5	0.6	1.8	0.3
4	2	0.6	2.4	0.4
		<b>Loss:</b>	0.25	

# How does it learn?

**Network:**



**Data:**

Input	Output
1	0.5
2	1
3	1.5
4	2

Input	Output	[ a ]	Est.Out	Error
1	0.5	0.6	0.6	0.1
2	1	0.6	1.2	0.2
3	1.5	0.6	1.8	0.3
4	2	0.6	2.4	0.4
				<b>Loss:</b> 0.25

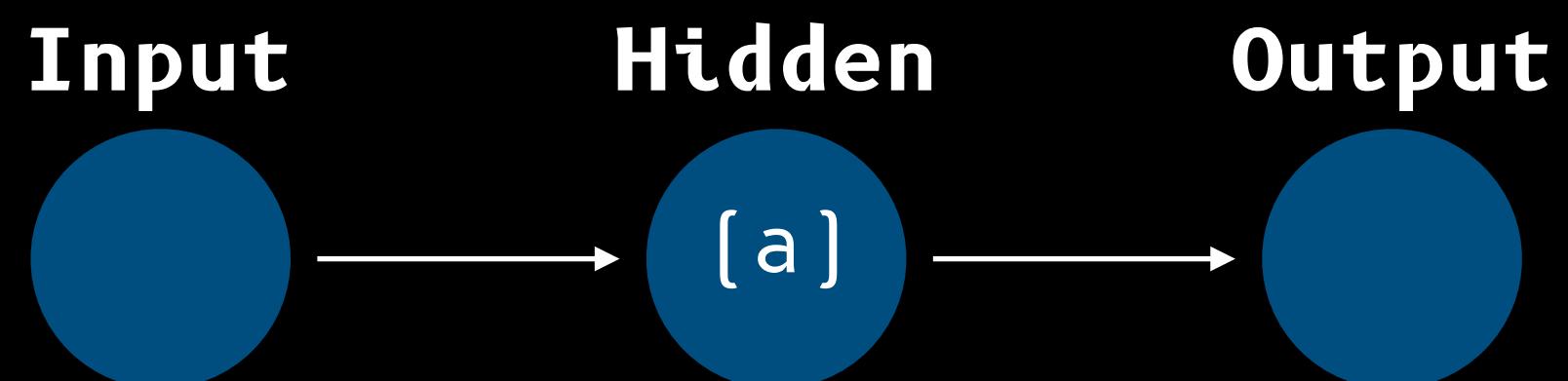
Input	Output	[ a ]	Est.Out	Error
1	0.5	0.55	0.55	0.05
2	1	0.55	1.1	0.1
3	1.5	0.55	1.65	0.15
4	2	0.55	2.2	0.2
				<b>Loss:</b> 0.125

Input	Output
1	0.5
2	1
3	1.5
4	2

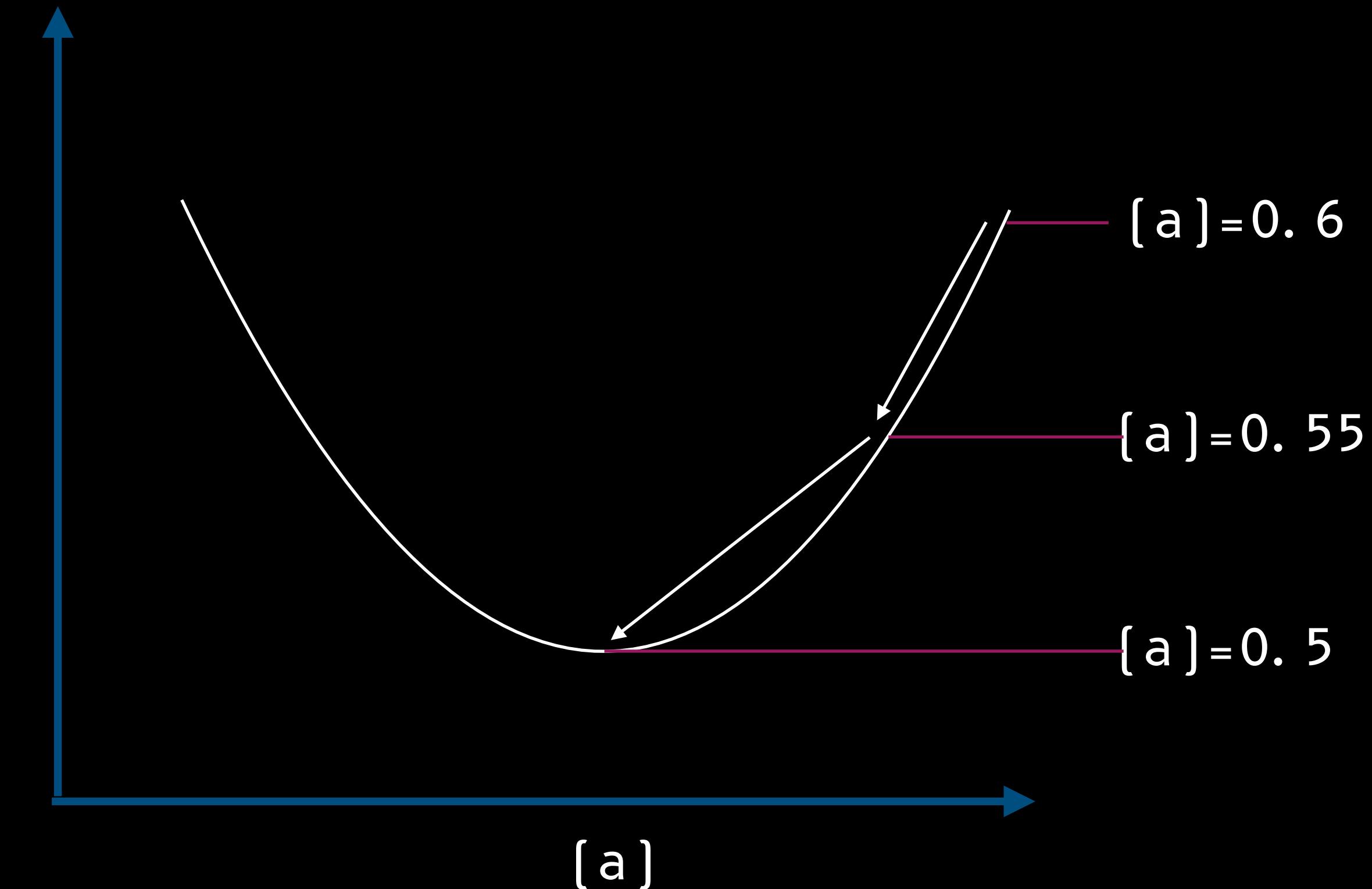
Input	Output	[ a ]	Est.Out	Error
1	0.5	0.5	0.5	0
2	1	0.5	1	0
3	1.5	0.5	1.5	0
4	2	0.5	2	0
				<b>Loss:</b> 0

