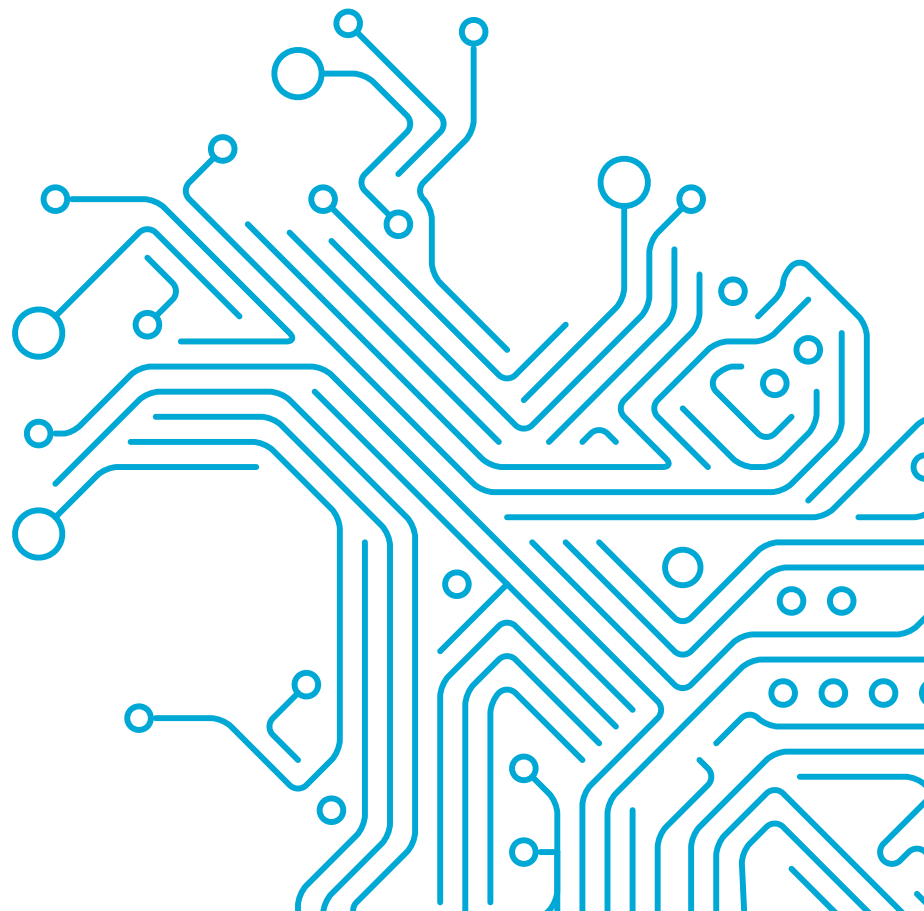


Call for Expression of Interest

DOCTORAL STUDIES

ANNOUNCEMENT | JULY 2024



General Presentation

Choose to do your Ph.D. with INESC TEC and embark on a journey of intellectual exploration, personal growth, and global impact.

Are you passionate about making a real impact on the world through ground-breaking research? Getting involved with INESC TEC and pursuing a Ph.D. programme can be your gateway to transforming ideas into reality, with the possibility of being a driving force in shaping the future.

INESC TEC provides exclusive conditions for doctoral candidates, offering a dynamic environment where cutting-edge technological advancements and real-world applications converge. Pursuing a Ph.D. with INESC TEC not only enhances the academic journey but also equips researchers with the skills and experiences essential for addressing real-world challenges and making a meaningful impact in their fields.

If you are interested in developing your studies in any of the following scientific areas, express your interest and send us your preferences:

- **Artificial Intelligence**
- **Bioengineering**
- **Communications**
- **Computer Science and Engineering**
- **Photonics**
- **Power and Energy Systems**
- **Robotics**
- **Systems Engineering & Management**

(see Annex I for details in each scientific area)

Seize the opportunity to reshape what is possible in your field. Upon submitting your application, we will connect you with the supervisors who best align with your research interests. Additionally, we offer assistance in exploring potential financial support options in Portugal and guide you through the application process to one of the Ph.D. programmes INESC TEC is associated with. Our commitment to excellence extends to providing an environment that supports your success.

