

Laboratory Work No. 1

Introduction to *Python, Jupyter Notebook, and Google Colaboratory (Colab)* tools/environments for creating and testing image analysis and machine learning algorithms

The aim of this laboratory work is to familiarize yourself with one of the possible environments for working with convolutional neural networks, to prepare it for other laboratory work and homework assignments.

Main task [8 points]

When performing this LD, the following tasks must be completed:

1. Learn about the possibilities offered by Google Colab for solving AI, data science, or other engineering tasks:
<https://colab.research.google.com/notebooks/intro.ipynb>
2. Try out the examples at the bottom of this page (from task [1.]) ("Featured examples" (Machine learning examples)).
3. Try creating your own Jupyter Notebook and saving it to Google Drive. Try out the possible formatting options in Notebook (code, description, output).
4. Run this example in your own Colab environment:
<https://www.tensorflow.org/hub/tutorials/movenet>
 - a) Try all parts of this example;
 - b) Replace/add to the "Single Image Example" part of this example so that photos from your Google Drive are used for analysis;
 - c) Complete the example so that the visualized image (photo with the visualized skeleton) is saved as a graphic file and copied to your Google Drive directory;
 - d) Perform research on the skeleton extraction algorithm: create a test set of at least 20 images, feed all images into the algorithm, visualize the results, and save them to Google Drive.

Questions [2 points] [optional task]

1. What difficulties did you encounter while performing the task and how did you address/resolve them?
2. What were the results of your investigation of the skeleton detection algorithm? What did you notice? Does the example work with the same accuracy for all images?
3. Come up with your own question (related to this LD) and answer it.

Comment: How will this be useful for future work? If you choose to use the Colab environment not only for these LDs, but also for other projects that use deep artificial neural networks, training such networks will require data transfer between the calculations performed in Colab and Google Drive. Drive stores your created notebooks, data, and neural network coefficients. Colab does not store data; everything is discarded when the Colab session ends. Therefore, you need to upload all the data from where it is stored at the beginning and save it at the end of the calculations. In addition to Google Colab and Drive, there are other services where you can run similar projects, such as Kaggle, AWS, and Paperspace. The services differ in terms of how much computing resources are provided for free.

Contents of the Report

As a report, send the **script(s)** (*.py files or Jupyter Notebook file) prepared for the solution of this task part [4.] and **additionally those files in PDF format**. In the scripts, provide explanations in the form of comments about what you did and why you did it in the most important steps you had to perform. Also, include the results of testing the algorithm/model you created to solve the task. If you submit a Jupyter Notebook file (and its PDF) and all the results of your task solution are clearly visible among the script execution results, it is not necessary to submit the test results separately. Also, include answers to the questions (answers to the questions are not a mandatory task).

Report submission and evaluation

VILNIUS TECH/EF/ESK – Computer Vision in Medicine – Introduction to programming tools/environments

This LD task should be completed and sent by email to dalius.matuzevicius@vilniustech.lt by 23:59 on 2025-09-23.

Late submission of the report will result in a 25% reduction in the task.