# **Deep learning – Personal course report**

## **What are your thoughts about deep learning in general?**

I don’t have any particular thoughts on deep learning. The tasks are no different from classical machine learning, deep learning models are just more capable. In my opinion the tasks are not difficult or easy, they only require time spent trying different parameters and models. The reason might be that we don’t create solutions, just using someone else’s heavy math work.

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

The easy part is using libraries like PyTorch due to their extensive investment of money and time they have great documentation and code standards. The difficult part is working with data and choosing correct models and their parameters. Hopefully these advanced libraries will figure out how AI models can automate the process of finding the correct options.

## **What would you like to learn next in machine learning?**

I think machine learning has a huge potential in the gaming industry. It would be interesting to try to apply deep learning technologies to a video game AI to make it adapt to a player’s actions dynamically and not in a scripted way. Scripting creates limitations and makes AI too predictable, so I think adding deep learning would greatly enhance gaming experience if implemented correctly.

## **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?**

I would like to work as a professional machine learning engineer. Preferably in medical facilities because I think AI currently can bring the most benefits to the medical analysis of various diseases, which should in turn make curing such diseases cheaper and therefore more accessible for not rich people. So, if I could choose, I’d go work in this field but it’s not critical for me.

## **How do you understand the following concepts and/or technologies? In your own words, write about what you can do with them while performing data analytics, and where they are useful.**

* **TensorFlow (and PyTorch)**  
  TensorFlow and PyTorch are deep learning frameworks that provide tools for deployment, building and training neural networks. Both frameworks take care of complex mathematical operations needed for neural networks, so we don’t need to implement these manually.
* **Encoders (LabelEncoder, OneHotEncoder etc.)**Encoders transform categorical data into numerical formats that neural networks can process, since machine learning algorithms only understand numbers. LabelEncoder and OneHotEncoder provide different encoding techniques. LabelEncoder assigns a unique integer to each category while OneHotEncoder creates binary columns for each category. It is important to choose a correct encoder during machine learning development. It significantly impacts model performance.
* **Normalization, standardization and regularization**These techniques improve model training, convergence, and generalization capabilities. Normalization/Standardization scales features to comparable ranges, addressing the issue where features with larger magnitudes might dominate the learning process regardless of their importance. Regularization prevents overfitting by adding constraints that discourage complex models.
* **Deep learning application optimization (both dataset and algorithm optimization)**Dataset optimization focuses on improving the quality and representativeness of training data. Examples of Dataset optimization are data cleaning, feature engineering, or data augmentation. Algorithm optimization involves refining the neural network itself. Examples of algorithm optimization are hyperparameter tuning or experimenting with different optimizers. Both of these kinds of optimization are necessary for well performing models.
* **The role of data analytics in deep learning**In order to make right choices mentioned many times above we need information about the data we work with. That’s what data analytics give us. By exploring data both mathematically and visually we can discover important properties that will guide us in making the choices. This makes data analytics one of the foundational parts of deep learning.
* **Essential phases needed to produce a complete deep learning application, from raw data to a user application with user interface?**Creating a complete deep learning application may require various amounts of phases depending on the purpose of application and characteristics of the team developing it. I have chosen the following phases:  
    
  *1. Problem Definition*  
  Clarify objectives, constraints, and success metrics to guide development.  
    
  *2. Data Collection and Preparation*  
  Gather relevant data from diverse sources, clean it by handling missing values and outliers, and transform it into a suitable format for machine learning algorithms.  
    
  *3. Exploratory Data Analysis*  
  Examine the data through statistical analysis and visualizations to understand distributions, relationships, and potential challenges before model development.  
    
  *4. Model Development*  
  Design and implement an appropriate neural network architecture based on the problem type and data characteristics using frameworks like TensorFlow or PyTorch.  
    
  *5. Model Optimization*  
  Systematically refine the model through hyperparameter tuning, regularization techniques, and architectural adjustments to improve performance metrics and generalization capabilities.  
    
  *6. Evaluation and Validation*  
  Assess model performance against unseen data using appropriate metrics and analyze error patterns to validate real-world applicability.  
    
  *7. Deployment and Integration*  
  Package the trained model into a production-ready system with appropriate interfaces and integrate it with existing infrastructure or user-facing applications.  
    
  *8. Monitoring and Maintenance*  
  Continuously track model performance in production, periodically retrain with new data, and update as requirements or data patterns evolve.

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

The course was great. Everything was explained nice and clearly.

Thank you for your teaching!