# How does it learn?

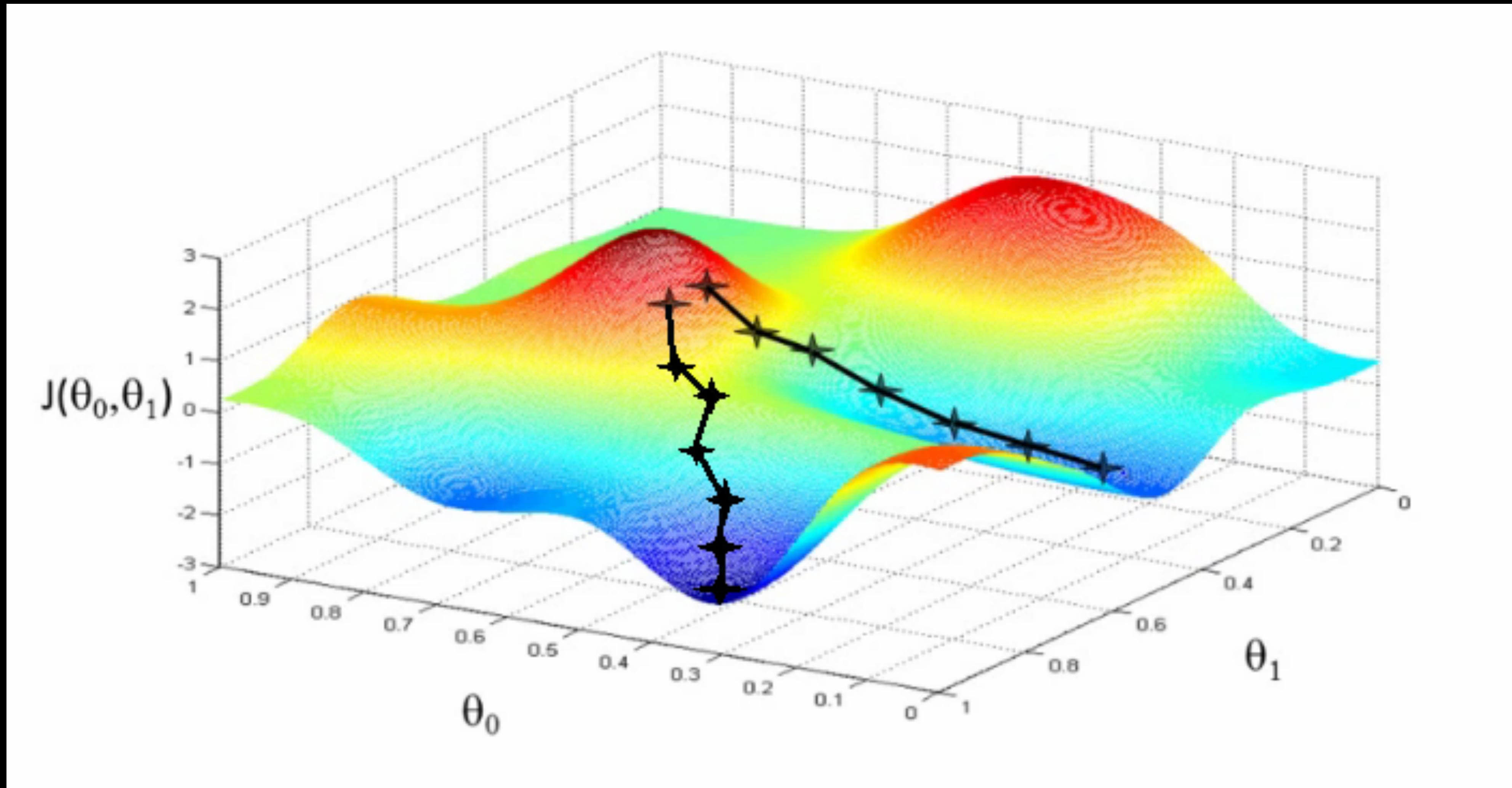
**Network:**



