

Problem solving: Task1: Simple Image Classification network (CNN+FCNN, FBPass):

- One complete forward-backward learning cycle through a **very simple** classification network consisting of a feature extraction/learning part (CNN with conv. and pooling layers) and a classification part (FCNN with at least one fully connected/dens layer):
- Two phases: experimental and problem-solving:
 - **Experimental:** Make a complete example in the format of "Given-Find-Solution" (see the "Examples_Given" folder for understanding and inspiration). Some suggestions for things that can be explored and understood (increasingly complex):
 - Forward-Backward pass (FBPass) for a single convolution layer (find the loss-gradient for both the kernel (F) and the input (X)).
 - Add bias and an activation function (AF) to the conv. above.
 - **Add a pooling-layer and a fully connected (dense) layer** (minimum complexity to deserve full score)
 - Implement the FBPass of the conv. layer using the corresponding convolution matrix / transposed convolution matrix (what happens when padding, receptive field and stride change).
 - Experiment with different activation functions (AFs) and loss/cost functions (LF/CF) (including regression and MSE (mean square error), or maybe start with this, makes things a bit simpler/easier).
 - Experiment with input/output tensors with depth > 1 (i.e. 2).
 - Experiment with a batch size > 1 (i.e. 2).
 - Etc.
 - **Problem-solving:** You will then turn your "complete" example into a problem by providing parts of it as "Given", as well as what to "Find". On one of our "problem-solving" days all the Given/Find-problems will be disclosed in the morning (or a few days before), then you will be given some time to at least try to solve one of the problems from your fellow students. At the end of the day the solutions will be revealed (should take between 5 and 7.5 min to solve if you know the answer).
 - So, what is the difference between the two phases? In order to make your Problem solvable within 5+ min. some of the "Solution" in the Experimentation part must be moved into the "Given" part of your Problem and the "Find" part of your problem must be more specific, you don't need to do more of the same, ask about different things and just provide the needed information to find that.
 - The idea was to have the activity above as a physical workshop but seeing how difficult it is to get hold of a room suitable for the purpose we might end up with at digital twist on this as well.
- This is an individual task with individual deliverables, but you are encouraged to collaborate. E.g., test your problem on a fellow student, or develop some base structure together that can be used in different ways; your contribution should be unique and distinct to your collaborator in some way.
- We highly encourage you to use a Python Notebook for your experimentation (and problem). Only basic tools like Python, NumPy, matplotlib, etc. should be used, no PyTorch e.g.

- What should be **delivered**? In principle two notebooks (complete example and problem solving), focusing on a clear explanation of the solution presented in Markdown cells (the calculations are more for your own experimentation and to see that things are correct).
- **Assessment**: The level of **explanation and** correctness (the level of underlying **understanding** that the contribution displays). The level of **concreteness and detail** (depth of something rather than overview of everything). The level of **simplicity** (as simple as possible and as complex as needed in order to illustrate your point). The level of **readability / quality** (easy to read and follow). The level of **complexness / difficulty** for the chosen topic (some topics are more difficult than others, less existing examples etc.). The level of **creativity and originality** (both are valued). The level of **references and links** to previous works that have inspired you / that you have build on top of. The assessment will be based on the **overall evaluation** of your contributions, taking all the criteria mentioned above into account.
 - **Remember**: The target audience for your contributions / examples should be your fellow students (or yourself before you started working on this task, by going through your example one should get almost as much knowledge as you had to obtain in order to make it).
- **Deadlines**: more info will follow. Important to get started, deadline for this will be mid Oct.

NB: The devil is in the **details**. Learning by **doing**. :)