POLITECNICO DI MILANO

PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 40th cycle

Research Area n. 1 - Computer Science and Engineering

PARTENARIATO PNRR Research Field: GENERATIVE AI FOR INTENT-BASED MULTIMODAL USER INTERFACES

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation 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	The research conducted by the doctorate student will

research	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 Interfaces - 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	1 Full Professors 1 Associated Professors 3 Assistant Professors 1 PhD Students
Name of the research directors	Prof. Maristella Matera

Contacts
maristella.matera@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student (5.707,20 Euro per student)

TEACHING ASSISTANTSHIP: availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

COMPUTER AVAILABILITY:
1st year: Yes
2nd year: Yes

3rd year: Yes

In the framework of PNRR - PARTENARIATO ESTESO FUTURE ARTIFICIAL INTELLIGENCE RESEARCH D.D. 341 del 15/03/2022 Avviso pubblico per la presentazione di Proposte di intervento per la creazione di Partenariati estesi alle università, ai centri di ricerca, alle aziende per il finanziamento di progetti di ricerca di base nell'ambito del Piano Nazionale di Ripresa e Resilienza, Missione 4 Istruzione e ricerca Componente 2 Dalla ricerca all'impresa Investimento 1.3, finanziato dall'Unione europea NextGenerationEU CUP: D53C22002380006 DECRETO DI CONCESSIONE: D.D. 1555 del 11/10/2022