



Curricular Internships Topics 2024-2025

This year, INESC TEC is offering you 47 internship topics! The topics are organized into the following scientific domains:

- **AI - Artificial Intelligence**
- **COM - Communications**
- **CSE - Computer Science and Engineering**
- **PES - Power and Energy Systems**
- **ROB - Robotics**

Choose **up to 3 topics that most interest you** and fill in [\[here\]](#) the application form indicating your order of preference. On the form, you should also **indicate the keywords that best characterize your research preferences**. If none of the topics you have chosen are available, you may be offered a topic within the same scientific area and aligned with your interests.

Each topic is identified by a reference, for example, **[AI01]**. Use these references to fill in the application form.

If you want to develop a different theme or if you don't particularly identify with any of the proposed topics, **in the motivation text available on the form you should describe the research themes you are most interested in pursuing**. In this case, you should put the generic reference of the scientific field you wish to apply for in the "options" section, for example, **[ROB00]**.

Described in the section below, in addition to the title of the topic and a brief description of what is required, you will find the names of the supervisors, the research center where you will be working, the location of the internship and the estimated number of hours.

Inteligência Artificial

- Ref. [AI01] Clustering of Energy Consumption Time Series using Network Topological Features
- Ref. [AI02] Explore the applications of generative AI to scenarios generation in the energy sector
- Ref. [AI03] Spiking Neural Networks for Control
- Ref. [AI04] Uncertainty Quantification in Wind Power Forecasting Using Conformal Prediction
- Ref. [AI05] Produce Explainability Maps by Prediction or Gradient Descent
- Ref. [AI06] Automatic Recognition of Pig Aggressiveness
- Ref. [AI07] How Robust are Ordinal Regression Methods against Adversarial Attacks?
- Ref. [AI08] Detecting Anomalies in Waste Transportation
- Ref. [AI00] Generic Topic – Artificial Intelligence

Comunicações

- Ref. [COM01] Obstacle and Traffic-aware Vision-based Positioning Algorithm for Aerial Networks.
- Ref. [COM00] Generic Topic – Communications

Ciência e Engenharia de Computadores

- Ref. [CSE01] Human Motion Analysis for Neurological Diseases Diagnosis: AI & Computer Vision Approaches.
- Ref. [CSE03] Object Mosaic Planning
- Ref. [CSE04] Cross-Lingual Ad-hoc Text Retrieval in Tetun
- Ref. [CSE00] Generic Topic – Computer Science and Engineering

Sistemas de Energia

- Ref. [PES01] Joint planning of multi-energy networks
- Ref. [PES02] Front-end for an energy management system of a harbour
- Ref. [PES03] User interface for a charging management system for fleets of electric vehicles
- Ref. [PES04] Enhanced fault level (short-circuit current) assessment in smart grids
- Ref. [PES05] Performance Evaluation of Electric Vehicle Chargers in Temperature Controlled Conditions
- Ref. [PES06] Internship in Embedded Systems Software Development for Electric Vehicle Chargers
- Ref. [PES07] Distance protection applied to MV distribution networks with renewables
- Ref. [PES08] Development and analysis of APIs for interaction with electric vehicles
- Ref. [PES00] Generic Topic – Power and Energy Systems

Robótica

- Ref. [ROB01] Detection and tracking of an underwater acoustic sources
- Ref. [ROB00] Generic Topic – Robotics

Inteligência Artificial

Ref. [AI01]

Clustering of Energy Consumption Time Series using Network Topological Features

Energy consumption is critical in infrastructure development and planning, especially with fluctuating demand across regions and periods. The increasing availability of high-resolution data, such as hourly consumption time series from multiple locations, enables advanced analytics to better identify consumption patterns. This project proposes extracting topological characteristics from networks generated from consumption time series and using these features for clustering algorithms. Publicly available data, like that from E-REDES, will be used to test the methodology.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Carla Gonçalves, Vanessa Silva

Ref. [AI02]

Explore the applications of generative AI to scenarios generation in the energy sector

The objective is to explore the potential of generative AI for scenario generation in the energy sector, for example for future scenarios of the power system aligned with the energy transition and decarbonization process to enhance the efficiency of energy system planning and operation, and to investigate how AI-driven scenario generation can support decision-making processes for energy market stakeholders, including utilities, regulators, and system operators.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Jose Villar

Ref. [AI03]