About INESC TEC

The primary goal of INESC TEC is to exceed performance in research, while considering its social, environmental, and economic impact, with a commitment to the scientific and technological contribution to foster pervasive intelligence. As so, INESC TEC endeavours to be a relevant international player in Science and Technology in several domains, such as computer science, energy systems, artificial intelligence, communications, power and energy systems or robotics. Being an institution that operates at the interface between the academic and business worlds, bringing academia, companies, public administration, and society closer together, INESC TEC generates new knowledge as part of its research, and leverages that knowledge in technology transfer projects,

seeking impact through both value creation and social relevance. INESC TEC integrates 13 R&D Centres with complementary skills, always focused on the international market. At INESC TEC, the knowledge and results generated in fundamental research are typically applied in technology transfer projects, always ensuring greater and immediate social relevance. In Portugal, INESC TEC's technological innovation capacity has allowed the modernization of national sectors and the launch of new companies operating worldwide.

INESC TEC is a private non-profit research association, with Public Interest status, dedicated to scientific research and technological development, technology transfer, advanced consulting and training, and pre-incubation of new technology-based companies. Present in six sites in the cities of Porto (headquarters), Braga and Vila Real, and with more than 800 researchers, INESC TEC acts from knowledge generation to science-based innovation, and performs collaboratively in search for a more sustainable, responsible, and improved world.

Why doing your Ph.D. with INESC TEC?

Choosing to pursue a Ph.D. with INESC TEC offers distinct advantages for prospective researchers. Its dynamic environment, where cutting-edge technological advancements and real-world applications converge, provides unique circumstances for doctoral candidates.

Being an institution that operates at the interface between the academic and business worlds, solving practical problems, addressing industry needs and bringing society closer together, INESC TEC is the ideal place to pursue a more hands-on, industry-oriented approach to research in Portugal, exposing Ph.D. candidates to practical challenges and ensuring their research has direct applications in the field. The institution's industry ties provide access to cutting-edge technologies, mentorship, and a strong network. With state-of-the-art facilities, scholars engage in high-impact, industry-aligned research, fostering interdisciplinary collaboration. Ph.D. candidates benefit from technology transfer opportunities, translating their research into tangible solutions.

Overall, pursuing a Ph.D. at INESC TEC not only enhances the academic journey but also equips researchers with the skills and experiences essential for addressing real-world challenges and making a meaningful impact in their respective fields.

Who can apply?

All candidates who are eligible to do a doctoral programme at a higher education institution recognised in Portugal and who are looking for the added advantage of doing a Ph.D. with INESC TEC.

What we have to offer?

GUIDANCE ALONG THE PHD PATH

INESC TEC provides guidance to students along the different stages of their path: support in the selection and application to a PhD program, supervisor selection according to research interests, and career development support.

FREEDOM TO CREATE AND THINK

INESC TEC encourages PhD students to explore ideas, theories, and methodologies, allowing them to delve into uncharted territories, fostering innovation and pushing the boundaries of knowledge.

INTERDISCIPLINARY COLLABORATION

INESC TEC encourages collaboration among researchers from different domains. PhD students may benefit from exposure to diverse perspectives and have opportunities to work on interdisciplinary projects.

TRAINING AND WORKSHOPS

INESC TEC often organizes training sessions, workshops, and seminars to enhance the research and professional skills of PhD students. These activities contribute to the overall academic and professional development of the students.

NETWORKING OPPORTUNITIES

PhD students have the chance to build a strong network within the institute and beyond. This includes interactions with fellow students, faculty members, and professionals in the industry, fostering valuable connections for future collaborations.

PhD students also have the possibility of participating in international research projects and establish collaborations with researchers from foreign research centres. Participation in international scientific conferences is highly encouraged. INESC TEC also provides opportunities for stays at foreign research institution.

RESEARCH WITH LEADING RESEARCHERS

INESC TEC offers a range of research projects across various domains. PhD students have the opportunity to engage in cutting-edge research, supervised by experienced researchers and faculty members.

FINANCIAL SUPPORT

Monthly financial support

Securing financial support is possible, in the form of scholarships, stipends, or research grants. Students must be accepted competitively.

Tuition fees

INESC TEC pays all the tuition fees in national HEIs for scholars.

Health insurance

The institution offers health insurance coverage to all its PhD Students.

Performance-based bonuses

Furthermore, INESC TEC may offer performance-based bonuses, recognizing and rewarding students for their academic achievements, productivity, and contributions to research projects.

How you can apply

If you are interested in pursuing a Ph.D. apply to this call for expression of interest to develop your doctoral studies with INESC TEC, where you can benefit exclusive conditions for doctoral candidates.

All you need to do is fill out the Application Form available here, with your personal data, the scientific area you are interested in and some keywords to characterise your research preferences.

