Intro to Neural Nets

Class Logistics and Introduction

Session Agenda

1. INTRO & LOGISTICS

- Who am I? Why should you care what I have to say?
- Schedule and evaluation criteria.
- Delivery format, etc.

2. WHAT IS DEEP LEARNING?

- How did we get here? When are these techniques this useful?
- Examples of good, useful, and problematic applications

3. THE BASICS & A FIRST EXAMPLE

- What is a neural network?
- How does it work?
- Training our first neural network.

About Me

accenture

MSI at the ARF

NSF

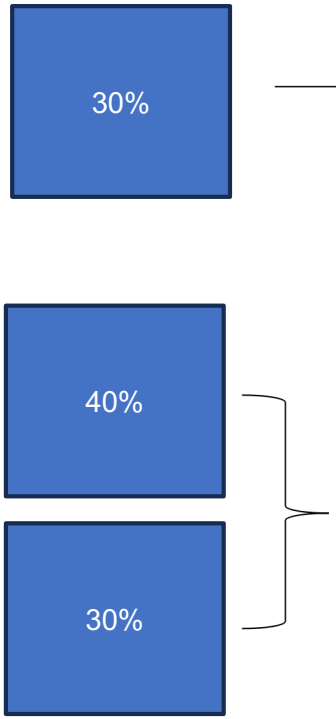
FFG Forschung wirkt.

Adobe

3M

Microsoft

Grading & Evaluation



Premodule quiz

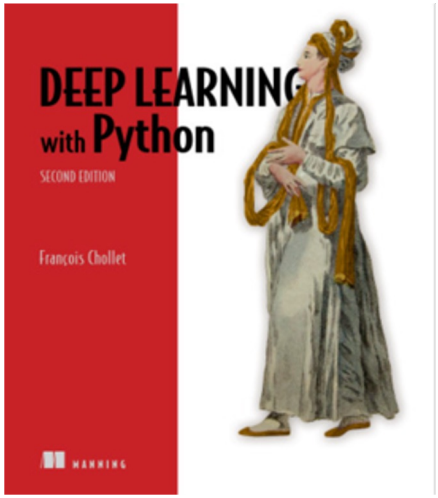
Post module

(40%) INDIVIDUAL PROJECT - Complete the Deep Learning assignment posted on NYU Brightspace . Please feel free to write to me and TF for any questions. The exercise should be done ***independently***. Discussions with other students are allowed, but each student needs to submit his/her individual write-up. Please submit a single Colab/RMD/HTML/PDF file as your homework submission (with your name and ID)

PLUS

30% GROUP PROJECT -- Assume you are a technical leader or business manager of a company, Brainstorm the main business of your company and the size of the business. Please describe the details of your virtual company. Describe how AI can potentially help your business. Describe in more detail about an AI strategy that you would like to implement. You should provide the timeline, the team, and the data acquisition strategy, and any other ideas that you would like to share. Based on the information above, please organize them and write an essay on the plan of implementing an AI strategy in your "virtual" or "real" company (12 point font, 1.5 line space, at maximum 2 pages).

Textbook



Chollet, François. (2021). *Deep Learning with Python (2nd Edition)*. Manning Publications Co. **ISBN-13: 978-1617296864.** https://www.manning.com/books/deep-learning-with-python-second-edition

We Will Be Using Keras...

SOFTWARE CONFIGURATION

- You can access Google Colab at https://colab.research.google.com. You should have setup a colab account already.

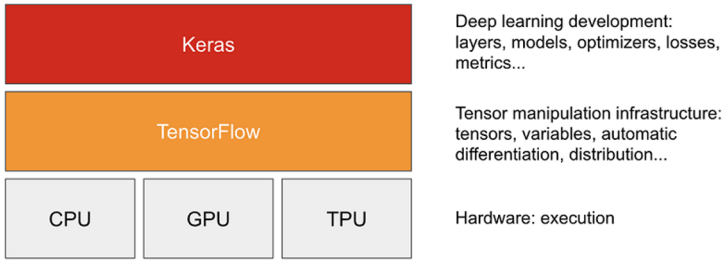
Keras and Tensorflow

1. Tensorflow

- A Python platform for working with tensors, implementing automatic differentiation, providing access to repositories of (well-known) pre-trained models.

2. Keras

- A higher-level API that wraps common usage patterns with Tensorflow functions, pre-defined loss functions, optimization algorithms, etc.
- Keras simplifies data scientists' interaction with Tensorflow.



Why Keras?

