



Piscine Pro AI / Machine Learning

Neural network model

Summary: In this Module, you will learn about neural network model (CNN).

Version: 1.00

Contents

I	Introduction	2
II	General Instructions	3
III	Exercise 00	4
IV	Exercise 01	5
V	Exercise 02	6
VI	Exercise 03	7
VII	Bonus part	9
VIII	Submission and peer-evaluation	10

Chapter I

Introduction

Greetings!



If you haven't already done so, read `en.toolkit.pdf`.

What this Module will cover:

In this module, we're about to embark on an exciting journey into the world of image classification, a powerful field of machine learning and computer vision. Using state-of-the-art deep learning techniques, we'll explore how to build Convolutional Neural Networks (CNNs) to label and classify images.

As we progress, we'll delve deeper into the world of CNNs, a class of neural networks specifically designed for image-related tasks. You'll learn how to design and train CNN architectures using industry-standard libraries like PyTorch or Keras. We'll explore techniques for feature extraction, model training, and fine-tuning to achieve impressive classification accuracy.

By the end of this module, you'll not only have a strong grasp of image classification principles but also the practical skills to apply CNNs to your own projects, whether it's identifying objects in images, recognizing handwritten digits.

Wishing you success in your learning journey.

Chapter II


General Instructions

Unless explicitly stated otherwise, the following rules apply every day of this Piscine Pro.

- Assignments must be completed in the specified order. Subsequent assignments will only be assessed if all previous ones have been correctly completed.
- Your assignments will be reviewed by your peers.
- You must not include any files in your submission other than those explicitly requested by the assignments.
- If you have a question, ask your left neighbor first. If that doesn't help, try your right neighbor.
- Any technical information you may need can be found on the Internet.

Chapter III


Exercise 00

	Exercise 00
Data exploration	
Turn-in directory: <i>ex00/</i>	
Files to turn in: Advanced01.ipynb	
Allowed functions: pandas	

For this first exercise, you'll need to load the data into colab and do some data exploration, i.e. you'll need to understand your data.

Chapter IV

Exercise 01

	Exercise 01
Data Visualisation	
Turn-in directory: <i>ex01/</i>	
Files to turn in: Advanced01.ipynb	
Allowed functions: pandas, seaborn	

In this exercise, to better understand your data, you need to display a bar chart to see if your data is balanced, and then display some images of your data set.

You should have something like this:

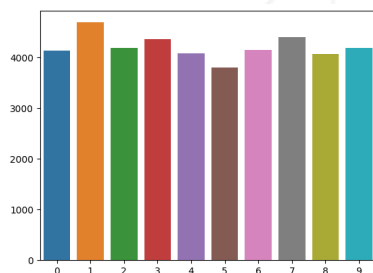


Figure IV.1: Distribution of Labels

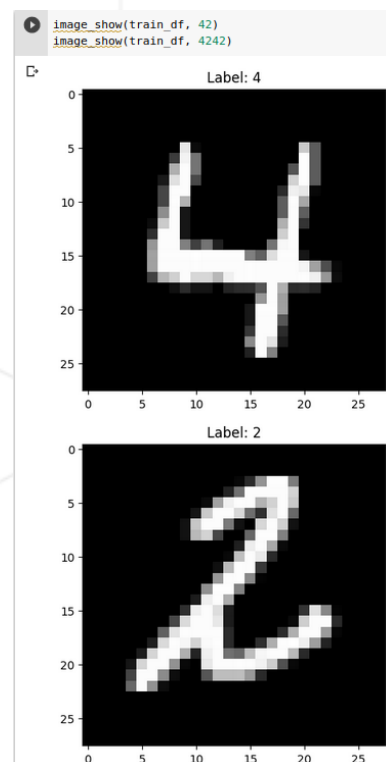



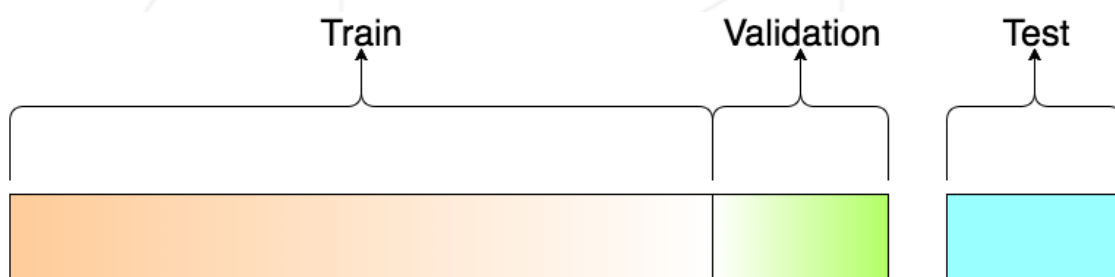
Figure IV.2: Numerical Attributes

Chapter V

Exercise 02


	Exercise 02
Data Split	
Turn-in directory: <i>ex02/</i>	
Files to turn in: Advanced01.ipynb	
Allowed functions: pandas, seaborn	

You have to separate your `train.csv` file into a training data set and a validation data set, and later we'll see your actual results on a test set.