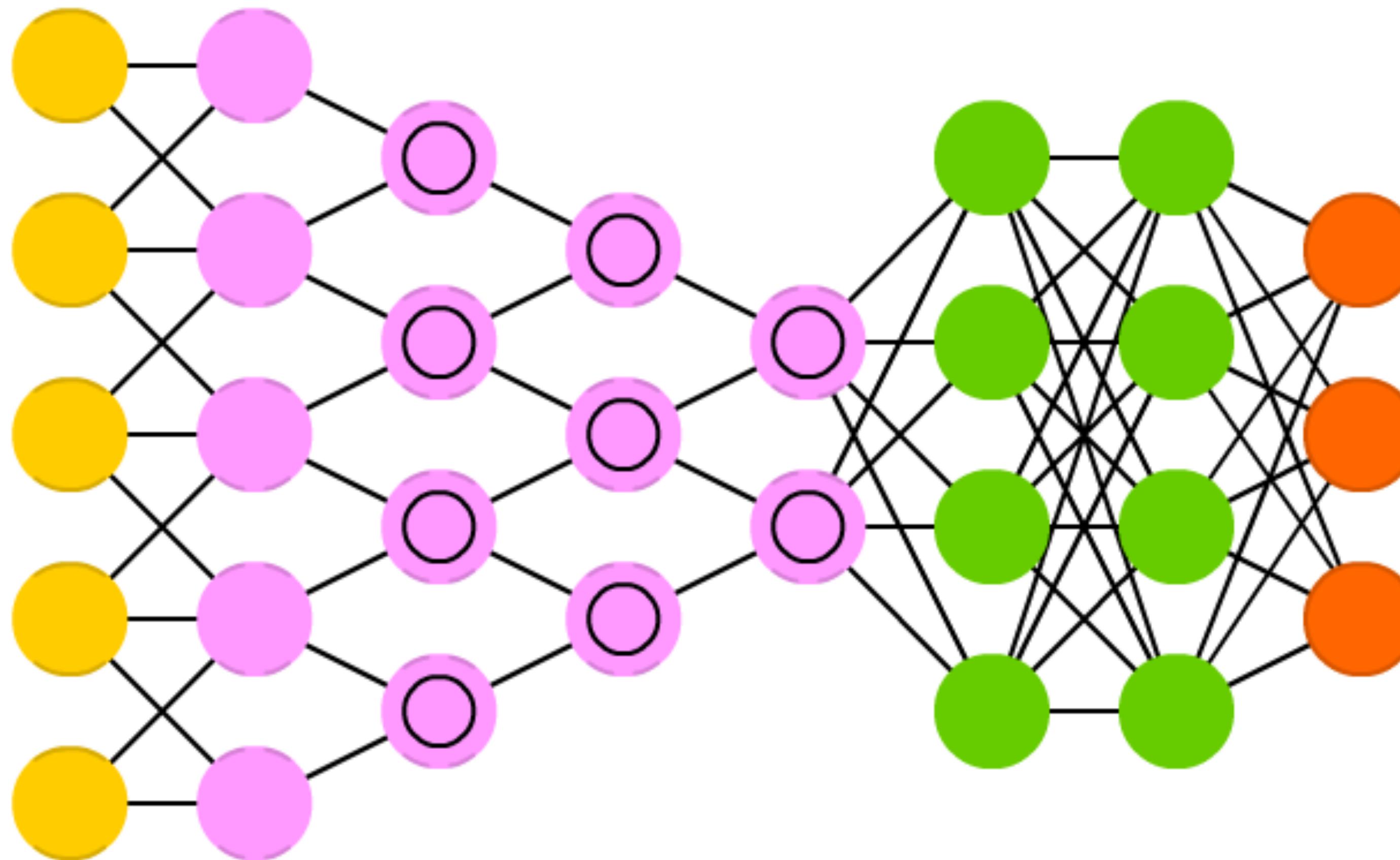
**Loss:**



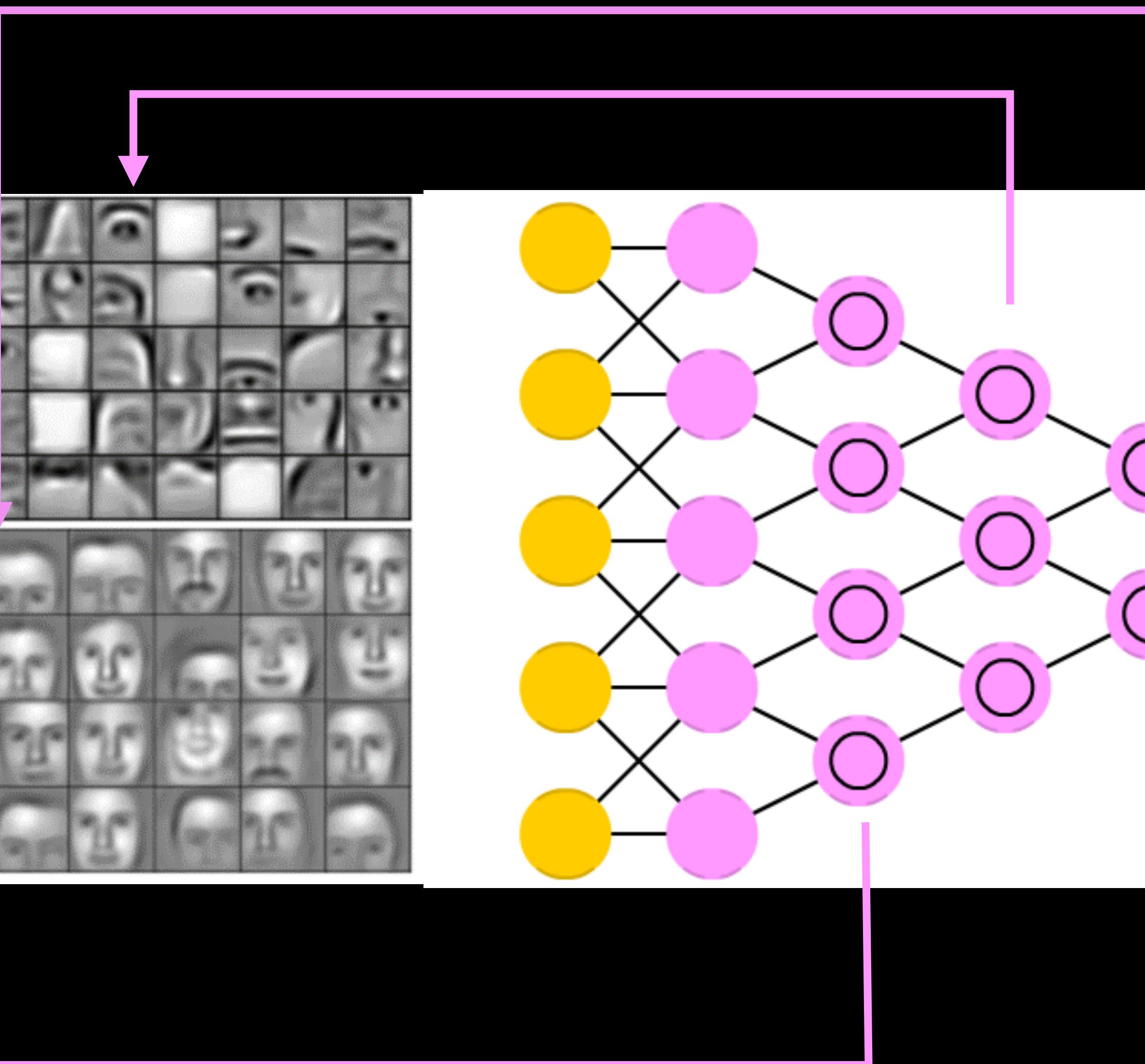
