Deep learning – Personal course report

Note: _this report is not an exam_, and the answers do not directly affect your exercise points. Answer all questions in your own words, there are no wrong or right answers!

This personal report is <u>required</u> for passing this course! ☺

The idea in this report is to answer each question in your own words, which means using an AI is not beneficial in this report.

Red – Prohibited, not to be used

The output must be created without the help of artificial intelligence. The student should use only their own knowledge, understanding and skills. The use of AI is forbidden for a justified reason and will be interpreted as fraud.

What are your thoughts about deep learning in general?

Do you think deep learning tasks are interesting, difficult or something else? Think about also what is possibly the reason for your opinion.

A: Deep learning (and AI in general) is a very interesting topic to me. I think it is fascinating that algorithms could predict values in a complex system. It amazes me, that this works. What I liked the most about this course was data processing before the data is given to the model. I enjoy thinking about, how the data should be structured so the model works.

What is easy in deep learning, what is difficult or complex?

If you want, you can think about this question from different point of views, for example: certain algorithms or neural network types, data preparation, neural network optimization, error metrics, TensorFlow, PyTorch, compare to scikit-learn / Classic ML etc.

A: I think it is not difficult to understand the basic concept of deep learning. But understanding the details gets very hard. I also think it is difficult to understand all the different parameters to improve the deep learning model since there is no specific way, how to improve the model, it always depends on multiple factors, and I guess you need a lot of experience to get good at this.

What would you like to learn next in machine learning?

For example: certain kind of datasets or certain use cases and applications in machine learning…. What would you like to code for machine learning in the future?

A: I would be interested in implementing a real model for a real business. This could be literally anything, but I want to see how the tech stack looks like, when you implement a model that processes new data the entire time and not just one time in a jupyter notebook.

Can you use your deep learning skills in your current activities and/or hobbies? Or even in your work? Would you like to work as a professional machine learning engineer in the future?

Provide examples, if possible.

A: I used a lot of the things we learned in applications for my mandatory internship. I definitely want to work in the data area and I also want to make more personal projects as well. The different topics gave me good understanding on how to work with data and machine learning.

How do you understand the following concepts and/or technologies? In your own words, write about what you can do with them while creating deep learning applications, and where they are useful.

- **Keras / TensorFlow (and PyTorch)**

  A: Keras, TensorFlow and PyTorch are all libraries from python, where you can build neural networks. Keras is the easiest to use, Tensorflow is only needed under circumstances, where Keras has no functionalities. Most of the time, Keras will do the job, Tensorflow might only be needed, if you are doing very advanced tasks

- **Encoders (LabelEncoder, OneHotEncoder etc.)**
  A: Encoders are used to change categorical data into numbers, so deep learning models are able to process the data. LabelEncoder is used for binary categorical data to turn for example Yes/No values into 0/1 values. OneHotEncoder is used for categorical data with no specific orders (for example car brands). The idea is, that to turn every category into a new column and use binary values (0/1). Categorizing "Audi", "Mercedes Benz" and "BMW" into 1, 2, 3 would be wrong, because BMW is not "more" than Audi.

- **Normalization, standardization and regularization**
  A: These methods are used to scale the data from different columns. In a csv, there could be a column with revenue, which goes from 1 000 000 up to 10 000 000 000 and a column with percentages from 0 to 1. A deep learning model would account more for bigger values, so you have to get these two columns on the same size. These methods to do exactly this.

- **Deep learning application optimization (both dataset and algorithm optimization)**

  A:
  Datasets: Normalization/Standardization, remove all null values, remove columns that are unnecessary, encoders for categorical data.
  Model: epochs, learning rate, dropout-layers, EarlyStop, ReduceLROnPlateau

- **The role of data analytics in deep learning**

  A: analyzing data is necessary to evaluate if the model is usable. Moreover, analyzing data helps to find out the purpose, why you want to use a machine learning model to predict data. It also helps to optimize the data and model for better predictions.

- **Essential phases needed to produce a complete deep learning application, from raw data to a user application with user interface?**

  A: First, you need a dataset and an idea/reason what values you want to predict. After this, it is important to get an overview over the dataset (dimensions of the dataset, how many nan-values, what columns do exist, which columns are categorial/numerical, what range is each column, how many categories are in a column). Nan-values should be removed. Next, words should be presented as numbers. Encoders are used to turn categoric values into numbers. Following this, find out which columns could be removed with a correlation or chi2 test. After using scalers like StandardScaler, the model has to be optimized. I is a good idea to run the model with the parameters that are estimated as most successful. Afterwards, the results are analyzed and depending on the outcome, parameters like LR, or epochs, as well as adding EarlyStop, or something similar. To estimate whether a model is good or not, methods like a confusion matrix or a ROC-AUC score are used. might be helpful to improve the model. In some situations, it makes sense to use multiple models. After finding the best performing model, the model should predict one or multiple datapoints. This step shows, how good the model is predicting new data. A GUI helps to create tests easier.

If you participated in the semester project this semester, describe your personal deep learning –related tasks in the project

This provides some extra points for this course as well!

Any other feedback considering the course itself or deep learning in general? Both positive and negative feedback is welcome!

Thank you for this course! 😊

A: The course was one of the most useful courses I had so far. It is well structured. If there is one thing that I would change, I would be to ask more questions during the lecture. This makes the lecture more interactive which is easier for me to follow instead of just listening. But anyway thanks for the course.