**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 rum them locally and us 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.