The neural net project

The result of the project should be a written report that contains a maximum of 10 A4 pages in 11 point or 12 point font. It should be written according to the standards of a scientific paper with citations and a reference list. The project should be finished and presented on Tuesday November 21st.

For this project, you can either keep the same classification or regression dataset that you used in project 1, which enables comparison of the results between the different methods, or alternatively you can choose a project that uses neural nets or differentiable and trainable algorithms for tasks such as language models or reinforcement learning. However, if you choose the latter alternative, you may need methods that are not covered in the lectures and that you need to learn on your own.

- Search for references to previous work where neural nets have been used on the same or similar data as yours. Use `scholar.google.com` or `citeseer.ist.psu.edu`.
- In what ways can your data be coded in order to be suitable for neural nets? Do you view your problem as classification or regression? Which codings do you intend to try?
- You can use JAX, MxNet, Tensorflow, Libtorch or PyTorch together with Keras or your own code. There are also several other toolboxes for deep learning and/or autodiff that you may use, for example for ROCm, Cuda and Julia.
- Consider how to split the data into sets for training, validation and testing. The validation set is employed to choose architecture, stopping criteria and other parameters. Do you intend to run cross validation? Plan and describe your experimental methodology.
- If it is feasible with your chosen implementation, a few different optimization algorithms / momentum schedules in combination with varying numbers of hidden layers and number of nodes in the these layers and number of epochs. How is overfitting related to the various choices?
- Give an interpretation of the output from the neural net for some selected inputs.

- Do you see signs of local optima? The error valley problem? Vanishing gradients?
- Do classifications have differing costs? How can you train the net with that taken into consideration?
- Calculate a confidence interval for the error ratio and describe what it means for the interpretation of your experimental results.
- Evaluate how good results you have obtained. It is more important to give a correct evaluation and work systematically than to obtain the lowest possible error percentage.
- Criticize and compare neural nets with classification and regression trees according to a number of suitable criteria that you choose yourself.
- What future improvements are there?