



UNIVERSITY  
OF TRENTO



# Laboratory on Neural Networks

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**TensorFlow**

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## Setup



Download and extract the lecture material from:

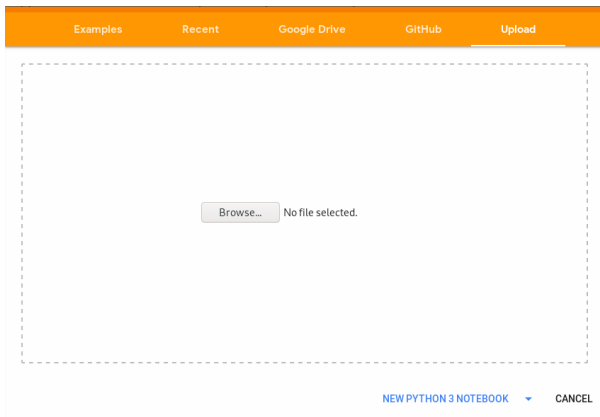
<http://disi.unitn.it/~passerini/teaching/2019-2020/MachineLearning/>

Open Google colab on your web browser and login (with your unitn account or a personal one):

<https://colab.research.google.com>

# Setup

Upload the file tensorflow-lab.ipynb



## Assignment

For the third Machine Learning assignment you will solve a classification task using **TensorFlow** over the OCR dataset. The dataset is already split into training and test sets. Your task is to train a deep neural network with **at least 3** convolutional layers on the training set and predict the labels on the test set. To pass the assignment, your network has to classify the examples in the test set with higher accuracy than the reference baseline for the dataset.

Additionally, you need to perform **model selection** (optimize at least one hyperparameter) and test your algorithm over a validation set and produce a report containing the results obtained.

## Assignment | Material

Download the assignment material:

<http://disi.unitn.it/~passerini/teaching/2019-2020/MachineLearning/>

The material contains:

- The training set examples;
- The training set labels;
- The test set examples;
- The test set labels;
- A README containing info about the dataset.  
this file also contains the reference baseline accuracy;

# Assignment

## *Step-by-step*

1. Build a neural network (at least 3 convolutional layers);
2. **Do model selection** (optimizing hyperparameters or testing different architectures, performing validation by splitting the train set);
3. Train your network over the full training set;
4. Use the network to predict the examples in the test set;
5. Place the labels in a file, in the same order as you read the test examples and in the same format of the labels in the training set.

# Assignment

## *Report*

Write a report describing the learning algorithm used and discussing the results obtained; The report should contain at least:

- The average accuracy over the your validation set and over the test set.
- A simple diagram of the network architecture (use Google Drawings or similar software);
- For each layer: number of weights, their shape, and the shape of the output.

# Assignment

## *Submit*

- After completing the assignment submit it via email
- Send an email to [mllab@unitn.it](mailto:mllab@unitn.it)
- Subject: tensorflowSubmit2019
- Attachment: `id_name_surname.zip` containing:
  - The text file containing the final predictions;
  - The code you used;
  - The report in PDF format.

### NOTE

- **No group work**
- This assignment is mandatory in order to enroll to the oral exam