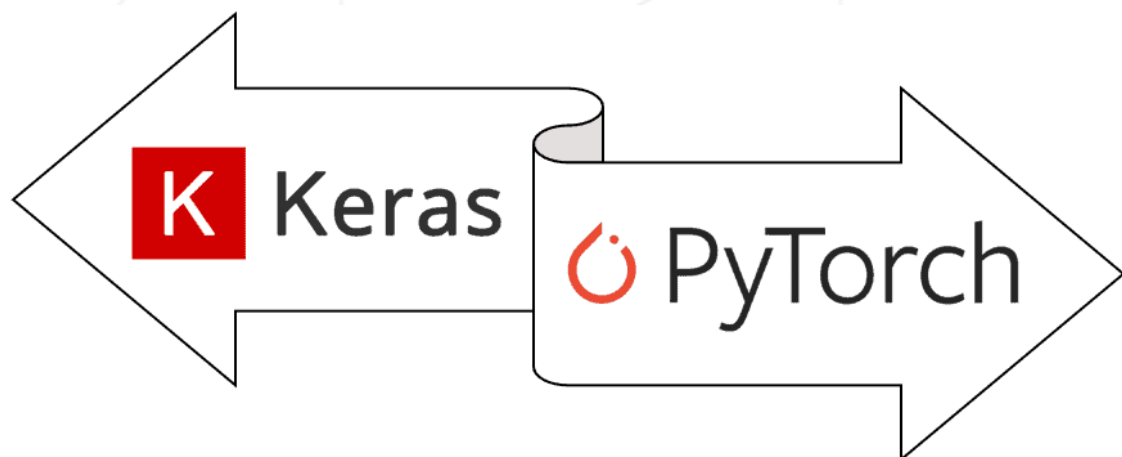


Chapter VI

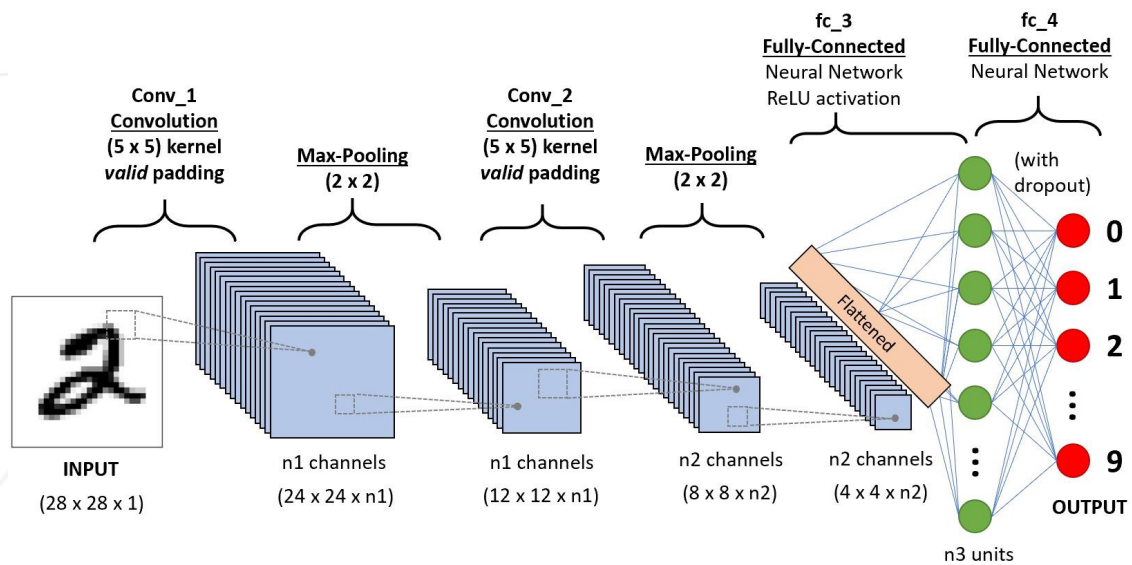
Exercise 03

	Exercise 03
Models	
Turn-in directory: <i>ex03/</i>	
Files to turn in: Advanced01.ipynb	
Allowed functions: All	

In this exercise, you will create a neural network using [Keras](#) or [PyTorch](#) (you can complete the exercise with both libraries if you want/have time; Keras is simpler for beginners).



Just like in the diagram below, create your own neural network with the requested layers.



You have to recreate each type of layer you require, making sure you understand the purpose of each layer and the activation function



You have to an accuracy greater than 0.95 on the Test set.

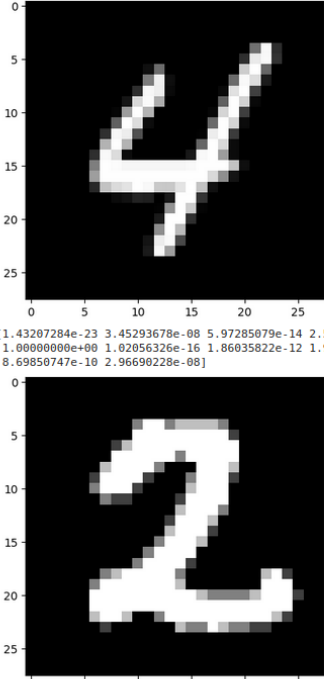
Chapter VII

Bonus part

If you have some time, you can try to validate this little bonus. It is not mandatory, so don't waste too much time doing it.

Display some images with your predictions

```
[40] image_show(test_df, 42, visualize=True, test_df=True)
      print(predictions[42])
      image_show(test_df, 4242, visualize=True, test_df=True)
      print(predictions[4242])
```



```
[1.43207284e-23 3.45293678e-08 5.97285079e-14 2.50143602e-25
 1.00000000e+00 1.02056326e-16 1.86035822e-12 1.94881139e-14
 8.69850747e-10 2.96690228e-08]

[9.1252943e-11 3.8889572e-03 1.0000000e+00 4.0728279e-10 1.8171478e-13
 2.0083014e-21 1.7261727e-14 1.4040934e-07 2.8609300e-05 4.8089895e-17]
```



The bonus part will only be assessed if the mandatory part is PERFECT. Perfect means the mandatory part has been integrally done and works without malfunctioning. If you have not passed ALL the mandatory requirements, your bonus part will not be evaluated at all.

Chapter VIII

Submission and peer-evaluation

- Create a `professional_training_Advanced` folder at the root of your home, and move around in it.
- Create a new `module01` folder and navigate to it.