Course 

LECTURE AND DISCUSSION

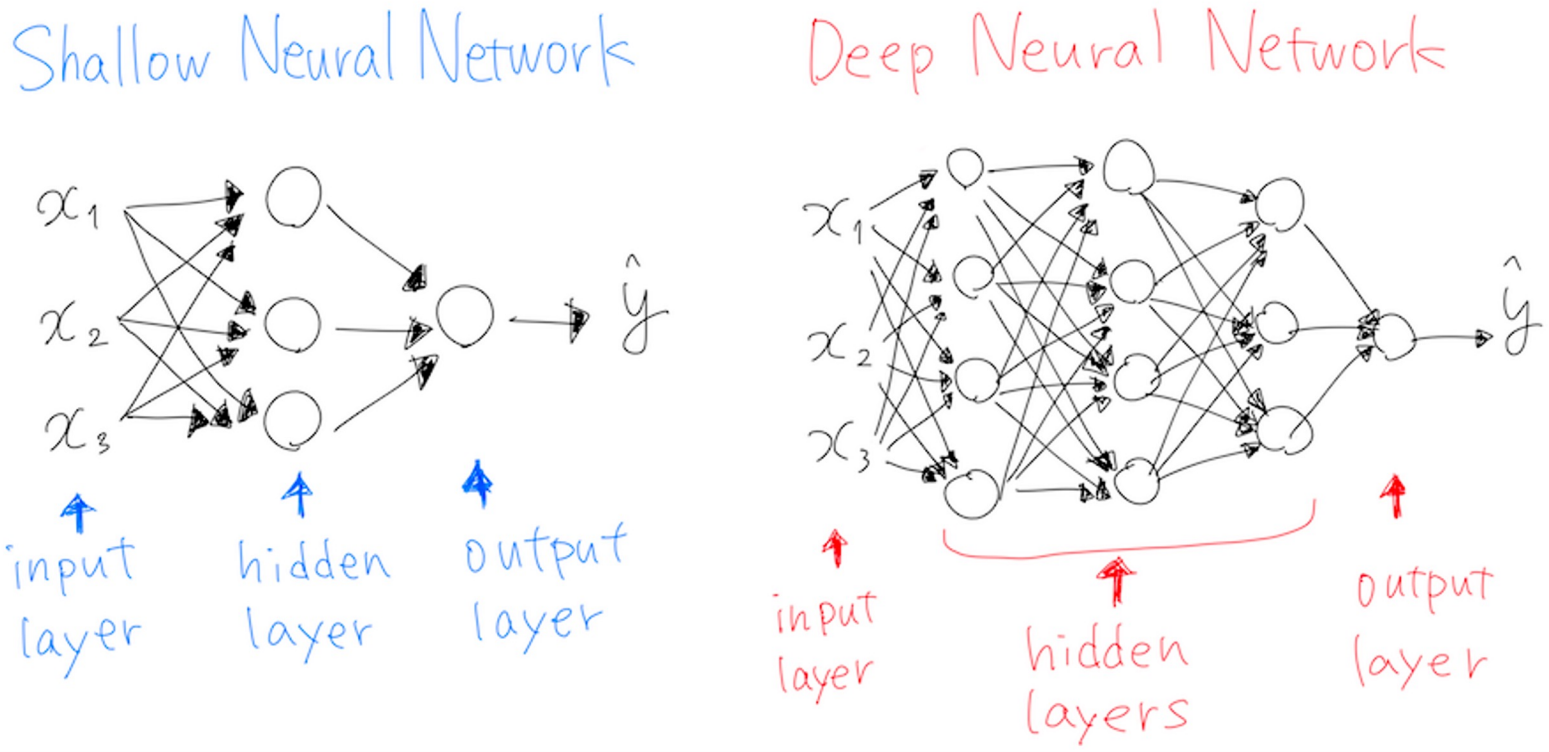
- For each session block over the next two days, I will begin by presenting concepts, describing logic, discussing implementation considerations.

HANDS-ON EXERCISES

- The latter half of each session will be dedicated to hands on examples in Colab notebooks, where I will walk through the code and explain the logic of what we are doing, allow you to ask questions, etc.

Question: What is ‘Deep’ (vs. Shallow) Learning?

What is 'Deep' Learning?



A Very Simple Application

Communicated by Dana Ballard

Backpropagation Applied to Handwritten Zip Code Recognition

Y. LeCun
B. Boser
J. S. Denker
D. Henderson
R. E. Howard
W. Hubbard
L. D. Jackel
AT&T Bell Laboratories Holmdel, NJ 07733 USA

The ability of learning networks to generalize can be greatly enhanced by providing constraints from the task domain. This paper demonstrates how such constraints can be integrated into a backpropagation network through the architecture of the network. This approach has been successfully applied to the recognition of handwritten zip code digits provided by the U.S. Postal Service. A single network learns the entire recognition operation, going from the normalized image of the character to the final classification.

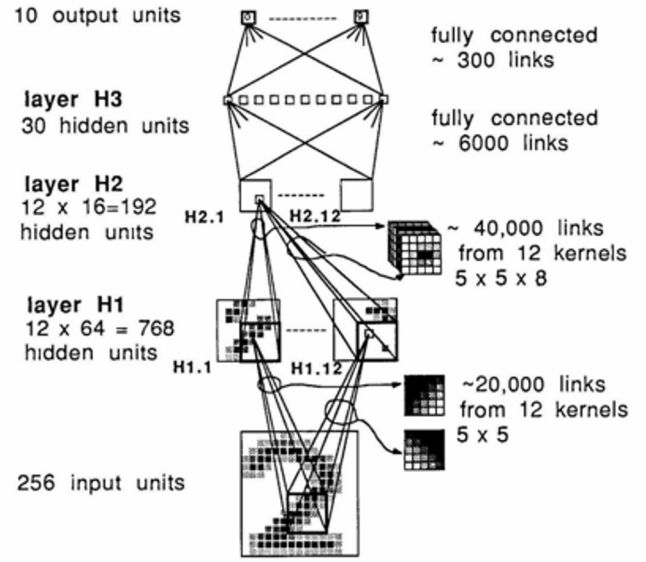
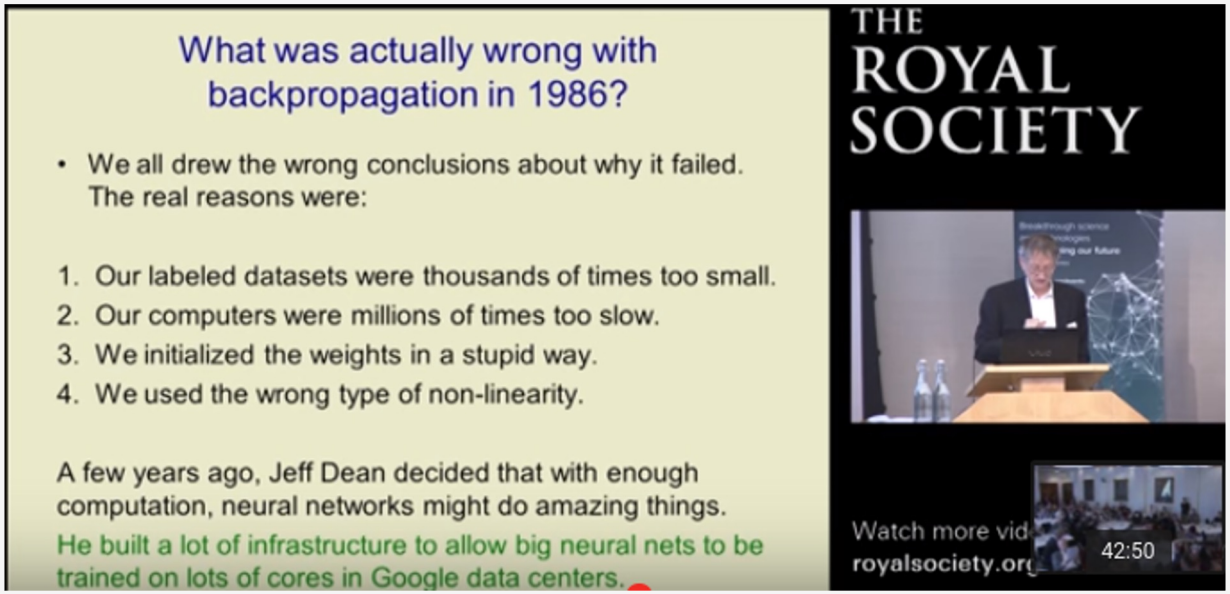


