Physalia Courses

A deep-learning neural network for image recognition

A working model

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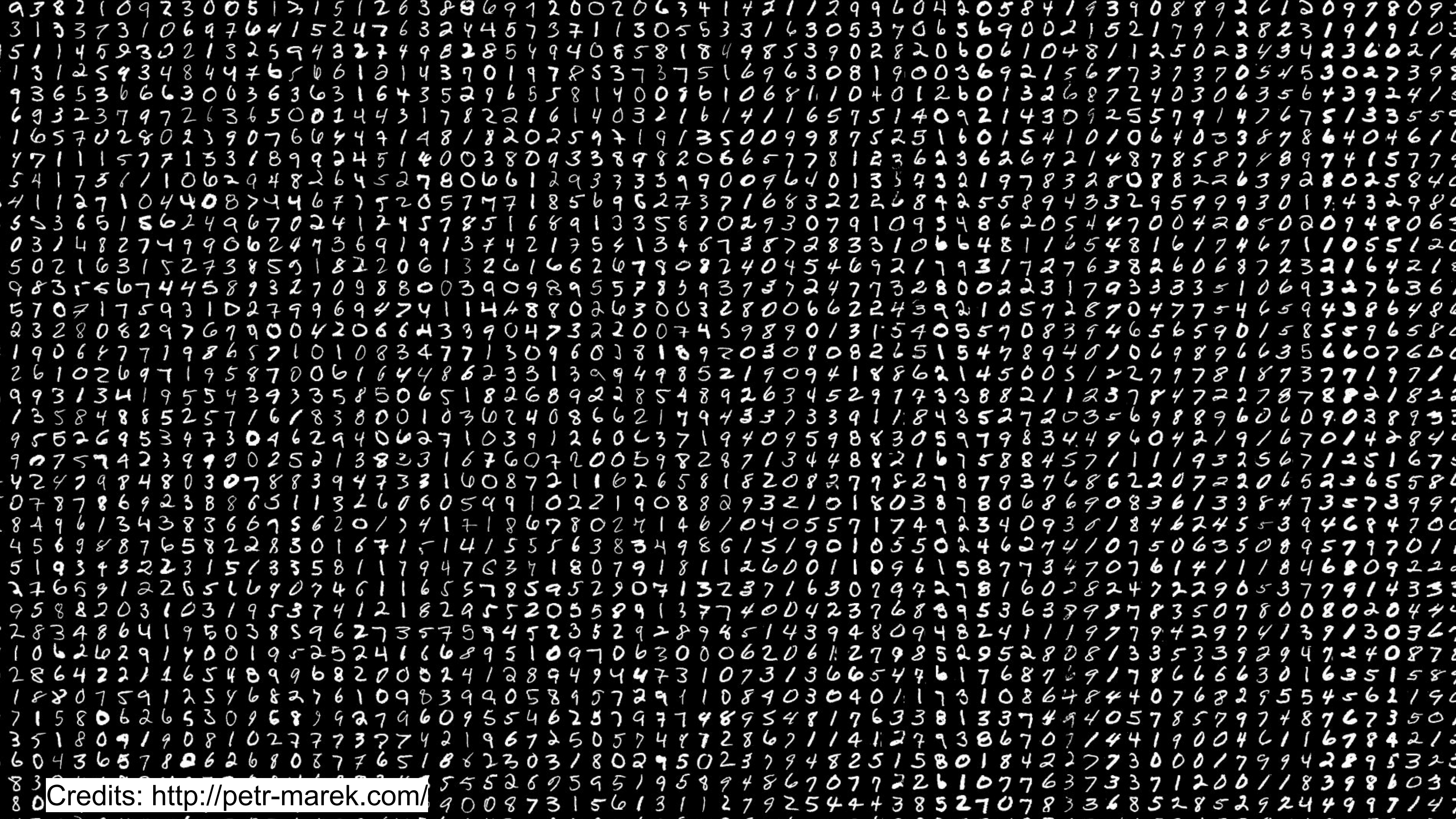
Objectives

- we start by **showing a working deep learning model for image recognition** (a task at which DL is very good!)
- the objective is to give you some ideas of **what DL is about**
  - no worries if you don’t understand everything
  - we’ll delve in details in later sessions
- you’ll get some **basic intuition** of **what DL is** and **how it is structured**

A first working example

- **MNIST** (Modified National Institute of Standards and Technology) database → large collection of **handwritten digits** [more info here]
- Commonly used to train machine learning models for image recognition
- The aim is to use this database to build a **first deep learning model** for **image recognition**



Credits: http://petr-marek.com/

A first working example

- From the MNIST dataset
  - **60,000 images for training**
  - **10,000 images for testing**
  - Reference: http://yann.lecun.com/exdb/mnist/

