# Deep Learning and Applications

### Howework II

### Due date: Nov 3, 2025

## 1   Task Description

This homework assignment includes two tasks designed to deepen your understanding of Transformers, a crucial component of large language models (LLMs), and their practical applications using popular LLM frameworks.

- **Task 1**: Building a Transformer Pipeline In this task, you will construct a deep learning pipeline from scratch to pre-train a Transformer. You will practice fundamental techniques such as the Transformer architecture, and the development of a pre-training pipeline. This will reinforce your understanding of the core elements that enable LLMs to handle complex language processing tasks.

- **Task 2**: Examining LLM Bias and Limitations In this task, you will investigate the limitations and potential biases inherent in LLMs. Using a pre-trained BERT model as a case study, you will explore specific examples that reveal biases and limitations, providing insight into the challenges and ethical considerations associated with deploying LLMs in real-world applications.

## 2   Instruction

The more detailed instructions of the homework are available at the Colab notebook. You could directly work on the Colab environment, where GPUs are provided to accelerate training.
**Please do not save on the original file. Instead, you should make a copy of the file on your own Google drive, and do the homework on your own copy.**

## 3   Handling Your Answer

After finishing that, you could hand in the Colab file through the Google form.

## 4   Evaluation

For this homework, you need to implement codes and write reports to answer questions in the colab notebook. For all the two tasks of the homework, we will check your codes to see whether you implement the models in a correct way, and we will read your reports to assess your understanding. The grades will be given based on the code correctness and the report discussion quality.