Figure 3 Log mean squared error (MSE) (top) and raw error rate (bottom) versus number of training passes

Then It Shuffled Along for Decades…

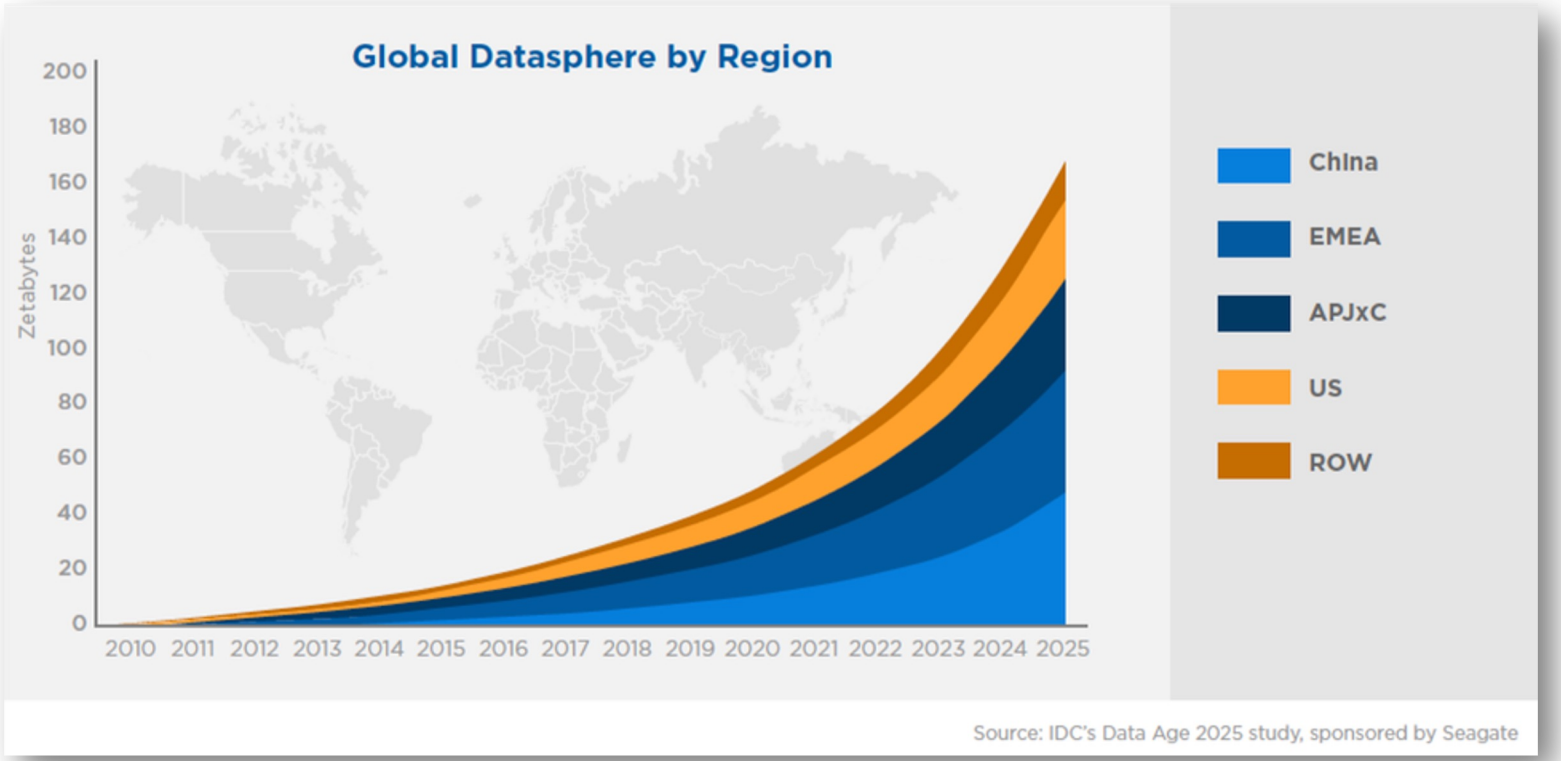


Now…

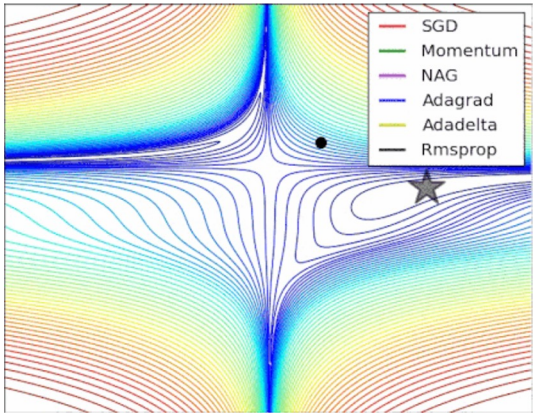
Why Did Deep Learning Take Off?

