2 Week Workshop

Week 1

- **Day 1:** *Intro to LLMs* - including a brief history, how they are training, the data used to train them, and discuss practical applications in industry. Finish with an overview of what topics we will cover during this workshop.
    - **Hands-on activity:** Prepare development environment, connect to LLM using access token and secret keys, make the first call to the LLM. Discuss LLM prompts and show examples of how prompts affect the output. Compare the difference between adding prompts to model context vs not adding a prompt.

- **Day 2:** *Retrieval Augmented Generation (RAG)* - Intro to RAG and why it is useful for adding context to LLM. Discuss how document vectorization works, methods of document retrieval, embedding models, chunking, and vector databases.
    - **Hand-on activity:** Vectorize a collection of documents and retrieve the top-k results from the vector store, take the response from the vector database and use it in a prompt.

- **Day 3:** *Chatbots* - Building a chatbot over RAG. During this learning session, I want to introduce the students to chatbots and how to integrate them with RAG. This will allow them to use a specific dataset of their choosing to inform the LLM with context specific documents. During this session, I also want to introduce the concept of memory. We want to build a chatbot that can handle follow up questions and not just forget the previous interactions with the user.
    - **Hands-on activity:** Build a chatbot that has a memory and uses RAG.

- **Day 4:** *Workflows vs Agents* - Intro to Workflows vs Agents. During this session, I want to start covering the difference between workflows and agent-based systems. 1) Workflows using Prompt chaining - decomposing a task into subtasks and using the output of the previous task as input into the next task. 2) Workflows using Routing - classify input and direct it to a specificity follow up task. 3) Workflow using Parallelization - work simultaneously on a task and aggregate the outputs.
    - **Hands-on activity:** Have students select from a workflow type and outline the components. At the end of this working day the students should have a functional “Workflow”, i.e. a user inputs a question, at least two subtasks are performed and the LLM provides a response from the augmented prompt.

- **Day 5:** *Agents and Multi Agent Systems* - Continue with a more detailed discussion on agents and how they can be used to create a flexible system. Intro to Tools. Tools are called by the agent to solve problems based on the user question. Intro to Multi-Agent System (MAS) - are used to create more complicated workflows where you have multiple agents tasked to solve a problem.

    - **Hands-on activity:** Define and create the first tool and integrate it into an agent workflow. Create and define a multi-agent system where at least two different agents are present in a graph and have access to separate tools.
    - ***Project Proposal Day*** - students will form groups and projects will be proposed for final capstone presentation.

Week 2

- **Day 6:** *Project Proposal and Special Topics* - Project final approval. Special topics: Agent frameworks. Discuss Chain of Thought and ReAct agent frameworks. Intro to Langgraph. Langgraph is a framework that will help developers define their agent workflow.
    - **Hands-on activity:** Implement Chain on Though agent (CoT) and ReAct agent. Begin working on a group project.

- **Day 7:** *Work on Project and Special Topic* - Passing multimodal data into LLM. Open the possibility of passing images into LLM context.
    - **Hands-on activity:** Short working activity where students pass images into an LLM. This opens up the possibility of projects incorporating images into their capstone project.

- **Day 8:** *Work on Project and Special Topic* - Intro to Langfuse. Traces, evals, prompt managements and metrics for debugging and improving your LLM application.
    - **Hands-on activity:** Integrate Langfuse into LLM application. Continue working on the Capstone project.

- **Day 9:** *Work on Project and Special Topic* - Q&A over graph databases. Continue working on the Capstone project.
    - **Hands-on activity:** Discuss cost vs benefits of implemented Q&A over graph database. Provides students with a notebook that shows implementation of graph databases using Neo4j. Continue working on the Capstone project.

- **Day 10:** *Finalize Capstone project and Presentations*
    - **Hands-on activity:** Complete Capstone project and present to auditorium.

1 Week Workshop

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- **Day 4:** *Agents and Tools* - Continue with a more detailed discussion on agents and how they can be used to create a flexible system. Intro to Tools. Tools are called by the agent to solve problems based on the user question.

- **Day 5:** Project Presentation

Project Proposals

- **Project 1:** *LLM + RAG based project* -
- **Project 2:** *Workflow based project* -
- **Project 3:** *Agent based project* -
- **Project 4:** *Group proposals* - groups propose their own ideas for a project.