You must also write a short text explaining your motivation for doing this Ph.D., briefly describing the research themes you are most interested in or want to study further, highlighting the important points of your academic path and relevant experiences you've had. In the end, you can indicate your future ambitions and goals.

In case you have already a preference, you can identify in the motivation letter the name of the supervisor you are interested in working with or the name of the specific research project already underway at INESC TEC.

Evaluation, Selection and Notification

After receiving your expression of interest, your application will be screened and analysed by a panel of expert researchers, who will identify potential alignment with our faculty's expertise, considering your academic background, research interests, and motivation letter.

At INESC TEC, we uphold a commitment to transparency and inclusivity throughout the application and matching process. Therefore, all candidates can expect to receive a response regarding their application.

Contacts

For more information, please contact us through the following email scientific-culture@inesctec.pt.

Annex 1.

Artificial Intelligence

Artificial Intelligence is a decades-old scientific domain which has recently boosted its importance and impact in science, the economy and society in general.

Stemming mostly from Computer Science, AI has strong influences from other scientific fields, namely mathematics, neuroscience, linguistics, psychology, philosophy, and physics. In the 21st century, AI has made major advances, particularly in areas dominated by machine learning and more specifically deep learning. These include natural language processing, computer vision, content generation and recommender systems. Artificial Intelligence is already having a significant impact on many industries, including healthcare, energy, finance, transportation, and manufacturing, and is also playing an increasingly important role in our everyday lives, from virtual assistants to online recommendation systems. The symbolic legacy of AI is also very significant with roots in mathematical logic, linguistics, and psychology. Currently, symbolic approaches open avenues for explainability and transparency in AI systems.

Besides the fundamental need for large amounts of high-quality data (for the correct application), the growing influence of Artificial Intelligence calls for a human-centric approach with advances in the trustworthiness of the delivered tools, chiefly the interpretability of predictions and decisions, generalisation to unseen and even unpredictable situations, and robustness to biased data or unethical results.

Nowadays, Artificial Intelligence has powerful algorithms that can approach very difficult tasks, only doable by humans until little more than five or ten years ago, with astounding quality. Although the success of current neural and statistical approaches is almost blinding, there is a very important legacy of symbolic methods. They matter not only to the human dimension of AI, but also to the possibility of powering non-symbolic solutions with new cognitive layers that can be engineered and designed.

The growing dissemination of AI solutions and AI agents as enhancers of human capabilities, artificial co-workers or artificial experts, boosts the importance of human-AI interaction and of the trustworthiness of AI counterparts. The myriad of different interaction scenarios motivates research along many lines, such as human modelling (including the theory of mind), human-AI collaboration (including human oversight), interaction, usability and user experience, information visualisation and visual analytics, explanations and verification of AI processes and results.

The power of current and future AI also requires the mitigation of AI risks and implications. AI solutions and deployment must be ethical by design, following European and International guidelines that defuse as much as possible any potential harm. The ongoing and foreseen transformation of human tasks and jobs requires anticipation and reflection by all the players.

From an algorithmic point of view, the current moment of AI is strongly influenced by the emergence of large models built using deep and reinforcement learning. These approaches are fundamentally statistical and extremely data-thirsty. At the same time, they can capture refined patterns due to highly powerful estimations and are highly reusable. While their stochastic nature dispenses human intervention and obliterates the knowledge engineering bottleneck, the need for labelled data is still demanding and costly. On the other hand, their statistical nature and complexity make them highly opaque and hard to scrutinise.

Bioengineering

The field of Bioengineering addresses fundamental engineering principles, practices and technologies for medicine, biology, environmental and health sciences to provide effective solutions to problems in these fields. This field includes (but is not limited to) the development of mathematical theories & models, physical, biological and chemical principles, computational models and algorithms, devices and systems for clinical, industrial and educational applications in these domains.

We envision the next generation of advances and high impact of research on bioengineering for prevention, early detection and diagnosis of different types of diseases, ageing-related impairments, rehabilitation, occupational health and wellness, environmental-biology interactions, among others.

Development of bioengineering novel methods and tools for the prevention, early detection and diagnosis of different types of diseases, ageing-related impairments, rehabilitation, occupational health and wellness, environmental-biology interactions, among others.

Development of advanced technologies at the frontier of engineering, medicine, biology and other health & environmental sciences and transfer them to the future world market.

Communications

Context-aware, on-demand communications systems using and providing ubiquitous sensing.