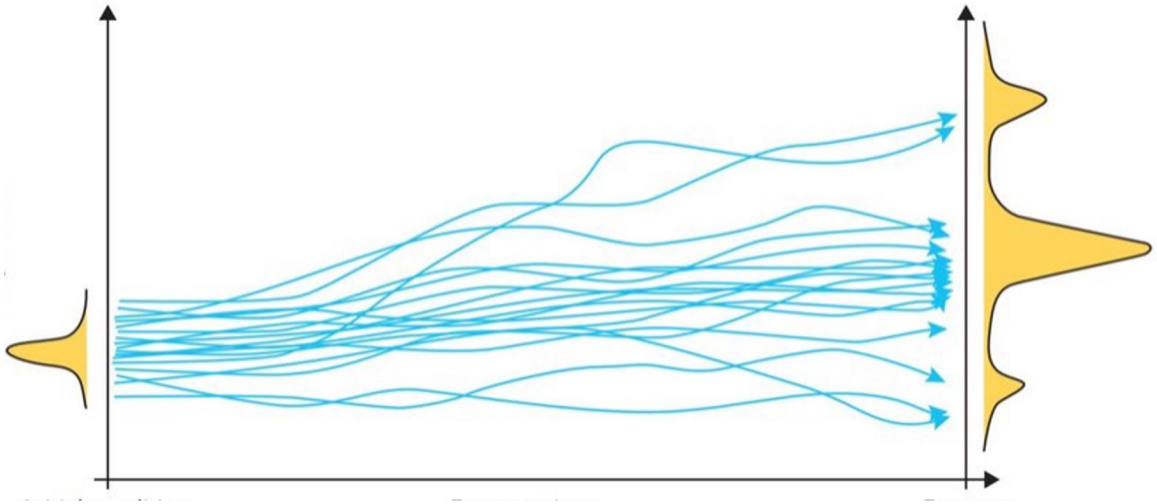

Video Games

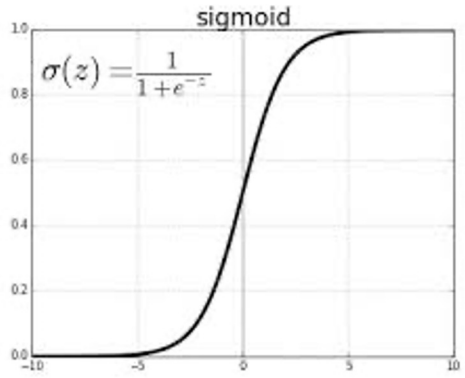
Data



Algorithmic Improvements



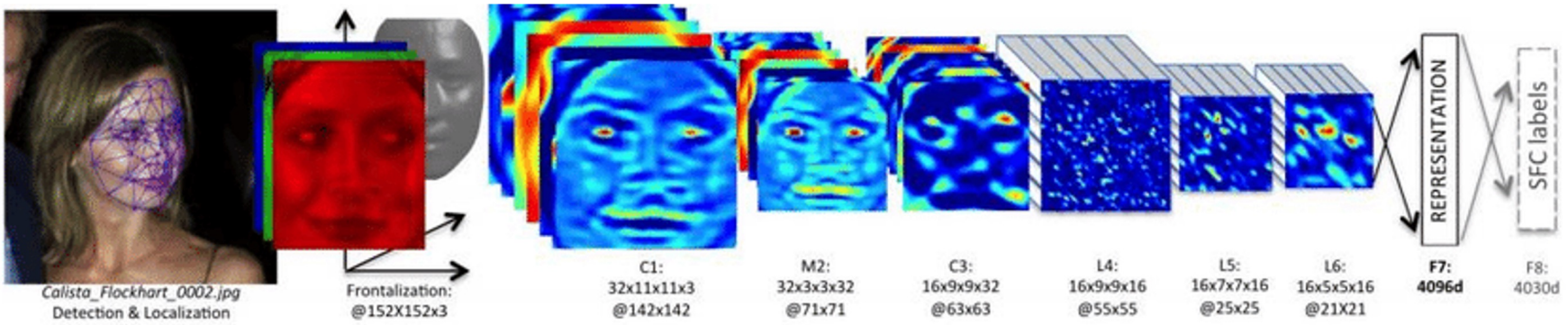




When to Learn Deeply (vs. Not)

COMPLEX RELATIONSHIPS

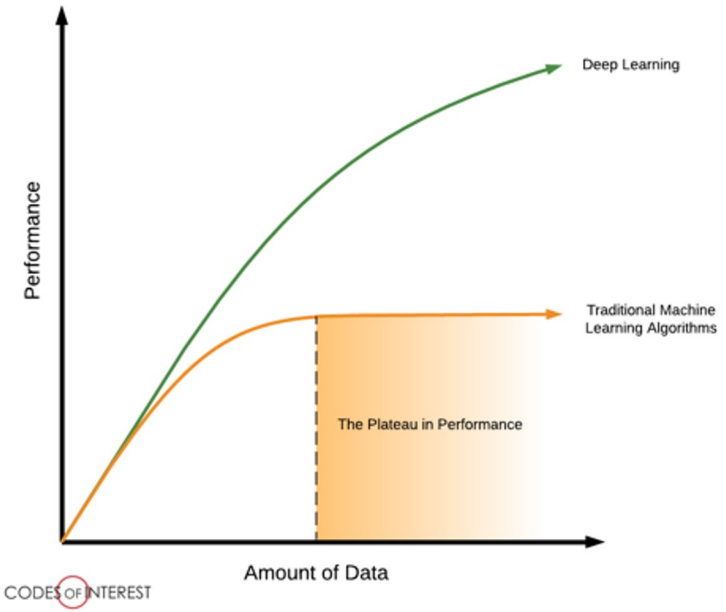
- Complex, non-linear, interactive relationships and mappings; common use cases involve unstructured (high dimensional) data. Deep learning techniques remove the need for feature engineering, a daunting task.