Spiking Neural Networks for Control

Spiking Neural Networks (SNN) are an alternative paradigm to traditional neural networks and its bioinspired modelling can offer edge AI solutions for control problems. The goal is to implement a SNN for continuous domains to solve a classic nonlinear control problem.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Ricardo Bessa

Ref. [AI04]

Uncertainty Quantification in Wind Power Forecasting Using Conformal Prediction

Accurate wind power forecasting is crucial for grid stability, but unpredictable wind patterns create uncertainty. This project applies Conformal Prediction (CP), a statistical method that

generates prediction intervals with a user-specified confidence level, quantifying uncertainty around forecasts from models like ARIMA and LSTMs. Unlike traditional methods, CP is model-agnostic and guarantees that the true value falls within the interval with a given probability. By integrating CP into time series models, the project aims to improve the reliability of wind power forecasts, enhancing decision-making for energy operators.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Orientador: Carla Gonçalves

Ref. [AI05]

Produce Explainability Maps by Prediction or Gradient Descent

The goal would be to produce novel xAI (explainability) methods. Two ideas: (i) directly by gradient descent during inference; (ii) train layers to produce the mask based on the encoder.

Steps: 1. Take a pre-trained model (e.g., resnet50 trained on ImageNet). 2. Implement the two aforementioned methodologies. 3. Evaluate results. 4. Compare with traditional xAI baselines (such as grad-cam using a python package).

Research Center: CTM - Telecommunications and Multimedia

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Ricardo Cruz

Ref. [AI06]

Automatic Recognition of Pig Aggressiveness

The objective is to recognize pig activity in a video; in particular, the customer is interested in knowing if there is a pig that is being violent. The student should explore work already done in the literature and propose a model for the customer's data.

Some models that the student should explore are models that work directly with the video, such as temporal neural networks (such as RNN/LSTM and transformers), and static models, such as optical flow, which tries to capture movement in a single image and can then be used by a static model.

Research Center: CTM - Telecommunications and Multimedia

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Ricardo Cruz

Ref. [AI07]

How Robust are Ordinal Regression Methods against Adversarial Attacks?

Ordinal regression consists of predicting a discrete variable $Y \in \{C_1, C_2, \dots, C_k\}$, where a well-defined ranking exists, such as in regression, $C_1 < C_2 < \dots < C_k$. We evaluate if a model is good for an ordinal task using accuracy, mean absolute error, Kendall tau, quadratic weighted error, etc. However, we are often interested in building a robust model that we are confident will not drastically change the decision to an adversarial attack. The goal is to evaluate the ordinal methods we have implemented against adversarial tasks.

Research Center: CTM - Telecommunications and Multimedia

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Ricardo Cruz

Ref. [AI08]

Detecting Anomalies in Waste Transportation

The proposal aims to develop innovative anomaly detection models to enhance environmental protection by addressing the crucial and often overlooked issue of combating fraudulent activities (that do not comply with the legal requirements set out in the waste legislation) in the transport or disposal of Waste. Anomaly detection is crucial in data analysis, focusing on identifying outliers or irregularities within datasets. The waste transportation process involves the movement of waste from producers to disposal or recycling facilities. By applying various approaches from the fields of Machine Learning, Network Science and AI, we seek to detect abnormal behaviors and patterns in data, which have not been extensively studied in this domain.

Research Center: LIAAD - Artificial Intelligence and Decision Support

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Shazia Tabassum

Ref. [AI00]

Generic Topic – Artificial Intelligence

With a significant impact on many industries, including healthcare, transportation and manufacturing, Artificial Intelligence is also playing an increasingly important role in our everyday lives, from virtual assistants to online recommendation systems.

About Artificial Intelligence at INESC TEC: more information [here](#)

Comunicações

Ref. [COM01]

Obstacle and Traffic-aware Vision-based Positioning Algorithm for Aerial Networks.

In natural and man-made disasters, the reliability of communication infrastructure is crucial. Unfortunately, events like wildfires, earthquakes, floods, and even cyber and terrorist attacks can leave these networks unavailable. That's where Next Generation Networks (NGN) come in. These innovative systems are designed to overcome communication challenges in difficult scenarios. One of the most promising solutions is the use of unmanned aerial vehicles (UAVs) to provide on-demand wireless connectivity. However, NGN's success relies on high frequencies that are highly dependent on Line-of-Sight (LoS) availability and can easily be blocked by obstacles. While cost-effective and broadband solutions have been explored, the challenge of positioning UAVs to compensate for the loss of LoS due to obstacles has yet to be fully addressed.