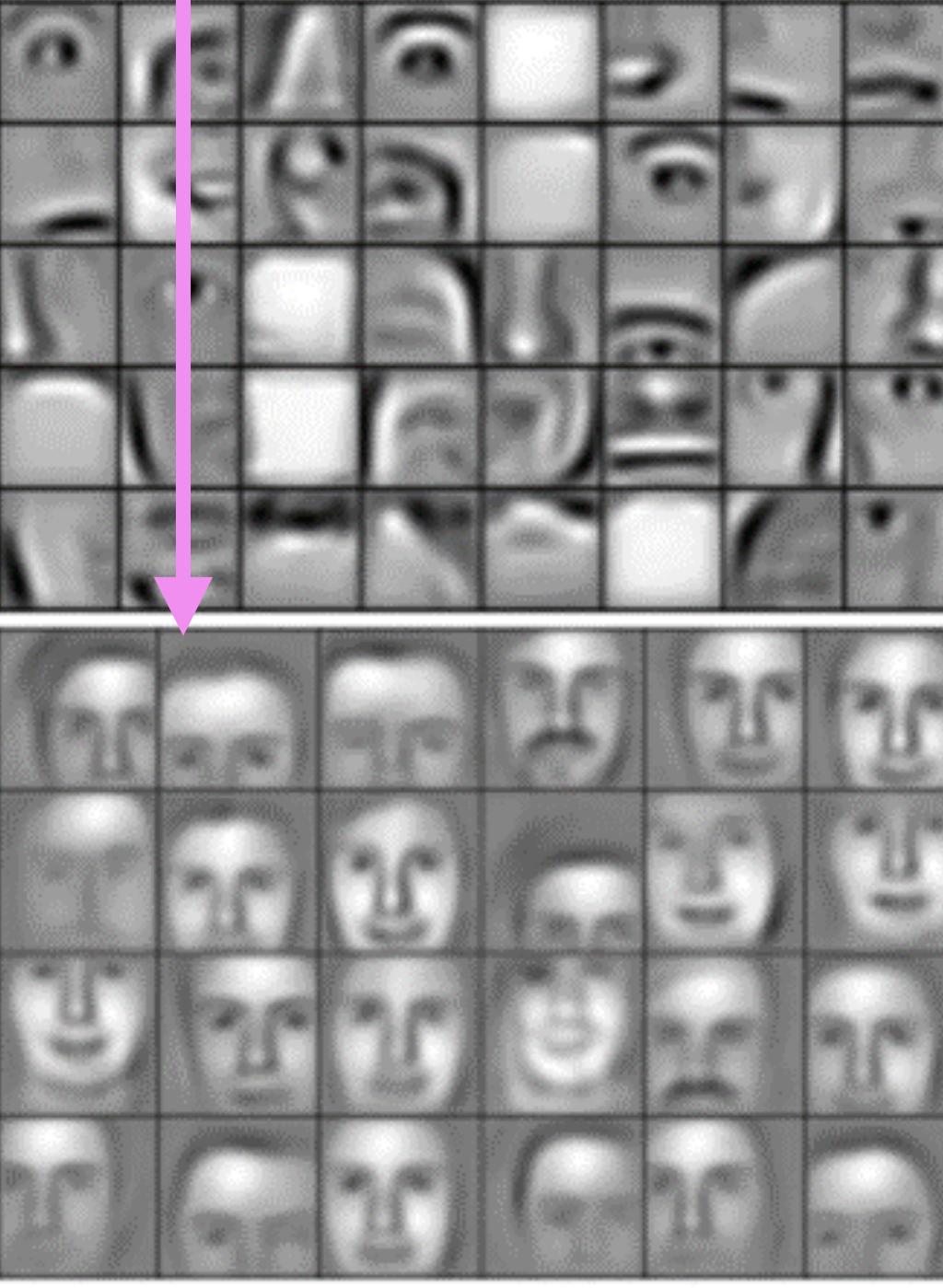
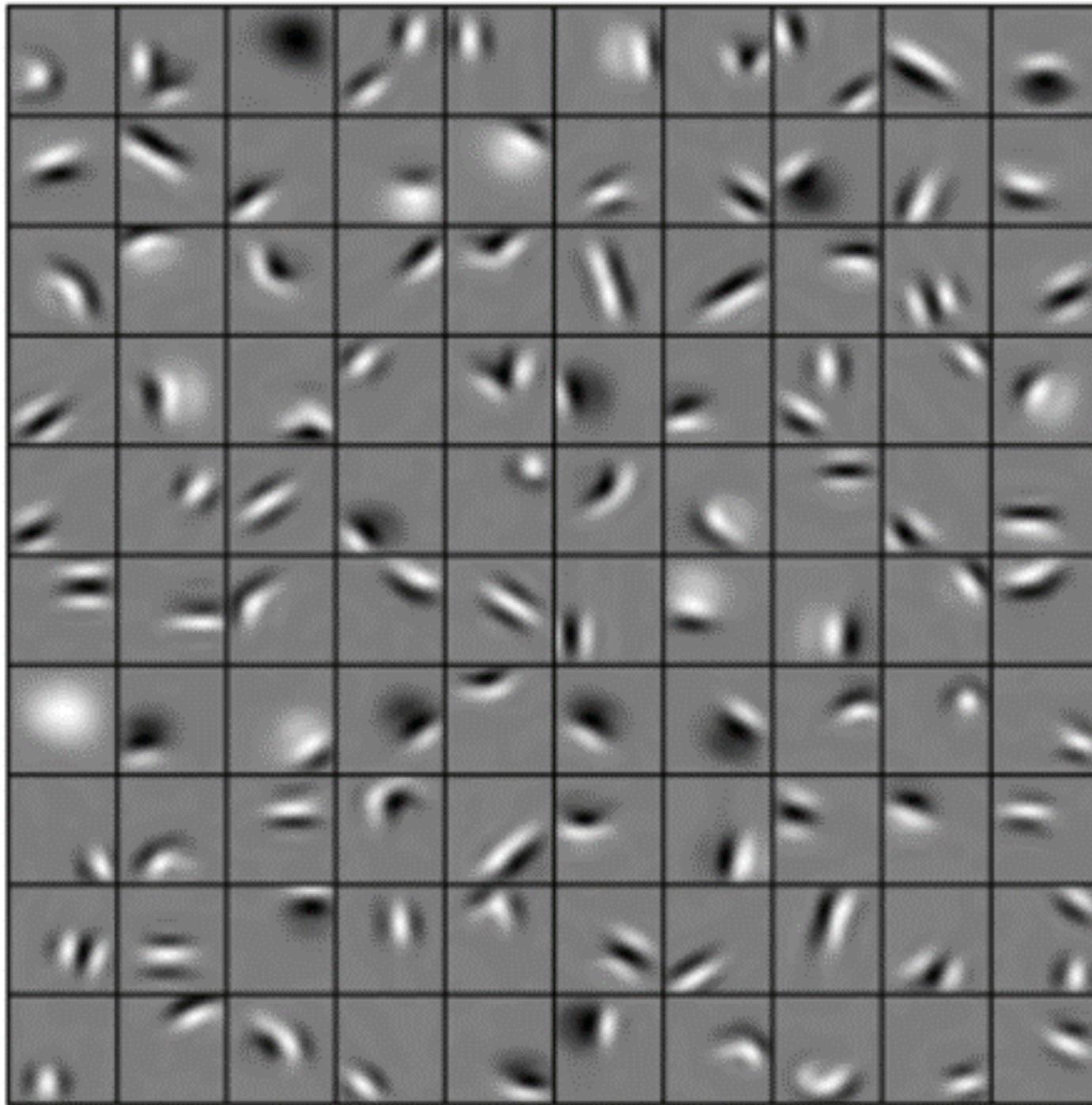
# How does it learn?



