Workshop on Building Agentic AI Applications with LLMs

Organizer:
Dr Noushath Shaffi
Department of Computer Science, Sultan Qaboos University, Muscat, Oman

Prof. Mufti Mahmud
Information & Computer Science Department, King Fahd University of Petroleum and Minerals, Dhahran, 31261, Saudi Arabia

- **Duration** : Full day

- **Main organiser contact details**:
    - o *Department of Computer Science, Sultan Qaboos University, Muscat, Oman*
    - o Email: n.shaffi@squ.edu.om
    - o Phone: +968-98813766

- **Short biographies of organisers** (150 words max for each organiser)
  Dr.Noushath is a passionate academician and researcher with 15 years of teaching experience in CS, complemented by research consultancy at Hewlett Packard Research Labs. He holds a Ph.D. in CS and has published more than 40 peer-reviewed articles across areas including Biometrics, Document structure Analysis, and multimodal data analytics. He is also a holder of multiple U.S. patents. His research has been supported by several grants and has contributed to advancing applications of AI in healthcare.

  Dr Mufti Mahmud is a Professor at King Fahd University of Petroleum and Minerals, Saudi Arabia, where he directs the Cognitive Computing and Brain Informatics research group. Previously, at Nottingham Trent University (UK), he led research initiatives and served in key administrative roles, including coordinating the Computer Science Research Excellence Framework unit and directing the Cognitive Computing & Brain Informatics research group. A recipient of the 2021 VC Outstanding Researcher Award and a Marie-Curie postdoctoral fellow, Dr Mahmud has secured around £4 million in research funding from reputed funding agencies like European Union and British Council. With over 400 peer-reviewed publications, he is ranked among the top 2% cited scientists in Computer Science since 2021. He holds significant

leadership positions in learned societies, including chair (2023-2024) and vice-chair (2020-2022) of IEEE CIS Intelligent Systems Application Technical Committee and member of Brain Informatics and CIS Health Systems Technical Committee, and an elected Board of Governors of APNNS (2025-2026). He serves as an editor for journals like Cognitive Computation, Brain Informatics and Frontiers in Neuroscience. He has chaired numerous international conferences, including ICONIP 2024, IEEE/WIC WI-IAT 2025, the Brain Informatics (2020-2022), and the Applied Intelligence and Informatics Conference (2021 onwards). He is the chief editor of book series including Applied Intelligence and Informatics book series with Springer-Nature, Smart Health System with CRC Press and Decentralised Systems and Future Internet with Scrivner/Wiley. Dr Mahmud is a Fellow of the Higher Education Academy (UK) and a senior member of IEEE and ACM, with memberships in BCS, INNS, APNNS, APA, and Sigma Xi.

- **Description of the workshop (500 words max):** The rapid advancements in Large Language Models (LLMs) have transformed artificial intelligence from a powerful tool for natural language processing into the backbone of next-generation intelligent systems. Among these, *Agentic AI*—AI systems capable of autonomous reasoning, planning, and multi-step decision-making—has emerged as a paradigm shift, enabling the development of highly adaptive, goal-directed applications. To equip participants with the necessary skills and practical knowledge in this cutting-edge area, this workshop focuses on **building agentic AI applications using LLMs**, leveraging NVIDIA's powerful cloud-based GPU infrastructure. This hands-on workshop will guide participants through the conceptual foundations and technical implementations required to create intelligent agentic systems. Participants will gain exposure to LangGraph, a popular and widely adopted framework purpose-built for constructing agentic AI pipelines. LangGraph extends the functionality of LangChain, a foundational library for working with LLMs, by offering graph-based abstractions to design multi-step workflows, manage stateful reasoning, and coordinate multiple agents within a single application. While the primary focus will be on LangGraph, the workshop will also introduce key LangChain concepts to ensure participants have a strong foundational understanding.

- **Scope and topics:**
  This workshop introduces participants to the principles and practices of building *Agentic AI* applications using Large Language Models (LLMs). With

hands-on training delivered on **NVIDIA's cloud GPU platform**, participants will gain both foundational knowledge and practical experience in designing autonomous, reasoning-driven AI agents. The workshop emphasizes **LangGraph**, a powerful framework for implementing agentic workflows, while also providing background on **LangChain** to build a strong conceptual base. By the end of the session, attendees will have the skills to develop, deploy, and extend agentic AI systems for research and real-world applications.

- **Topics Covered**

  1. **Foundations of Agentic AI**
     o Introduction to LLMs and autonomous AI agents
     o Concept of reasoning, planning, and multi-step task execution
  2. **LangChain Essentials**
     o Overview of LangChain components (prompts, chains, tools, memory)
     o Limitations of linear chains and transition to graph-based workflows
  3. **LangGraph Fundamentals**
     o Graph-based abstractions for agentic workflows
     o State management and dynamic control flows
     o Building structured and reusable pipelines
  4. **Hands-on Development**
     o Implementing simple agentic applications
     o Tool integration and retrieval-augmented generation (RAG)
     o Building multi-agent collaboration workflows
  5. **Advanced Concepts**
     o Debugging and error handling in agentic AI systems
     o Performance optimization with GPU acceleration
     o Ethical and responsible considerations in autonomous AI
  6. **Workshop Outcomes**
     o Real-world use cases and deployment strategies
     o Portfolio-ready projects in agentic AI
     o Certificate of completion from NVIDIA

- **Invited speakers (name, affiliation, email, weblink)**
  Noushath Shaffi
  Asst Professor – AI Focus Group
  Department of Computer Science – College of Science
  Sultan Qaboos University – Sultanate of Oman

Email: n.shaffi@squ.edu.om

- Timeline of paper submission: N/A

- Prior history of the workshop (if any): N/A

- Potential program committee members (name, affiliation, email, weblink): N/A

- Any other relevant information: N/A