

# Advanced Computer Vision

## Exercise Sheet 1

Winter Term 2023  
Prof. Dr. Niels Landwehr  
Dr. Ujjwal

Available: 07.11.2023  
Hand in until: 14.11.2023  
Exercise session: 17.11.2023

### Task 1 – An example computer vision problem and model [50 points]

The goal of this task is to become familiar with Jupyter notebooks and to experiment with a simple computer vision problem, from building the data set to training a classification model (given code we provide, see file *classification.ipynb* below).

1. As a first step, think of a binary image classification that you would like to solve, and collect data for it. Try to find a problem that is not too easy but would still be solvable well for a human. The problem can be e.g. distinguishing different objects, animals, persons, etc. Feel free to get creative. Then collect a set of training and test images of both classes for your problem. The training set should contain at least around 20 images (the more, the better). Images should be close to square. To train a classifier with the code we provide, you have to arrange training and test images in a particular folder structure. We provide an example for a simple cats-versus-dogs problem in the file *images.zip*, also see the comments in the file *classification.ipynb*.
2. Once you have assembled your data set, you can upload the notebook *classification.ipynb* in a Colab notebook (recommended) or another Jupyter cloud service. Execute the first cell in the notebook to load libraries. Executing the second cell in the notebook will allow you to upload your data set. Executing the third cell trains a binary image classifier and shows the training and test accuracy on the problem (this takes a few minutes). Can you come up with a classification problem that is solvable by humans but where the classifier gets only around 50% accuracy?
3. Feel free to experiment with the code and see if you can get higher accuracies, e.g. by increasing the resolution to which the images are scaled or by increasing the number of epochs the model will train. Also feel free to read the paper (linked in the notebook) that describes the *BiT* model on which the exercise is built. If you have prior experience in deep learning, also feel free to try and come up with an alternative model that possibly has higher accuracy in your problem.

### Handing in Exercise and Interactive Exercise Session

Please upload the solution to your exercise using the corresponding link on the Learnweb page (to be found below the link to the exercise sheet) until the date mentioned above. For best readability, please typeset theoretical exercises in Latex as far as possible. For practical programming exercises, please upload a Jupyter notebook file (\*.ipynb) that will run in Colab or another cloud provider of notebooks (if you used another cloud provider, please include a link to it). Please also upload other necessary files to run your notebook, such as the data set in this exercise.

Solutions to the exercise will be discussed in the exercise session (Friday 12:15) on the date mentioned above. Please be prepared to present your solution in the exercise session by sharing your screen, showing your solution and explaining in detail what you have done.