A first working example

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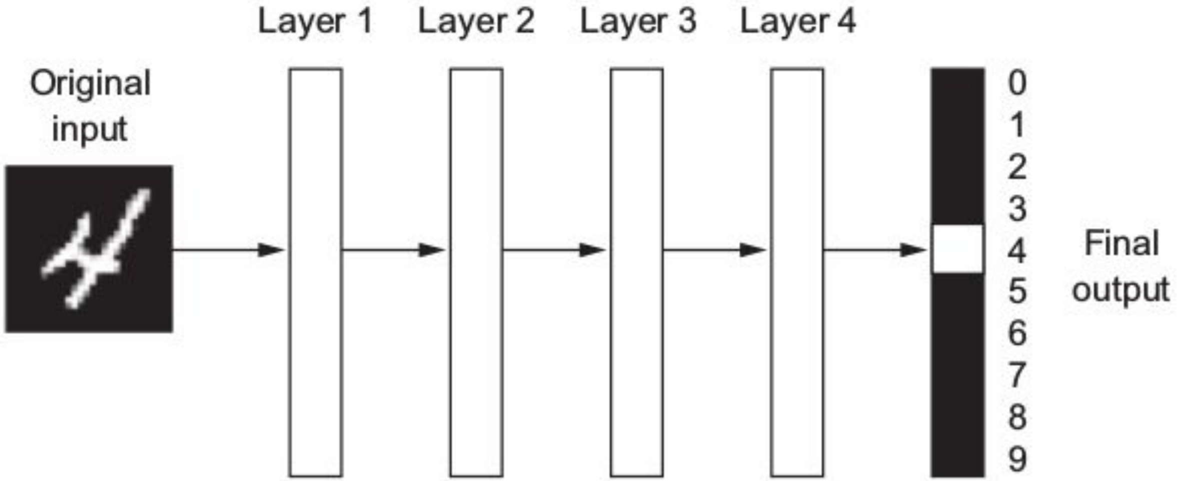
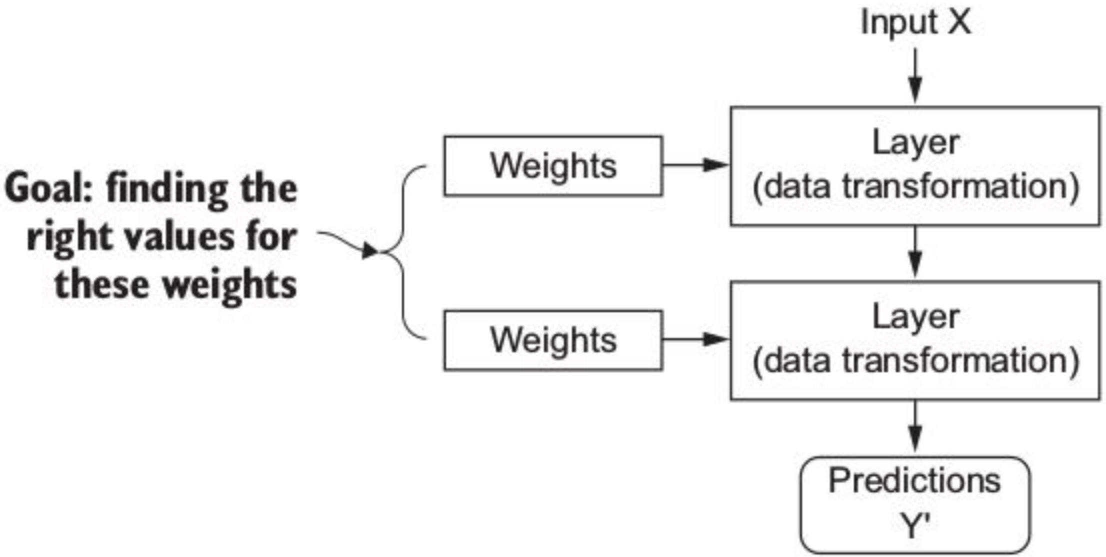
1) Step 1: **train the deep learning model**
2) Step 2: get **predictions** (recognize images/handwritten digits) on **test data**
3) Step 3: measure the **accuracy of prediction**

Handwritten digit recognition



From François Chollet

Model diagram



Input X

Layer
(data transformation)

Layer
(data transformation)

Predictions
Y'

Weights

Weights

Goal: finding the right values for these weights

From François Chollet

The needed tools

- **Python (3)**
- **Interactive Python Notebook** (.ipynb file) → **Jupyter** notebooks
- Google colab / Docker on server [our working environment]
- **Keras** (wrapper around Tensorflow) [more on this later]

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What is your skill level with these tools?

- feel free to ask questions
- use our slack chat to interact with us (one of the two instructors will always be there)
- if needed we can go back on some of this material

A first working example - components

- SETUP
  - import libraries
  - configure parameters
- DATA MANAGEMENT
  - load MNIST data
  - data (images) preprocessing
- MODEL
  - build
  - compile
  - train
  - test

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The standard part

The boring part

The cool part

A first working example - steps (real world)

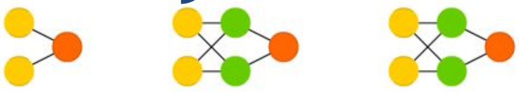
- SETUP
  - import libraries
  - configure parameters
- DATA MANAGEMENT
  - load MNIST data
  - data (images) preprocessing
- MODEL
  - build
  - compile
  - train
  - test
- RINSE AND REPEAT

The standard part

The boring part

The cool part

The professional part



Let’s do it!

1. “Black box”
2. Decomposing the model

1- the Black Box

- Training the model
- Getting prediction accuracy on test data

- go on the server
- open a terminal
- run **keras.mnist_train.py**
- run **keras.mnist_test.py**

2- decomposing the model

- chunk-by-chunk training and testing
- interactive Jupyter notebook

- go on the server
- **code_01_keras_MNIST.ipynb**