Politecnico di Milano

PhD in
Information Technology

Research Area n 1 - Computer Science and Engineering

Research Title:
Generative AI for Intent-Based Multimodal User Interfaces

Scholarships and Financial support	
Monthly net income of PhD scholarship (max 36 months)	€. 1400
Increase in the scholarship for stays abroad	for up to 6 months
Number of scholarships	1
Beginning of PhD	February 1, 2025
Deadline for application	18/12
Context of the research activity	
Motivations and objectives of the research in this field	LLMs are revolutionizing our interaction with machines thanks to their ability to understand user intents from natural-language prompts. Their new multimodal capabilities enable an intuitive UX, bridging the gap between human intention and machine execution with benefits for usability and also inclusivity. However, a critical question remains: how can we leverage this increased interpretation ability to unlock disruptive interaction paradigms and “fluid” UIs that increase users’ productivity, also advancing accessibility and inclusivity? And how will this transition materialize in practical terms? In this context, the research conducted by the doctoral

	student will investigate how LLMs can help create adaptive prompt-driven multimodal UIs to support efficient ways of performing digital tasks. LLMs will help i) interpret user needs and goals, and ii) dynamically generate strategies and plans for interfaces and interactions. The characterizing features of this new interaction paradigm, the interaction patterns, and the building blocks of the new interfaces will be identified through intensive user reseach and formalized within a development framework contributing with a novel design system and a UI toolkit. Accessibility of the resulting paradigm will be prioritized.
Methods and techniques that will be developed and used to carry out the research	The research conducted by the doctorate student will have a dual focus on theoretical and practical implications. Defining a new interaction paradigm requires, on the one hand, the definition of new theoretical models and the design of advanced software architectures. On the other hand, it requires applying research methods involving users, to identify and evaluate effective interaction patterns unlocked by the new technologies that the candidate will investigate. It is also important to identify development methodologies and tools that can support the integration of the new interfaces and interaction paradigms within the application stack. Therefore, the research will focus on: - The analysis of the new interpretative and generative capabilities offered by the LLMs and the methods in which they can be integrated for the definition of intent-based UIs - The analysis of emerging and natural interaction styles, for example those in the XR family, or those related to Conversational User Itenrfaces - The definition of low-code/no-code methods and tools for the design and development of intent-based multimodal interfaces.
Educational objectives	The PhD student will deal with very advanced research topics, which are receiving much emphasis in the international research landscape and which also resonate well in the industrial world. In particular, the PhD candidate will: - Deepen advanced AI technologies; - Gain expertise in human-centered design to create technologies that align with users' needs - Learn theoretical models of human-computer interaction - Gain proficiency in ethical considerations related to AI, with practical frameworks for ensuring responsible use of GenAI in multimodal interfaces - Learn how to assess the feasibility of new technology and how to transfer theoretical research results into concrete processes for digital system production.
Job opportunities	With the ongoing emphasis on digital transformation, also based on LLMs and their integration in multimodal systems, at the end of the PhD program the candidate will be able to exploit the acquired skills in several organization, both in the public and the private sector,

	whose business implies the adoption of advanced systems enhanced by AI technologies. Specific interest on multimodal AI is now growing especially in the field of Industry 4.0. Other fields relate to the digital and communication industry. Given the European Accessibility act, multimodal AI will receive much emphasis for its ability to improve the accessibility of user interfaces.
Composition of the research group	Number of Full Professors: 1 Number of Associated Professors: 1 Number of Assistant Professors: 1 Number of Post-Docs: 2 Number of PhD students: 1
Names of the research directors	Prof. Maristella Matera
Contacts	maristella.matera@polimi.it
Additional support	
Housing: financial aid per PhD student per year (gross amount)	
Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other informations	