## Deep Convolutional Network (DCN)



<http://www.asimovinstitute.org/neural-network-zoo/>

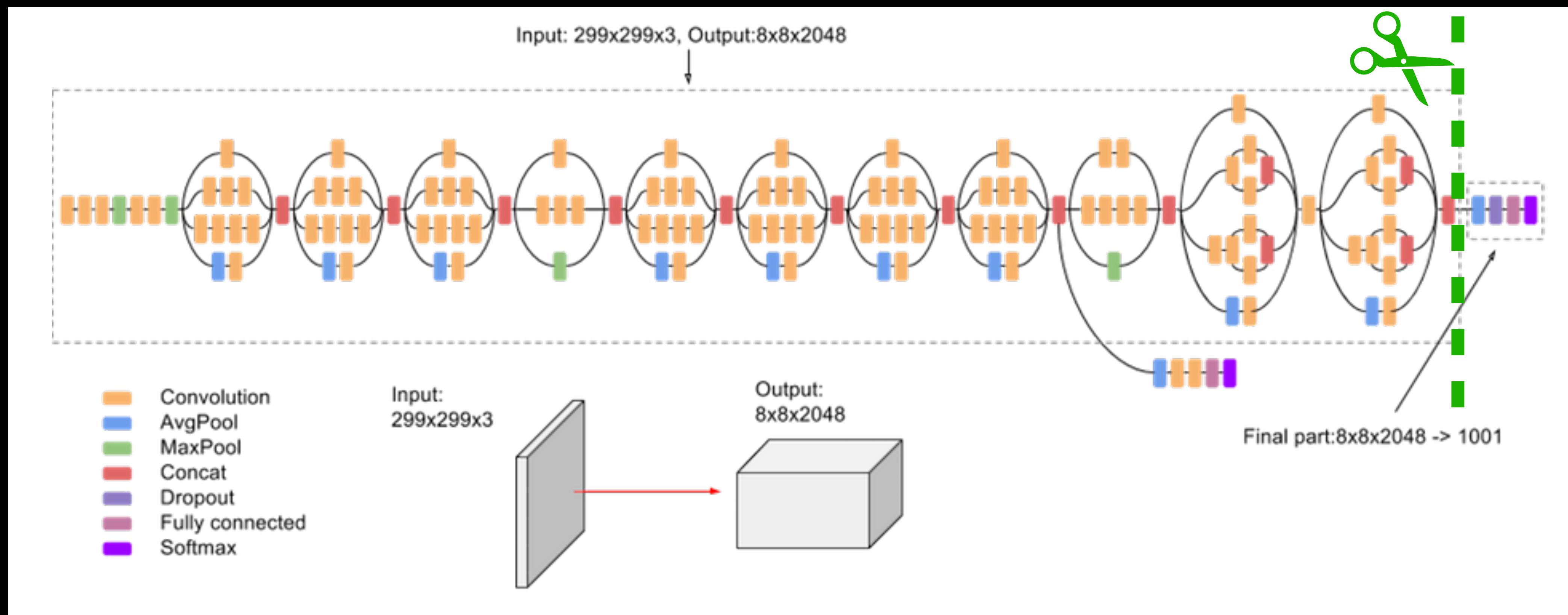


# Definitions

How long does it take?

# DIY Training NN

Cutting the head off a pre-trained model and retain the output layer



# DIY Training NN

← TensorFlow For Poets      ⏳ 21 min remaining

- 1 Introduction
- 2 Setup
- 3 Download the training images
- 4 (Re)training the network
- 5 Training And TensorBoard (Optional)
- 6 Using the Retrained Model
- 7 Trying Other Hyperparameters (Optional)
