



# PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 38th cycle

Research Area n. 1 - Computer Science and Engineering

PNRR\_351\_PUBBL\_AMMIN Research Field: CONVERSATIONAL WEB: CONVERSATIONAL  
AI FOR WEB INCLUSIVITY

**Monthly net income of PhDscholarship (max 36 months)**

**€ 1300.0**

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**

One of the strategic objectives of the digital transition taking place in Public Administrations (PAs) is to ensure the accessibility and inclusiveness of websites and digital services available to citizens. The research aims to study technologies, methodologies and tools for the design of conversational agents for the Web, leveraging on a close integration between Web technologies and Conversational AI models. Conversational AI is disrupting the way information is accessed. However, there is still a lack of conversational technologies leveraging the Web. The proposed research contributes to the formation of knowledge and tools for enhancing the accessibility and inclusivity of Web resources, particularly online services of PAs, thanks to digital channels based on the concept of Conversational Web. On the Web, accessibility is often reduced to the "a-posteriori" addition of HTML coding elements that enable speech assistive technologies (e.g., screen readers) to read the visual content of Web pages. The concept of Web accessibility is rethought/extended, defining: i) new standards for Web technologies, which can be "natively" integrated with the Conversational AI models' pipeline; ii) new communication and interaction paradigms, to transform Web pages into conversational ones; iii) new development platforms, facilitating the integration between Web and Conversational AI, following



	<p>a low-code/no-code logic that automatically generates and manages the conversational paradigm starting from the HTML coding of Web resources. This vision is in line with the requirements posed by the Directive (EU) 2019/882 on the accessibility of products and services, which requires that starting from 2025 the member states implement measures to enable all citizens, and specifically people with disabilities (physical, intellectual, mental or sensory), to participate fully and effectively in society: information must be made available through more than one sensory channel and presented in a comprehensible manner and in perceptible ways. This project is also coherent with the strategies for the digital transition and, in particular, with the digitalization of public services, whose goal is to ensure by 2030 that online public services are fully accessible to all, including people with disabilities. In this context, the proposed research enhances the digital strategy of PAs (and in particular of the Milan Municipality) and makes it accessible and inclusive in two ways: 1. Through innovative Web technologies that are inclusive and accessible "by design" thanks to their extension towards Conversational AI; 2. Through the definition of development methods and tools that facilitate the production of inclusive and accessible digital services. The resulting technologies will offer the dual advantage of improving: i) the accessibility of online services and ii) the effectiveness and efficiency of the development processes of accessible Web services.</p>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>Defining a new conversational paradigm for the Web requires, on the one hand, the design of advanced Web architectures in which to natively integrate Conversational AI models that must learn and be trained from Web content. On the other, it requires applying research methods that involve end users, to identify and evaluate effective conversational patterns for Web browsing. To further accommodate the goals of the digital transition process, it is also important to identify development methodologies and tools that facilitate the role of PAs in the production of inclusive digital services for citizens. Therefore, the research proposes:</p>



	<ul style="list-style-type: none"> <li>- The definition of a new multimodal interaction paradigm for accessing online content and services, for browsing Web sites, for searching archives;</li> <li>- The study of extensions for Web-coding languages and new technological standards for the Web, to promote a native integration between the classical model for publishing visual content and the extraction, from this content, of the knowledge needed to train Conversational AI models.</li> <li>- The definition of low-code/no-code methods and tools for the design and development of conversational interfaces for the Web, which will be able to meet the needs of Public Administrations (and in particular of the Municipality of Milan), to make the development of accessible online resources effective and efficient.</li> </ul> <p>The results achieved for the PA domain and with the support of the Milan Municipality will be generalized to the broader domain of Web accessibility.</p>
<p><b>Educational objectives</b></p>	<p>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:</p> <ul style="list-style-type: none"> <li>- Deepen advanced Web and Conversational AI technologies;</li> <li>- Learn how to design new technologies starting from the study of the users and inspired by the principles of inclusive design;</li> <li>- Delve into aspects related to the responsible and ethical use of AI.</li> <li>- Learn how to assess the feasibility of new technology and how to transfer theoretical research results into concrete processes for digital service production in PA.</li> </ul>
<p><b>Job opportunities</b></p>	<p>Given the extensive emphasis on conversational AI, and the ever-increasing requirements for inclusive technologies, the doctor will be able to exploit the acquired skills in any organization, both in the public and the private sector, whose business implies a presence on the Web and/or the production of digital artefacts on the</p>



	Web. Target employers are PA, governmental, Cultural-Heritage agencies, with a need to disseminate content and knowledge through the Web, as well as digital and communication industries.
<b>Composition of the research group</b>	0 Full Professors 2 Associated Professors 0 Assistant Professors 2 PhD Students
<b>Name of the research directors</b>	Maristella Matera

<b>Contacts</b>	
Maristella Matera maristella.matera@polimi.it 02-23993408 <a href="https://matera.faculty.polimi.it">https://matera.faculty.polimi.it</a>	

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

<b>Scholarship Increase for a period abroad</b>	
<b>Amount monthly</b>	650.0 €
<b>By number of months</b>	6

<b>National Operational Program for Research and Innovation</b>	
<b>Company where the candidate will attend the stage (name and brief description)</b>	Comune di Milano
<b>By number of months at the company</b>	8
<b>Institution or company where the candidate will spend the period abroad (name and brief description)</b>	TU Delft
<b>By number of months abroad</b>	6

<b>Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information</b>
<p>PUBLIC ADMINISTRATION WHERE THE CANDIDATE WILL ATTEND THE STAGE Municipality of Milan Activity sector: Technological and Digital Innovation <a href="https://www.comune.milano.it/comune/ministration-trasparente/organisation/articolazione-degli-uffici/organigramma/direzione-in-Tecnologia-tecnologica-e-digitale">https://www.comune.milano.it/comune/ministration-trasparente/organisation/articolazione-degli-uffici/organigramma/direzione-in-Tecnologia-tecnologica-e-digitale</a></p> <p>The activity at the Municipality of Milan will allow the student to validate the theoretical results of</p>



the research, being able to leverage the vast amount of online resources and services available to citizens. In particular, the student will have the opportunity to assess:

- The feasibility of the research results, and in particular the applicability of the methods and technological solutions to the digital resources of the Municipality of Milan;
- The benefits of the proposed technologies for the accessibility and inclusiveness, through studies that can reach a large user base;
- The impact of the methods and tools proposed on the efficiency and effectiveness of the development practices currently in use, and the benefits for the digital transition.

The activity will be conducted in the context of the board for the Technological Innovation and Digital Transformation, established by the Municipality of Milan in collaboration with Politecnico di Milano.

**INSTITUTION WHERE THE CANDIDATE WILL SPEND THE PERIOD ABROAD**

TU Delft, Department of Sustainable Design Engineering (SDE), The Netherlands

Activity sector: Knowledge and Intelligence Design

<https://www.tudelft.nl/en/ide/about-ide/departments/sustainable-design-engineering/>

At the "Knowledge and Intelligence Design" laboratory, the candidate will explore Human-Centered AI issues, and in particular the transparency of Conversational AI models for the design and control of systems that are centered on characteristics, needs, behaviors and values of end users, and that, as such, are (and can be perceived) safe, reliable and responsible. The activity will be contextualized within a research collaboration, which has been established in the last years given the common interests of the two groups at Politecnico di Milano and Tu-Delft in conversational AI and Human-Centered AI.

**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

5.300,25 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:** individual use

**DESK AVAILABILITY:** individual use