Communications technologies, mainly those that are wireless and aligned with the vision for next-generation, are essential for the development of other research areas. Current visions in fields such as industry, energy, smart cities, mobility, health, sea, and agriculture demand well-engineered communications solutions. The current and next generations of communications systems are substantially different from the previous generations. The next generation of mobile and wireless communications will use and provide ubiquitous sensing and localisation capabilities, service-oriented software architectures, autonomous systems for supporting communications equipment such as high-altitude platforms and drones, ubiquitous artificial intelligence, and edge and cloud computing for creating on-demand virtual networks.

Motivated by this vision, the new emerging bandwidth-intensive, latency-sensitive applications, and the need to connect the unconnected, this scientific domain sees as its major challenge the design of communications systems that are more context-aware and deployable on-demand. This means communications systems that can dynamically adapt their characteristics according to the communications context, including the physical environment, energy constraints, the communicating peers, and the users or machines involved in the communication.

Computer Science and Engineering

The field of computer science and engineering is facing significant scientific and technological challenges, especially in the wake of the ongoing digital transformation. The pervasiveness of computer systems brings about new and often unforeseen challenges that defy our knowledge and best practices.

These challenges arise from the sheer complexity and scalability of computer and software systems, and the ever-increasing demand for their performance, interoperability, security, privacy, dependability, and sustainability. The incredible progress being made towards the widespread use of digital sensing and instrumentation technologies along with the sheer computing power at our disposal reinforces our resolve to effectively and efficiently collect, filter, curate, store, process, visualise and analyse the massive volumes of data generated.

As our reliance on information systems grows, there is a rising need for these systems to be trustworthy, fast, always available, and ethically responsible. Software development, verification, and testing have become crucial aspects in the critical path of any digital system, underlining the paramount importance of ensuring quality throughout the entire process.

The whole computing pipeline is becoming more complex, which poses additional challenges in ensuring reliability and performance. Therefore, research on computing architectures and non-functional aspects of software is essential for achieving the scalability, interoperability, and efficiency required for sustainable digital systems.

Power and Energy Systems

Support to the Sustainable Energy Transition.

This Scientific Domain supports the energy transition leading to a reduction of GHG emissions, via the decarbonisation of the energy system, large-scale RES integration, electrification of the society and increased energy efficiency.

This involves the combination of physical representations and data-driven methods for modelling and optimising energy systems, leveraging from emerging technologies like AI, blockchain and interoperability.

Results include concepts, models, methodologies and tools useful for addressing the decision problems of citizens, communities, multi-utilities, system operators, regulators, policymakers and government bodies.

Photonics

The vision for Photonics research at INESC TEC is to explore the potential of photonic-based science in the development of innovative enabling technologies contributing to a smarter, sustainable, and more efficient operation of complex systems such as the human body, the environment or critical infrastructures.

This activity of discovery and innovation subscribes to Optica's core values and is built on accepted scientific methods and engineering practice. It involves:

1. Advancing fundamental understanding of the fundamental physics of light-matter interactions, as well as explore new materials and phenomena that could lead to novel photonic devices;
2. Unlocking the Potential of Light through advancements in technology and applications for information transmission and sensing;
3. Fostering interdisciplinary collaborations to develop innovative solutions to complex problems.

Overall, our vision for photonics research prioritises advancing fundamental understanding, developing new technologies, fostering interdisciplinary collaborations, promoting sustainable development, and advancing diversity and inclusion.

Robotics

Robotics became more intelligent, autonomous, and useful in a wide area of applications. This new paradigm poses new challenges and problems to be solved that require new scientific approaches.

The operation in complex and dynamic environments requires increasing levels of autonomy, with abilities to create and maintain maps of the environment, to react and adapt to unforeseen events, as well as to operate unattended for longer periods.

The increasing interaction between humans and robots poses new, often unforeseen, and risky situations that need to be mitigated. Programming and communicating with robots to assign tasks must be increasingly intuitive and accessible to any operator.

The possibility of acting through forms that did not exist before, such as interacting with flexible objects of manipulating objects from moving platforms, takes robotics to new fields and with new challenges.

New fields of application of robotic systems and novel operational scenarios also require novel design methodologies, simplifying the deployment of these technologies.

Systems Engineering and Management

Systems engineering and management research seeks to advance the design, implementation, and improvement of systems for decision support, human-centred operations, intelligence, technology management, and innovation.

Major challenges arise from optimisation in complex organisations and networks at multiple levels, customer-centric service design, and technology-based innovation management and policy, targeting improvements in business performance, productivity, innovation, resiliency, and economic, social, and environmental sustainability.