- 8 Training on Your Own Categories (Optional)
- 9 Next steps

## 1. Introduction

[TensorFlow](#) is an open source library for numerical computation, specializing in machine learning applications.

### What you will build

In this codelab, you will learn how to run TensorFlow on a single machine, and will train a simple classifier to classify images of flowers.

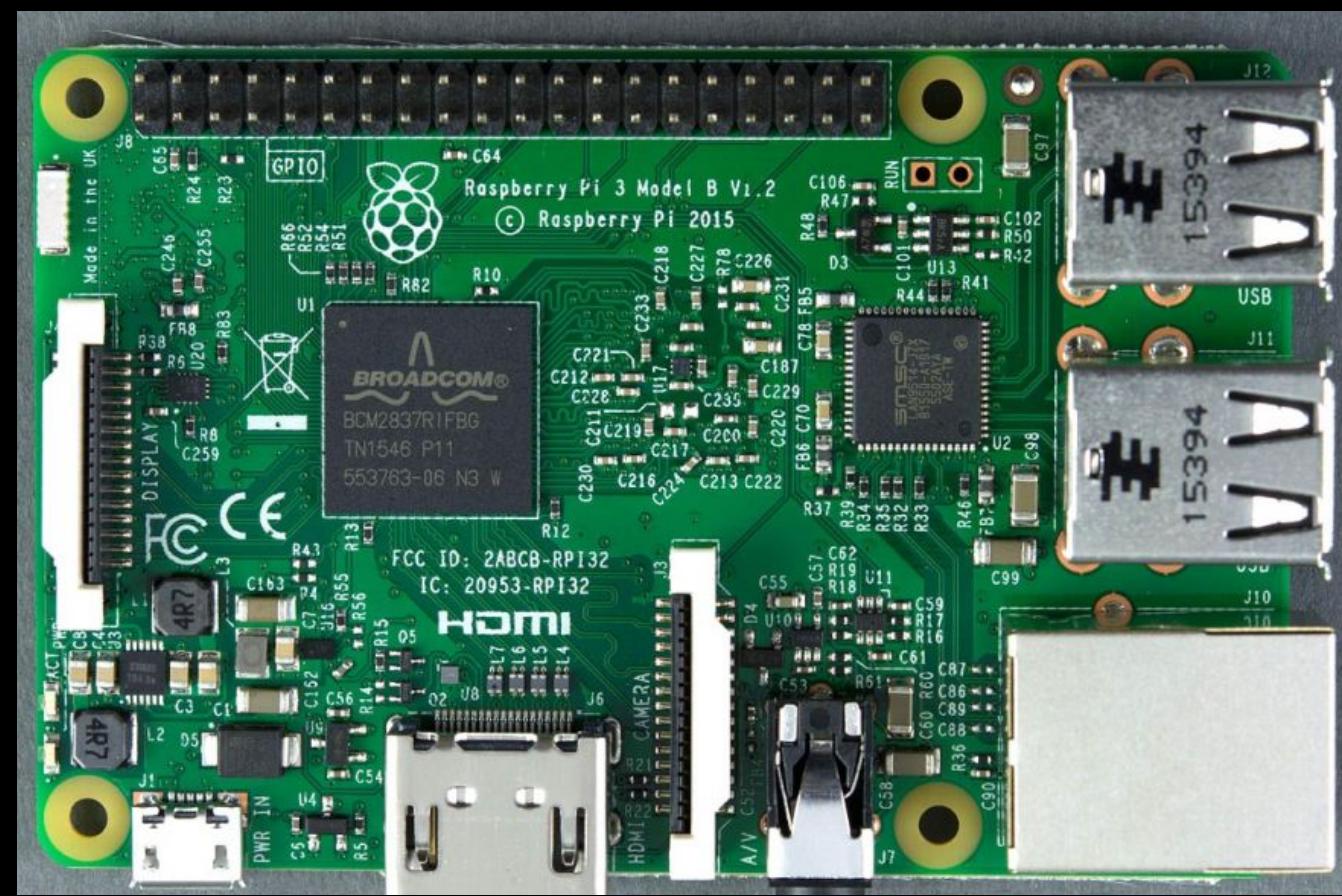
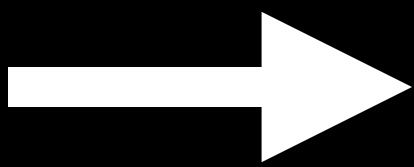


Image CC-BY by Retinafunk

```
daisy (score = 0.99071)
sunflowers (score = 0.00595)
dandelion (score = 0.00252)
```

