AI-110: Intro to Large Language Models (LLMs) and LLM-based apps.

Course Length: 8 training hours

Course Description:

Artificial intelligence has become an extremely important area for IT professionals and engineers with the scientific breakthroughs and practical applications of generative AI systems, especially its Large Language Model (LLM) variant such as OpenAI's GPT, Google's Gemini and many other closed- and open-source models. Due to its growing importance and impact on every aspect of our lives, understanding the concepts, functionalities and practical usage of LLM-based systems is quickly becoming essential for all IT and other technical professionals as well as for managers with technical background.

This training focuses on Large Language Models (LLMs) concepts and techniques on a high level as well as on techniques and tools of LLM application development.

Main topics:

- Introduction to LLM based applications: current types, building blocks, challenges
- Why and how LLMs work and are trained?
- Using closed- and open-source LLMs directly via their APIs
- Using LLMs via app. development frameworks
- Prompt engineering
- "Talk with your documents": Retrieval Augmented Generation (RAG)
- "AI that thinks and acts": LLM Agents
- Quality Assurance at LLM apps: Tracing and Evaluation (optional)

Besides gaining a basic understanding of Large Language Models (LLMs) and other technologies used in LLM-based applications, students will be able to examine their features and play with them during instructor's demonstration and lab exercises.

This training is part of the AI portfolio of Component Soft which explores essential AI topics, such as:

- AI-110 Intro to Large Language Model (LLMs) and LLM-based apps.
- AI-151: Using Codeium/Windsurf as coding assistant
- AI-435: GenAI Application Development with LLMs (OpenAI GPT, Google Gemini, Anthropic Claude, Meta Llama, Mistral, Deepseek)

Structure: 50% lecture, 25% demonstration by the instructor, 25% hands on lab exercises

Target audience: Technical managers as well as IT and telco professionals who want to familiarize themselves with Large Language Models (LLMs) and LLM based applications.

Prerequisites: Basic understanding of IT concepts, User experience with ChatGPT or similar chatbots.

Detailed Course Outline

Module 1. **Introduction to LLM based applications: current types, building blocks, challenges**
- Main usage areas of LLM-based applications
- Main types of LLM-based applications
- Building blocks of LLM-based applications
- Demo: Popular LLM-based application types

Module 2. **Why and how LLMs work and are trained?**
- Main elements and operation of LLMs
  (tokenizer, embeddings, transformer, transformer head, next token selector)
- The 4+1 training phase of LLMs
- Most important LLM vendors and models
- Demo: LLMs before ChatGPT

Module 3. **Using closed- and open-source LLMs directly via their APIs**
- Using LLMs through APIs
- LLM API text generation modes
- Typical LLM parameters
- Demo: Using a closed-source and an open-source LLM via API

Module 4. **Using LLMs via app. development frameworks**
- What are LLM app. development frameworks
- Their advantages and disadvantages
- Case study: Langchain, the most popular framework
- Demo: Using LangChain in an LLM chatbot

Module 5. **Prompt engineering**
- What is prompt engineering?
- Golden rules of prompt engineering
- The "Just Ask" Principle, Zero-shot prompts
- Some important prompt engineering rules
- Demo: Demonstrating basic prompt techniques

Module 6. **"Talk with your documents": Retrieval Augmented Generation (RAG)**
- What is Retriever Augmented Generation (RAG)?
- How does RAG work?
- Main building blocks of an RAG pipeline
- Advanced RAG techniques
- **Demo**: Demonstration of Retrieval Augmented Generation (RAG) in an LLM app

Module 7. **"AI that thinks and acts": LLM Agents**
- Motivations for LLM-based Agentic Systems
- Main Features of and Difference between Workflows and Agents
- Main Building Blocks: Functions, Tools, Agents
- The ReAct autonomous agent execution logic
- Multi-agent systems
- Demo: Agentic workflow and agent

Module 8. **Quality Assurance at LLM apps: Tracing and Evaluation (optional)**
- Why do we need them during development?
- Tracing and evaluation tools for LLM-based apps
- Tracing basics
- Evaluation basics
- **Demo:** Langsmith Tracing and Evaluation