Computer vision, pattern recognition and image retrieval

Project

As part of laboratory classes in the "Computer vision, pattern recognition, and image retrieval" course, each student must prepare a project on their own.

Project guidelines

The aim of the task is to develop our own model of a convolutional neural network designed to obtain information from color images. For example, for their classification, segmentation, or finding objects in images or others.

As part of the project, you should:
- develop a new network model,
- carry out its training process with the use of an appropriate method of validation and testing.
The whole process should be done by writing a program in the Matlab environment.

The model should contain at least 5 convolution layers with different parameters. As data, please use a generally available (free) or self-made database of digital color images in the RGB format. The data should be divided into subsets: training, validation, and testing.

The program should include:
- preliminary development of data sets,
- definition of learning and validation process options,
- model training,
- and part of the code dedicated to testing the learned network model.

The trained network model should be saved to a separate file.

Documentation guidelines

The project also includes the documentation developed for it, which should include:

- Description of the selected set of images, adopted proportions of its division into subsets: training, validation, and testing. The size of these collections and examples of images.
- Theoretical introduction containing a description of the selected type of network model, its purpose, architecture and description of individual layers.
- Description of the adopted method of entering data into the network model, and the preliminary operations performed on them.

- Description of the adopted training, validation and testing options, along with the adopted parameter values.
- Analysis of the obtained results of the operation (testing) of the learned network model along with a list of the calculated metrics (e.g. specificity, sensitivity, precision, etc...).
- Final conclusions from the completed project (e.g. you can indicate what was easy, what was a certain difficulty, possible problems, are there alternative solutions, etc.).
- The documentation should also include:
  - diagram of the architecture of the developed network model (analized in Deep Network Designer),
  - diagram of the course of the learning process,
  - program source code,
  - screenshots of the results obtained.

Passing condition

To obtain credit for the project, the documentation must be sent as an answer via the e-learning platform in the .pdf file format. Additionally, a „*.m" file with the program code and a „*.m" file with the saved version of the learned network models. The project developed in the Matlab environment should be delivered to stationary laboratory classes.

First deadline for submitting the project: January 15, 2024.

The second (last) deadline for submitting the project: January 22, 2024.