

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







```
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5 | 93 + 3 2 2 3 | 5 / 3 3 5 8 | | 7 9 4 7 6 3 7 | 8 0 7 9 | 8 | 1 | 2 6 0 0 | 1 | 0 9 6 | 5 8 7 7 3 4 7 0 7 6 | 4 / 1 / 8 4 6 8 0 9 2 2 a
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83 Credits: http://petr-marek.com/ 55526059519689486707722610776373371200/183986039
```

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



- From MNIST
 - 60,000 images for training
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- 1) Step 1: train the deep learning model
- Step 2: get predictions (recognize images/handwritten digits) on test data
- 3) Step 3: measure the accuracy of prediction

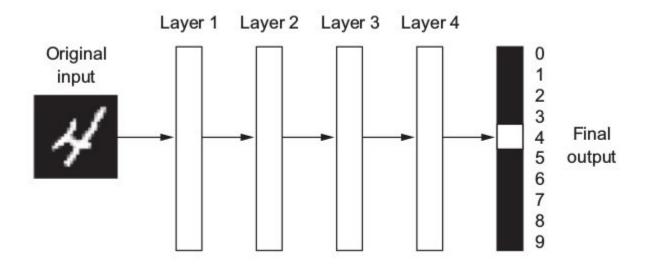






Handwritten digit recognition





From François Chollet

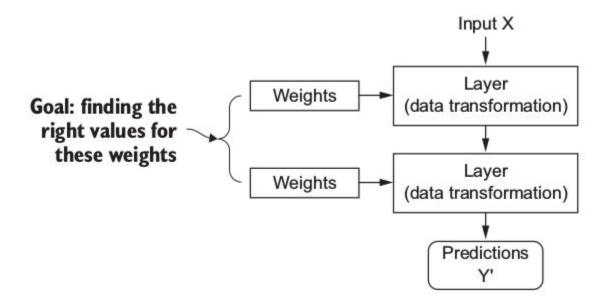


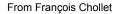




Model diagram













The needed tools



- Python (3)
- Interactive Python Notebook (.ipynb file) → Jupyter notebooks
- Google colab
- Keras (wrapper around Tensorflow) [more on this later]







A first working example - components



1. <u>SETUP</u>

- import libraries
- configure parameters

DATA MANAGEMENT

- load MNIST data
- data (images) preprocessing

3. <u>MODEL</u>

- build
- compile
- train
- test







A first working example - components



- 1. <u>SETUP</u>
 - import libraries
 - configure parameters
- DATA MANAGEMENT
 - load MNIST data
 - data (images) preprocessing
- 3. MODEL
 - build
 - compile
 - train
 - test

The standard part

The boring part

The cool part







A first working example - steps (real world)



- 1. <u>SETUP</u>
 - import libraries
 - configure parameters
- DATA MANAGEMENT
 - load MNIST data
 - data (images) preprocessing
- MODEL
 - build
 - compile
 - train
 - test
- 4. 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

- day1_code01_keras_MNIST.ip
 ynb
- day2_code00_keras_MNIST_de tailed.ipynb [tomorrow]





