

Workshop Procedure:

In this intensive 3-hour workshop, we'll dive into both theory of Large Language Models (LLMs) and hands-on coding demonstrations. The first 1 to 1.5 hours will focus on theoretical concepts, delivered through a structured monologue to provide clear, concise coverage of key principles. After the theory, we'll transition into live demonstrations, showcasing real-world applications and techniques across various use cases. Given the limited time, there won't be time for extended discussions. However, if desired, you – the participants - can form working groups around specific topics or applications, enabling collaborative exploration of the capabilities of LLMs in smaller teams following the workshop.

Application Cases Covered in the Workshop:

1. Fundamentals

- Learn **different ways to call LLMs** by using an API, download the LLM weights and run them locally and use a web-based interface.
- Experiment with various **prompting techniques** and their effect on the generated outputs.
- Explore the impact of **hyperparameters** (e.g., temperature, top-k sampling) on output diversity and creativity.

2. Text Generation

- Learn how to **generate coherent and creative texts** using pre-trained LLMs; use-case: idea generation machine for technologies.

3. Feature Extraction, Synthetic Data

- *Encoder model*: extract **embeddings** (numerical representations of text meaning) using LLMs and apply them for tasks such as text similarity analysis using cosine similarity.
 - Explore how embeddings can represent semantic meaning and facilitate other downstream tasks.
- *Decoder model*: Apply embeddings to generate synthetic data; use-case: semantic associations (mimic a "Cognitive-Affective Map")

4. Text Classification

- Use extracted embeddings to perform **text classification** with machine learning models like regularized regression or random forests.
- Alternatively, explore **fine-tuning LLMs** to classify text (sometimes) more accurately for specific tasks (see Appendix).

5. Summarizing Literature

- Apply LLMs for **summarizing scientific articles** using advanced techniques like **Retrieval-Augmented Generation (RAG)**, which combines LLMs with retrieval mechanisms.
 - Enhance your summarization by coupling it with **bibliometric analysis** to better understand academic research trends.

6. Appendix

- Discover advanced functionalities like **Text-to-Speech** and **Speech-to-Text** for converting text to audio and vice versa.
- Explore **model fine-tuning techniques** to tailor LLMs for specialized applications and improved performance in specific tasks.