In this internship, we'll be tackling this challenge head-on by providing Line of Sight (LoS) to users through the use of UAVs. In the first phase of this work, we detect the position of the users by capturing photos or videos from the venue automatically. These photos are captured by a camera installed on the UAV. Then coordinated information on user equipment is

extracted using vision tools and utilized for the positioning approach. The performance of the proposed solution is evaluated using Network Simulator 3 (ns-3). With this positioning algorithm, we aim to provide wireless connectivity to all users, even in the most challenging scenarios. Together, we will be helping to ensure that people stay connected when it matters most.

Research Center: CTM - Telecommunications and Multimedia

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 175 hours

Supervisors: Kamran Shafafi, Rui Campos

Ref. [COM00]

Generic Topic – Communications

Digital network communications underpin the Internet and the myriad of services we increasingly depend on, indispensable for the widespread digital transformation.

About Communications at INESC TEC: more information [here](#)

Ciência e Engenharia de Computadores

Ref. [CSE01]

Human Motion Analysis for Neurological Diseases Diagnosis: AI & Computer Vision Approaches.

We are seeking 2-3 students to tackle core challenges in Human Motion Analysis, focusing on Wholebody Human Pose Estimation (HPE), and skeleton-based action, emotion & gesture recognition using AI and computer vision approaches. We will focus on the epileptic seizure classification by analyzing movement patterns during seizures, leveraging skeleton-based deep learning techniques. The students can work on either of the pillars (HPE, action recognition), aligning the exact research problem according to their interests. This interdisciplinary project sits at the intersection of computational vision, medical research, and AI, offering a unique opportunity to contribute to significant advancements in computer vision and epilepsy treatment.

Research Center: CBER - Biomedical Engineering Research

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: João Paulo Cunha and Tamás Karácsony

Ref. [CSE02]

Multi-User Web Platform for Graph-Based Service Dispatch and Management

This proposal aims to develop a multi-user web application for managing, dispatching, logging, and serving graph-based services. The application will enable users to input graphs using a web canvas interface, where each graph comprises interconnected blocks. The system will be able to support the addition of more blocks and more graph rules dynamically. Once a graph is submitted, it will be dispatched to an existing API to process the input and return the results for further action.

The web application will support multiple users, ensuring robust access control and data segregation. Key functionalities will include user management, user-specific service handling, real-time logging of dispatched tasks, and monitoring the status of processed graphs.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Diogo André Pereira Babo

Ref. [CSE03]

Object Mosaic Planning

The primary challenge in organizational space planning is the efficient allocation of items in a container. This problem, extensively documented in the literature, falls within the domains of Cutting and Packing (C&P) and/or Object Mosaic Planning. While the autonomous organization and packing of items remain ongoing research areas, the growth of the robotics and automation industry has intensified the need for practical solutions. Historically, this operational research and management issue has been addressed to maximize space utilization, minimize resource consumption, and reduce packing costs.

In the robotics context, automatic robotic arms have been developed to aid in retail manufacturing, programmed to operate autonomously or execute operators' tasks. However, challenges in automating the packing process persist, making it an ongoing area of research and development.

Therefore, this proposal aims to continue the solutions developed at iiLab by creating a software system capable of adjusting, modifying, and generating the organizational space of objects inside a container. The main focus is on a system that allows robots to place objects, as well as improving the dataset used in deep learning models.

Research Center: CRIIS - Centre for Robotics in Industry and Intelligent Systems

Internship location: iiLAB, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: João Pedro Carvalho de Souza

Ref. [CSE04]

Cross-Lingual Ad-hoc Text Retrieval in Tetun

Cross-lingual information retrieval (CLIR) refers to the process of retrieving relevant documents when the document collection is in a language different from the user's query. Given that document collections and ad-hoc text retrieval baselines for Tetun already exist, this work aims to further investigate cross-lingual retrieval effectiveness and compare it to the baselines. For instance, querying in Portuguese and retrieving the corresponding results in Tetun. The experiment results will be showcased in a user-friendly search engine prototype.

Research Center: HumanISE - Human-Centered Computing and Information Science

Internship location: infoLab, FEUP, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Sérgio Nunes Gabriel de Jesus

Ref. [CSE00]

Generic Topic – Computer Science and Engineering

Computer science and engineering are the linchpins to the unstoppable evolution of computing and enable its application to an ever-growing plethora of computerbased solutions.

