Exercise 1 - Initiate

Due 30th October 2019

OVERVIEW AND GOALS

In this exercise you will research the topic, you want to work on during this course and plan your work. You should read scientific research, understand what's currently possible and produce a detailed plan of your next steps, including a time estimation for each step.

DELIVERABLES

1. References to at least two scientific papers that are related to your topic
2. A decision of a topic of your choice (see below for inspiration)
3. A decision of which type of project you want to do (see below)
4. A written summary that should contain:
    a. Short description of your project idea and the approach you intend to use
    b. Description of the dataset you are about to use (or collect)
    c. A work-breakdown structure for the individual tasks with time estimates for dataset collection; designing and building an appropriate network; training and fine-tuning that network; building an application to present the results; writing the final report; preparing the presentation of your work.

The result can be a single README file (Markdown can improve the visual appearance significantly) or a PDF document. Please put everything into a Git repository that can either be public or private. In case you prefer your work to remain private, create a private repository and grant me read-access to it (Handle is *apacha* on Github and Bitbucket).

Once you're done with your work, notify me by writing an e-mail to alexander.pacha@tuwien.ac.at with the subject **[Applied Deep Learning] Exercise 1 - <Your Matr.Number>** with the link.

TOPICS

The list of topics for your project includes but is not limited to:

- Computer Vision
    - Classification of Images

    - Detection of Object
    - Segmentation of Objects
    - Style Transfer
    - Text Recognition
    - Image Colorization
    - Image Generation and Adversarial Image Generation
- Audio Processing
    - Music and Genre Classification
    - Tracking of musical concepts, such as beats, key, onset, and tempo
    - Audio source separation
- Natural Language Processing
    - Fake News Detection
- Reinforcement Learning
    - Control a cart
    - Play chess

The list above should be understood as inspiration for you to come up with a suitable topic.

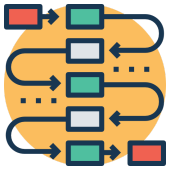
PROJECT TYPES

Bring your own data

The focus of this project type is to collect a comprehensive dataset that is suitable for training deep neural networks. Typically this project would include collecting a large number of samples (hundreds or thousands, depending on the topic) in a semi-automatic way and then starting to annotate these samples for supervised learning. Although the focus of this project type lies in collecting a dataset, you should run at least a simple neural network that showcases how to work with your data and establish a baseline for future researchers to refer to.

You will get bonus points if you make your dataset publicly available at the end of the course.

Bring your own method



The focus of this project type is to build or re-implement a neural network architecture that operates on an existing dataset that is already publicly available. Your method should reflect the state of the art, so it is fine to use an existing implementation but you should alter it and attempt to find ways how you can improve the results.

You will get bonus points if you can improve the state of the art.

Beat the classics

Deep Learning hasn't been around for a very long time, so many tasks can still be efficiently solved with traditional approaches. In this type of project, you will pick a problem, for which there is an established traditional algorithm (e.g., edge detection) and try to come up with an alternative approach that uses deep learning to do the same thing. Keep in mind that you must use the same metric for both approaches to have a fair comparison.

You will get bonus points if your approach works better than the traditional approach.

Beat the stars

Deep Learning can significantly improve the state of the art, often by making small incremental changes. The number of neurons, a clever loss function, a novel regularization method, or a specific kind of layer can have a large impact on the results. Many of these ideas are being published on a daily base on Arxiv.org and are awaiting their adoption. In this type of project you would pick one of these novel ideas (e.g., Deformable Convolutional Layers) and try to beat the current state of the art on a specific problem. Given the fast pace in the field, it is acceptable to beat state-of-the-art results that are up to a year old.

You will get bonus points if you actually manage to beat the state of the art. You may even consider publishing your work in a scientific conference or journal.

CRITERIA FOR GRADING

As discussed in the preliminary lecture, every assignment will be graded according to these five criteria (as applicable) with a maximum score of 10 points:

- Results
- Creativity
- Complexity
- Code Quality
- Presentation

OTHER QUESTIONS

In case you have other questions regarding the assignment, please send an e-mail to alexander.pacha@tuwien.ac.at with the subject line starting with **[Applied Deep Learning]** or post your question in the discussion forum in TUWEL (preferred).