When to Learn Deeply (vs. Not)

LOTS OF DATA ON HAND

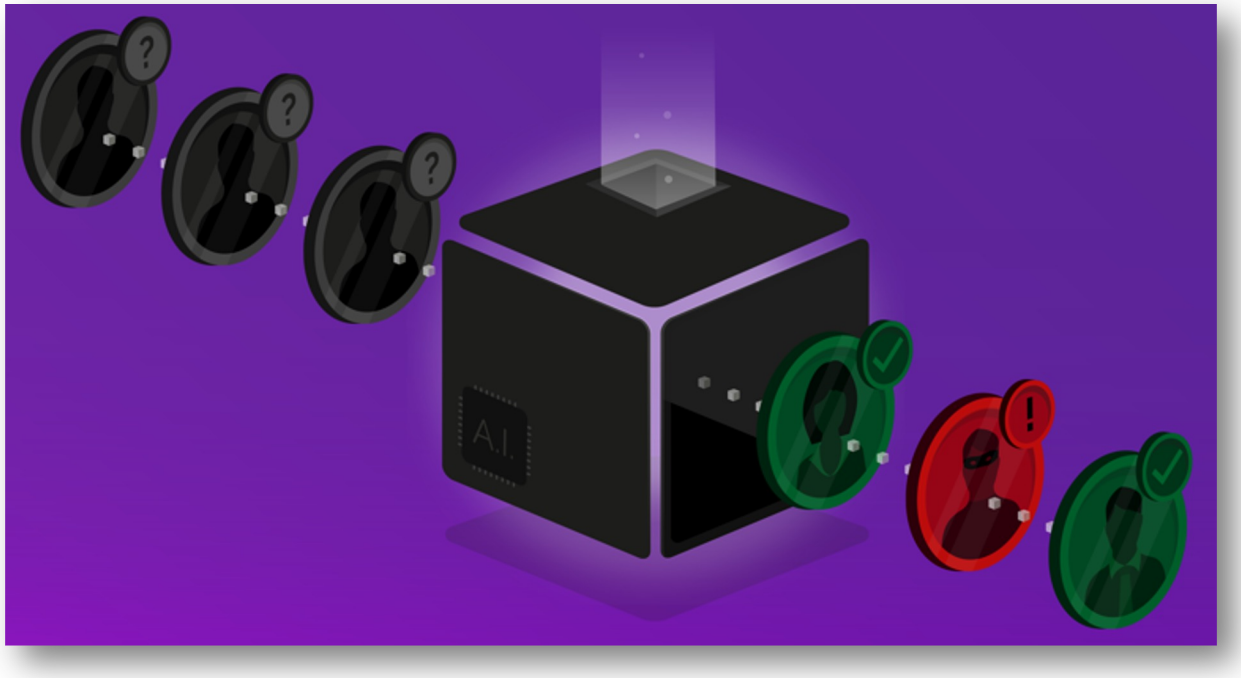
- To be able to learn those complex mappings, typically requires many, many, many training examples.



When to Learn Deeply (vs. Not)

LITTLE NEED FOR UNDERSTANDING

- Although there have been advancements in explainable and interpretable AI, deep nets are notoriously “black box” algorithms.