Did you find a mistake? [Please file a bug.](#)

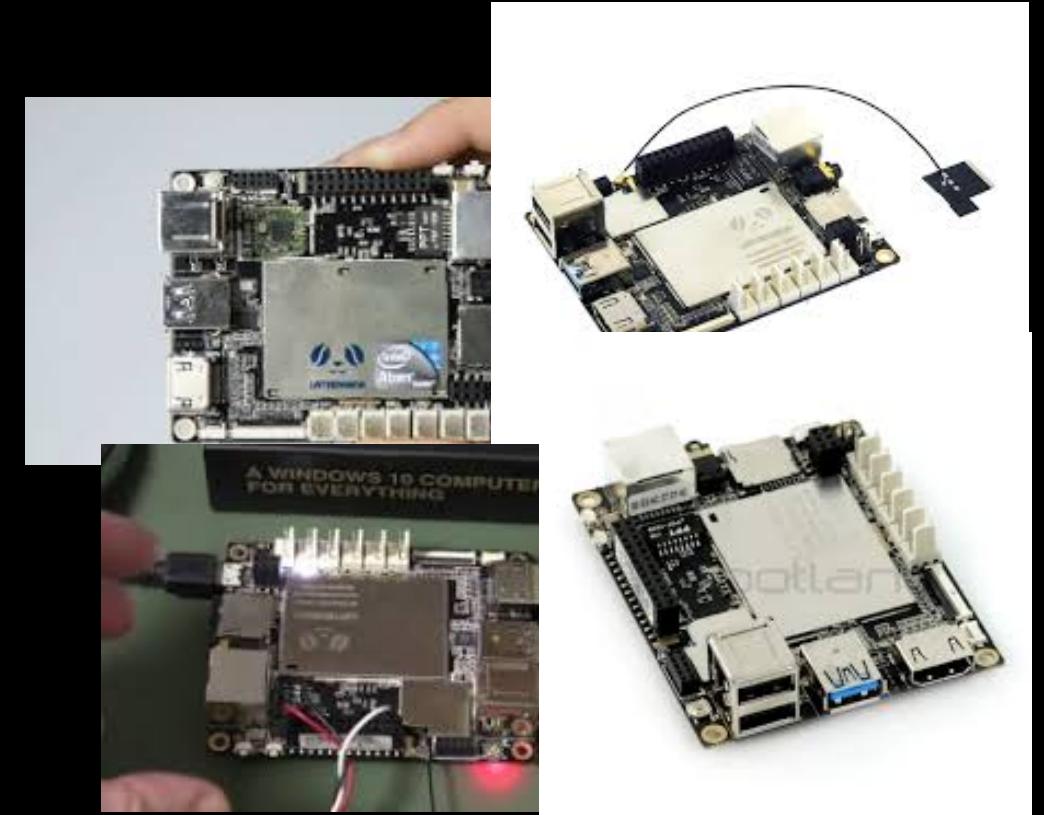
Next



# DIY Training NN

- Retraining MobileNET to recognize with single-board computers
- 50 training photos per
- 30s on my MacBook Pro 13" dual-core

```
INFO:tensorflow:Final test accuracy = 85.7% (N=14)
INFO:tensorflow:Froze 2 variables.
Converted 2 variables to const ops.
execution time was 29 s.
```

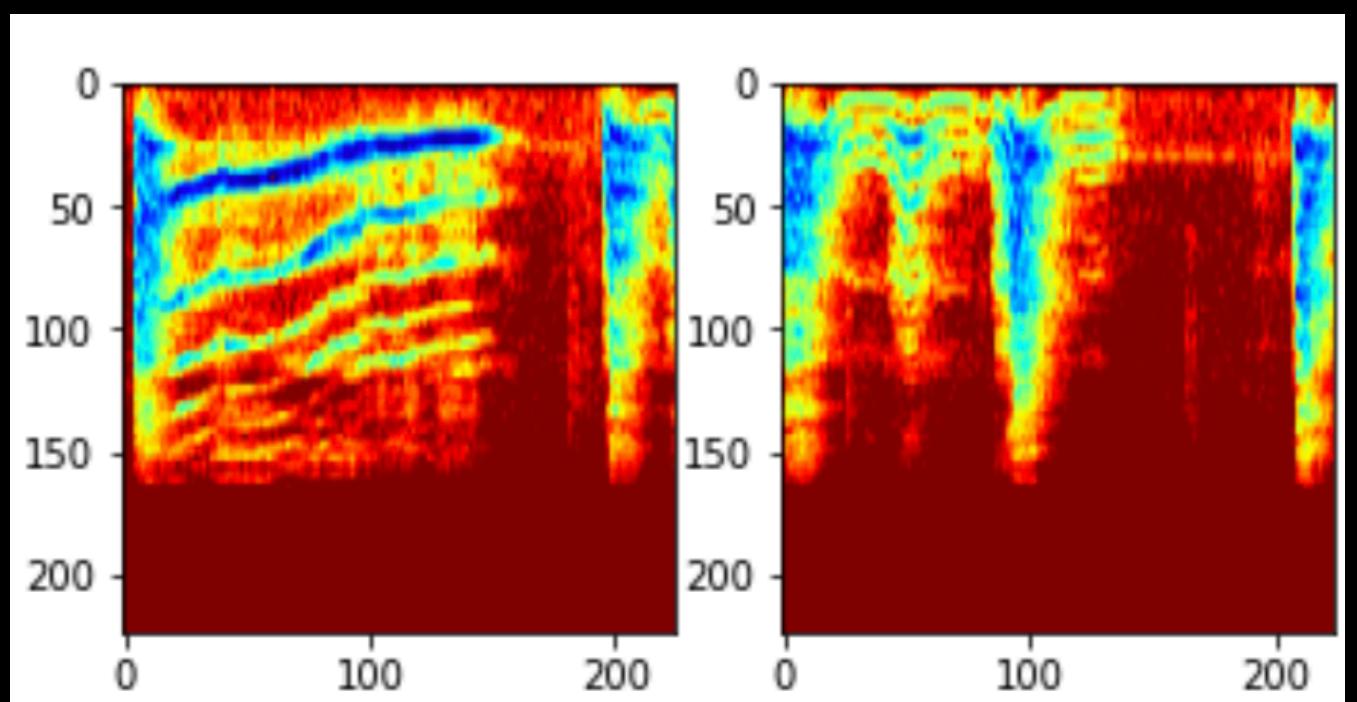


```
1 | x,sr=librosa.load(MainFile,mono=True)
2 | print(x[:10])
```

```
[ 7.2846080e-07  4.4798618e-04  4.2338486e-04  5.1860156e-04  5.2436633e-04
 6.2011537e-04  7.4167160e-04  7.3620537e-04  8.4487378e-04  6.9093634e-04 ]
```

