Weekly Summary Report 1

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Week 4

During this week I completed ANN exercise 1 and presented it at a lab session. I also started working on SNN 1 after watching the corresponding lecture to give me the necessary knowledge for completing the first few tasks.

What did I learn this week?

- I've learnt how biological and artificial neurons work in greater detail than before. I've also gotten to learn the basic implementation of SNN by doing the first half of SNN exercise 1.

Oral exam questions

How would you summarize the computation performed by a feed-forward ANN?

Svar: Input is transformed in regard to the weights and bias. (Dot product) and the output from that transformation is entered into an activation function in the hidden layer. The result then either enters a new hidden layer or into the output layer.

What is an ANN unit / weight / bias / activation function? Linear or nonlinear?

Svar: A node/multiplier/constant/decides if a node is activated/linear or nonlinear decides how the output will change after the activation function.

What different datasets are typically used when developing a machine learning model?

Svar: it's split into Training, Validation, Test

What is a generalization / training set / validation set / test set / hyperparameter?

Svar: Generalization: is the ability for a model to properly adapt to new unseen data . Training set: Data that the ML is trained on. Validation set: Separate from the training set to validate the model on unseen data. Test set: Testing the model on a Separate data set to see its accuracy. Hyperparameter: are parameters whose values control the learning process of a model ex. Epochs or learning rate

What is backpropagation? Vanishing gradient? How to overcome that?

Svar: Backpropagation is when you adjust the weights and biases taking the loss in to account. This is done by calculating several derivatives, some of which can be used in the next calculation and that's why you propagate it backwards to avoid unnecessary computations. Vanishing gradient: When the gradient of how much the weights should be adjusted has diminished a lot. A hyper parameter like learning rate can be implemented to avoid it.

What is stochastic gradient descent (SGD)?

Svar: in SGD we find out the gradient of the cost function of a single example at each iteration instead of the sum of the gradient of the cost function of all the examples.

Can you mention some machine learning models that are not neural networks?

Svar: KNN, SVM, Decision tree, Random forest, DBscan

What is linear / logistic regression?

Svar: Linear regression analysis is used to predict the value of a variable based on the value of another variable. Logistic regression is a statistical analysis method to predict a binary outcome, such as yes or no, based on prior observations of a data set.

What characterizes a good model, what methodology can you use to select a model?

Svar: Depends on the task, Performance, task size, unsupervised or supervised.

Time spent studying this week

Activity	**Time**
Lectures	3h
Report	1h
ANN Exercise 1	9h
SNN Exercise 1	5h
Total time spent	11h

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Week 3

The first week was fairly light with a course introduction and some beginning exercises. It also introduced the basics of machine learning and neural networks. Most of the information was not new to me as I've taken a couple of courses previously which also covered the basics.

What did I learn this week?

- I started working on exercise 1 fairly fast and during the work on that I've learnt a lot of how a neural network "actually" works. During earlier neural networks courses we've mostly used libraries which removes the brunt of the work making it extremely easy to implement the networks. This has always bugged me a bit as I wanted a deeper understanding which this exercise has given me.
    - With deeper understanding I'm talking about the actual algorithms and how to code them. Instead of importing a library which takes care of all that instantly.

Time spent studying this week

Activity	**Time**
Quizzes	30m
Lectures	3.5h
Report	30m
Exercise 0	2h
Exercise 1	13h
Total time spent	19.5h