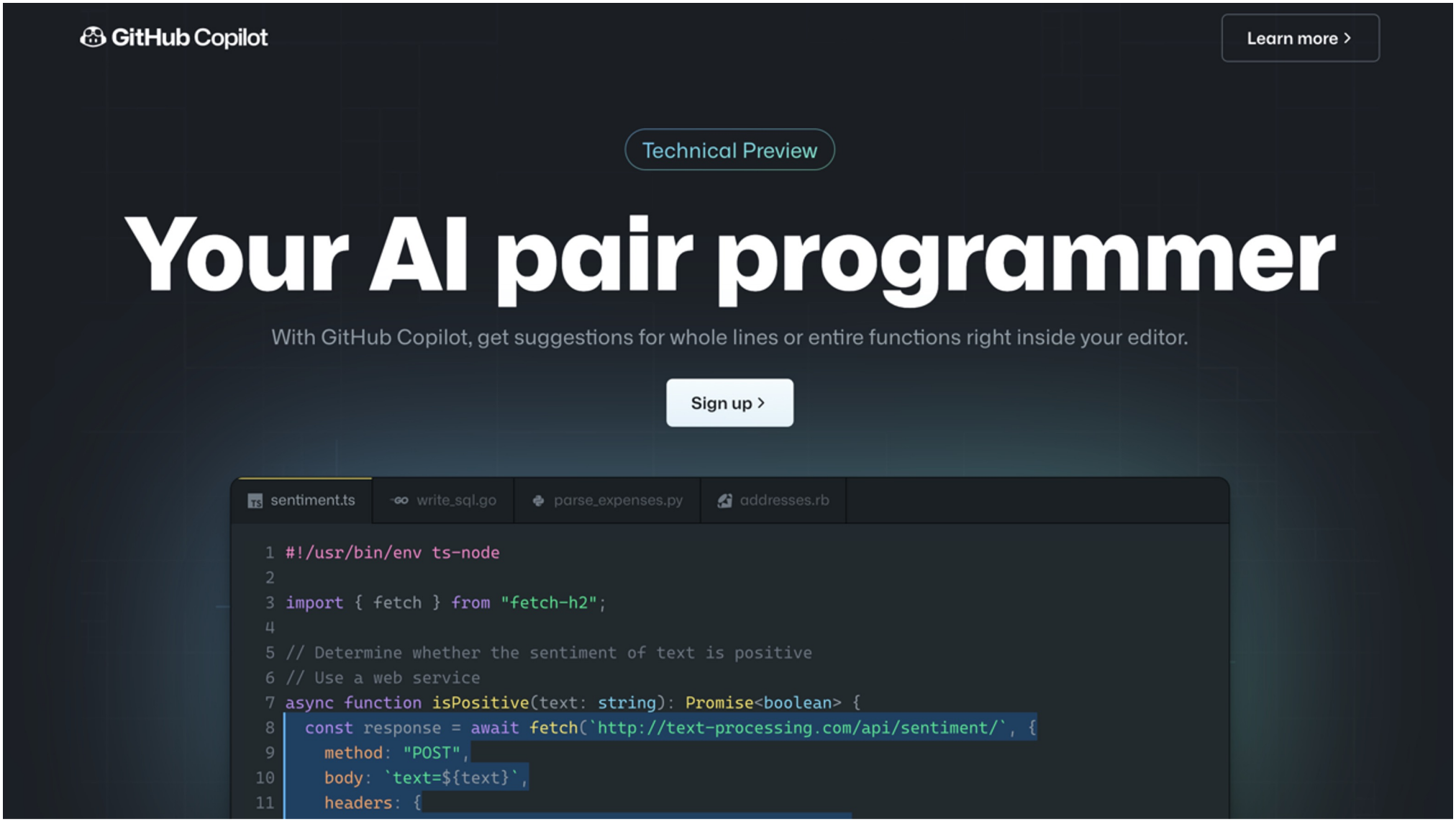
ARTIFICIAL INTELLIGENCE

A GPT-3 bot posted comments on Reddit for a week and no one noticed

Under the username /u/thegentlemetre, the bot was interacting with people on /r/AskReddit, a popular forum for general chat with 30 million users.

By Will Douglas Heaven

October 8, 2020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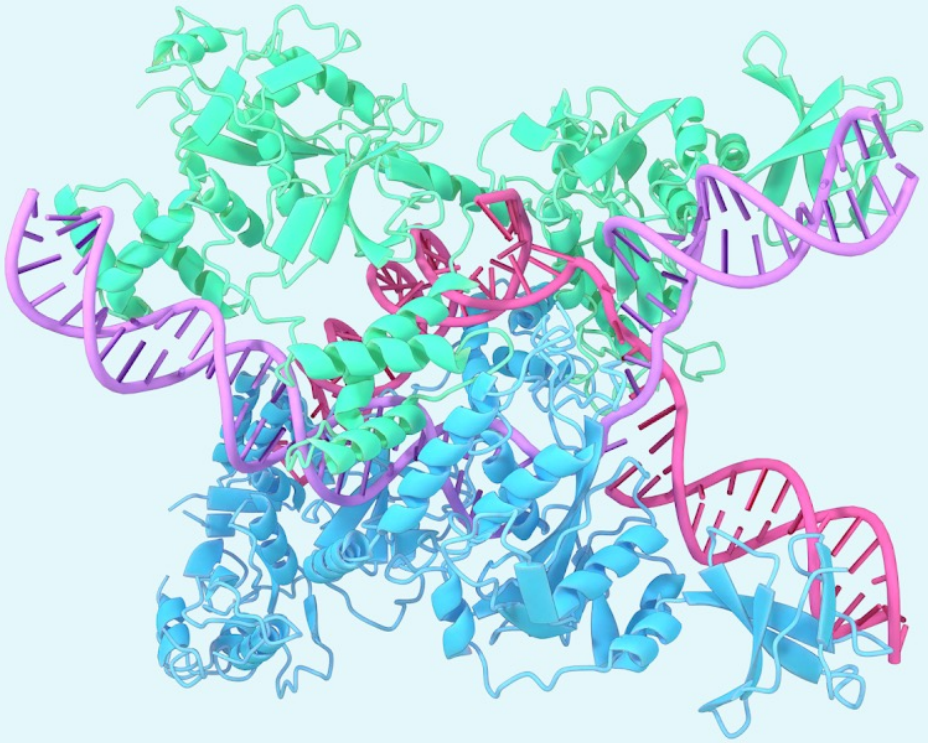
Sign up >
sentiment.ts
write_sql.go
parse_expenses.py
addresses.rb
#!/usr/bin/env ts-node
import { fetch } from "fetch-h2";
// Determine whether the sentiment of text is positive
// Use a web service
async function isPositive(text: string): Promise<boolean> {
const response = await fetch(`http://text-processing.com/api/sentiment/`, {
method: "POST",
body: `text=${text}`,
headers: {

TECHNOLOGY

AlphaFold

AlphaFold is accelerating research in nearly every field of biology.

Google DeepMind



Bloomberg Opinion

Money Stuff

Sorry, Zillow's Computer Can't Buy Your House Right Now

Also CEO pay, the Boredom Markets Hypothesis and Big Short guys being big short.

By Matt Levine +Sign Up
October 18, 2021, 1:18 PM EDT

Matt Levine is a Bloomberg Opinion columnist covering finance. He was an editor of Dealbreaker, an investment banker at Goldman Sachs, a mergers and acquisitions lawyer at Wachtell, Lipton, Rosen & Katz, and a clerk for the U.S. Court of Appeals for the 3rd Circuit.