! =

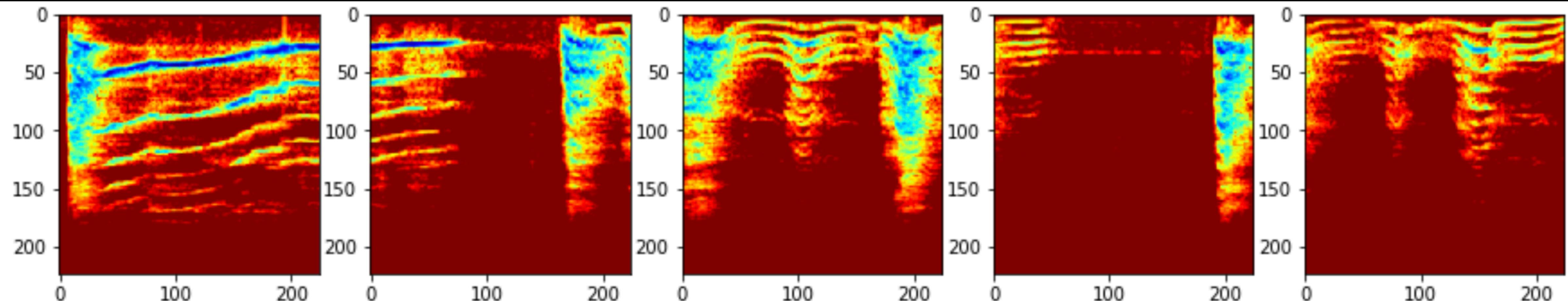




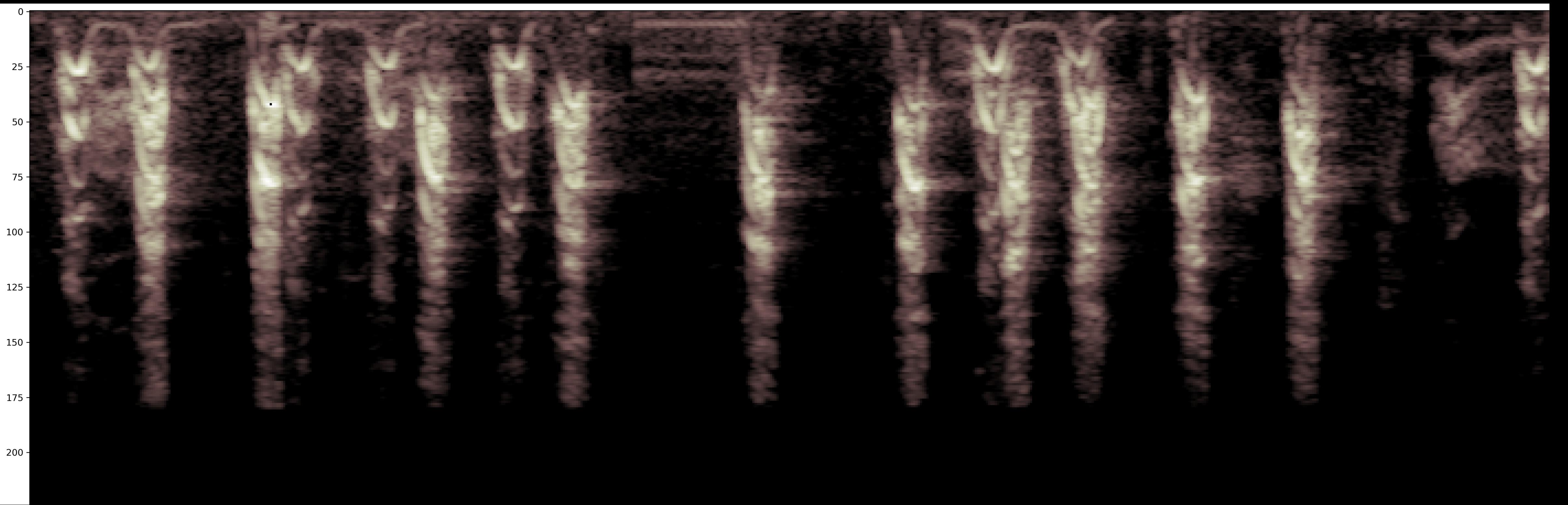
$\neq$



# Spectrogram generation



```
MainFile="..../AudioData/audio-cats-and-dogs/cats_dogs/train/dog/dog_barking_20.wav"
```



# What is done currently with audio detection

- Shazam (Apple Music google Assistant Alexa)
- Used for instructions and finding existing music.

# Today!

Getting set-up and running the basic audio.

# ToDos

- Join Discord <>
- Follow along on <https://github.com/DavidGoedicke/RealtimeAudioClassification/wiki>