Read more opinion

Zillow

Deciding how much you should pay for a share of large-cap publicly traded stock is not an *entirely* solved problem, but it's pretty close. If someone comes to you and says "hey I have 100 shares of Microsoft Corp. stock for sale, how much will you pay me for it," a pretty decent answer would be to look at the last price at which Microsoft traded – like a millisecond ago – and subtract, you know, one cent from that price. That will get you a price that is likely to be competitive (the seller might actually sell to you), likely to be profitable (you might be able to sell it for more than you paid), and

Forbes

Sub

EDITORS' PICK | Oct 14, 2021, 07:01am EDT | 79,274 views

Fraudsters Cloned Company Director's Voice In $35 Million Bank Heist, Police Find

Thomas Brewster Forbes Staff

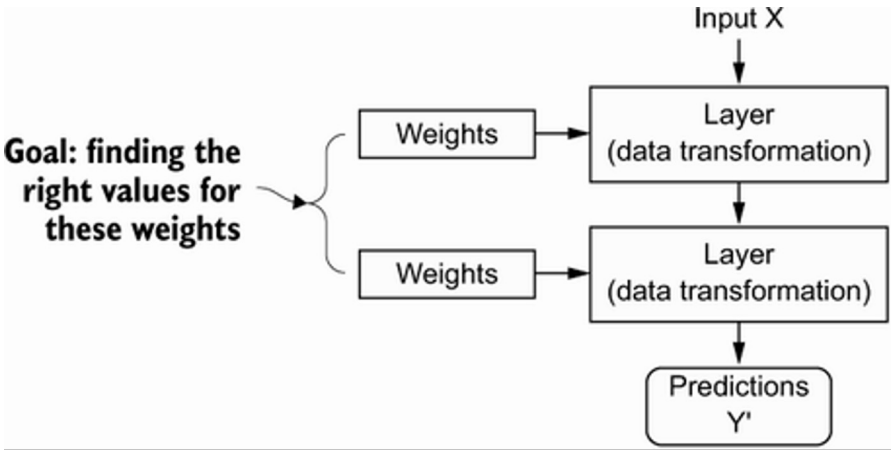
Cybersecurity

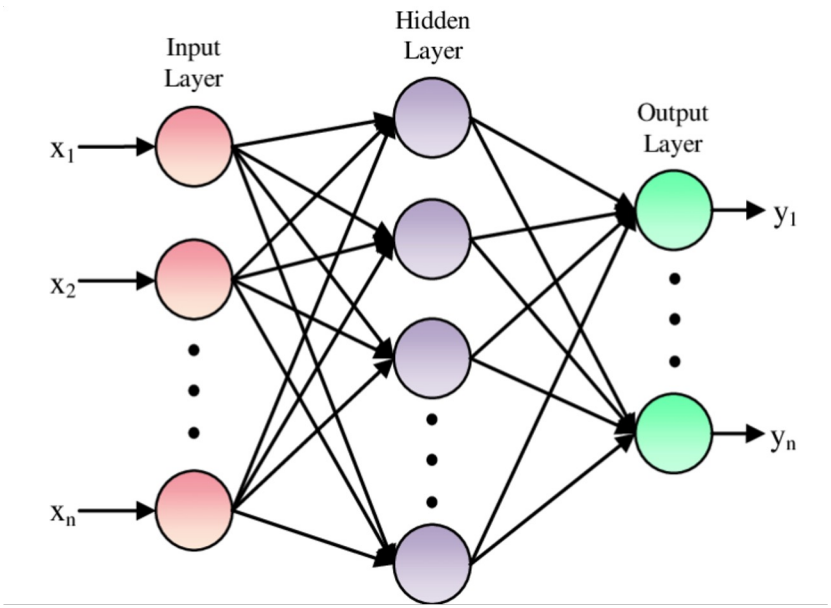
Associate editor at Forbes, covering cybercrime, privacy, security and surveillance.

https://twitter.com/gburtch/status/1366806289192517634

How Neural Nets Work, Conceptually

Model Parameters

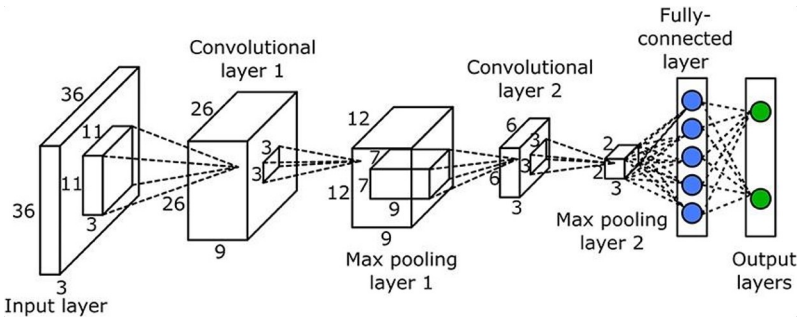




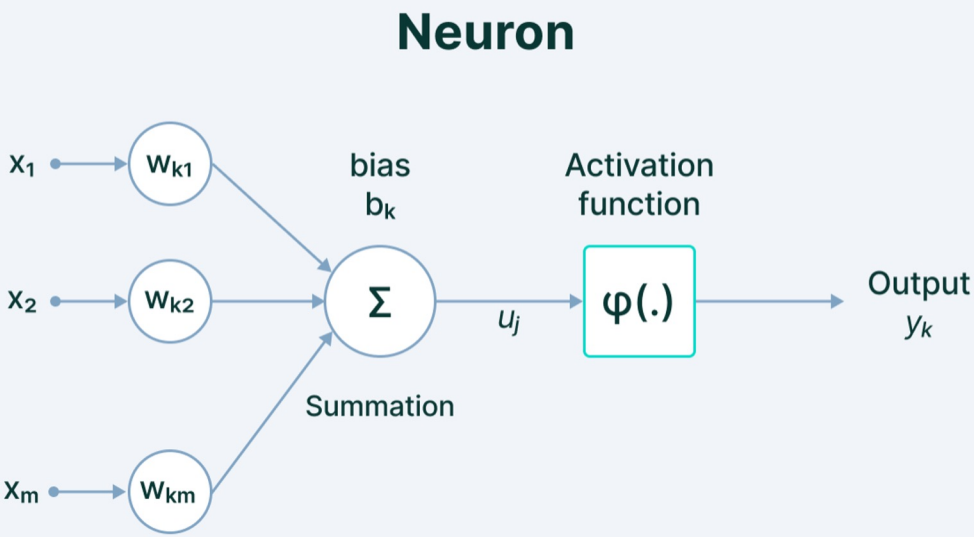
Neural Network Layers

Layers are the Key Building Block of NNs

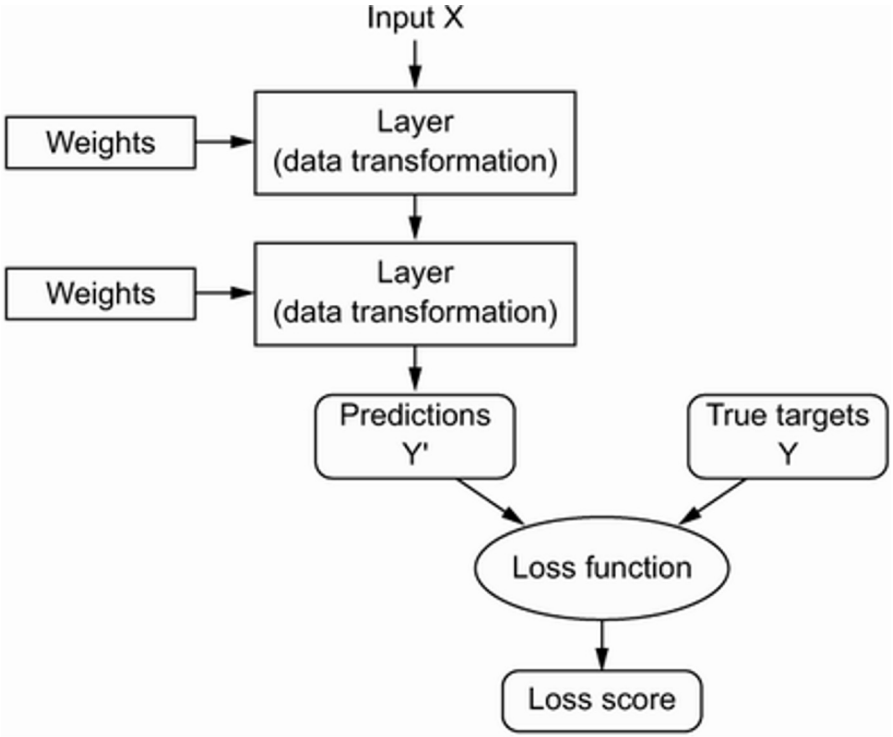
- Dense layers are the simplest form, layers.Dense(), but there are others, e.g., convolutional layers, max-pooling layers, recurrent layers, and so on: https://keras.io/api/layers/.
- These are different architectural components that can be mixed and matched in different ways to create different network topologies. It is also possible to construct custom layers.



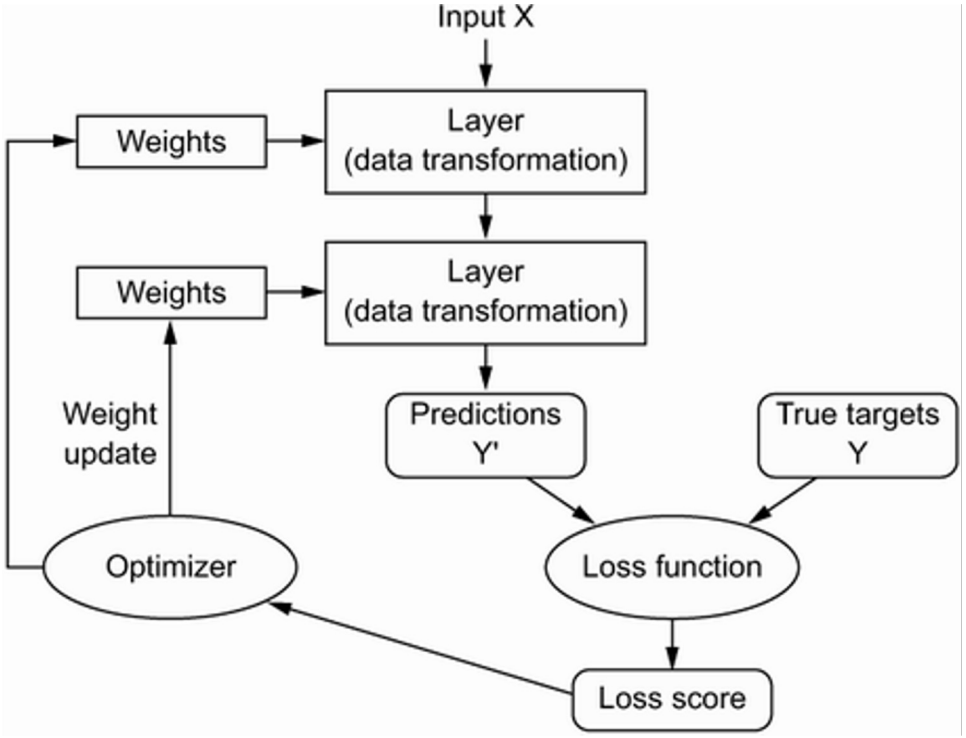
Model Parameters



Loss Function (Error)



Optimization



Questions?

First Example