About Computer Science and Engineering at INESC TEC: more information [here](#)

Sistemas de Energia

Ref. [PES01]

Joint planning of multi-energy networks

This internship will focus on the joint planning of multi-energy networks, integrating power, gas, and heat systems. The work will be divided into two phases:

Phase 1: Literature review and objectives

- Study existing multi-energy networks planning models.
- Define the planning objectives: cost, reliability, sustainability.

Phase 2: Data Collection & Modelling

- Collect and organise networks data.
- Develop joint optimization models for the planning problem.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Filipe Joel Soares

Ref. [PES02]

Front-end for an energy management system of a harbour

This internship will focus on developing the front-end for an energy management system tailored to a harbour environment. The work will be developed into two phases:

Phase 1: Research and design

- Study existing energy management systems and front-end frameworks.
- Analyse user requirements specific to harbour energy management.
- Design a user-friendly interface prototype based on the gathered insights.

Phase 2: Development and testing

- Develop the front-end using appropriate technologies.
- Test the interface for usability and functionality, ensuring it meets the system's requirements.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Filipe Joel Soares

Ref. [PES03]

User interface for a charging management system for fleets of electric vehicles

This internship will focus on developing the front-end for a charging management tool for fleets of electric vehicles. The work will be developed into two phases:

Phase 1: Research and design

- Study existing charging management tools and front-end frameworks.
- Analyse user requirements specific to fleet management for electric vehicles.
- Design a user-friendly interface prototype that allows efficient management of charging schedules and vehicle monitoring.

Phase 2: Development and testing

- Develop the front-end using appropriate web technologies.
- Test the interface for usability and functionality, ensuring it meets the system's requirements.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Filipe Joel Soares

Ref. [PES04]

Enhanced fault level (short-circuit current) assessment in smart grids

Typical strengths, short-circuit fault levels and network supply impedances will be analysed for the study of quality of supply in medium-to-low voltage distribution systems. Considering the disparity in distribution network design, this study will be based on a comprehensive database containing typical arrangements and equipment in EU systems, as well as on fully documented generic network models (both in PSS/E and Simulink) supplying different load subsectors, i.e. from metropolitan to rural areas.

The objective is to assess the gradient of fault level variation according to diverse feeder structures, as well as to identify alternative methods for determining the dependency in time of (short-circuit) fault levels to electricity demand.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Ignacio Hernando Gil

Ref. [PES05]

Performance Evaluation of Electric Vehicle Chargers in Temperature Controlled Conditions

With the increasing demand for electric vehicle (EV) charging solutions, the efficiency and safety of chargers are critical aspects. INESC TEC is currently developing AC chargers that operate in outdoor environments, exposed to various weather conditions, which can significantly raise their internal temperature, particularly during the summer. Given this scenario, it is essential to conduct tests to evaluate the impact of external temperature variations on the performance of the chargers. These tests will provide insights into how temperature affects the functionality and efficiency of the chargers, ensuring the reliability of the products under real-world operating conditions.

Objective: To develop and implement a temperature measurement system using DS18B20 sensors and a Raspberry Pi 3, which will be used to monitor the thermal performance of electric

vehicle chargers under different simulated temperature conditions in a climatic chamber. Additionally, the intern will be responsible for conducting and documenting the tests, analyzing the behavior of the chargers under extreme thermal variations, and identifying potential points of failure or design improvements to ensure the efficiency and safety of the equipment.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Pedro Gelati Pascoal

Ref. [PES06]

Internship in Embedded Systems Software Development for Electric Vehicle Chargers

The intern will contribute for the development of embedded systems software for electric vehicle chargers at the Laboratory of Smart Grids and Electric Vehicles (SGEVL) of INESC TEC. Their tasks will include programming microcontrollers and firmware, focusing on hardware communication through reading and writing to ports. The intern will work with simple embedded systems, such as Raspberry Pi, applying these concepts in practical projects. The candidate must have basic knowledge of C programming, experience with embedded systems (e.g., Arduino), and a basic understanding of firmware programming (reading and writing to communication ports).

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: José Miguel Ferreira

Ref. [PES07]

Distance protection applied to MV distribution networks with renewables

The proposed internship aims to investigate the application of distance protection in medium voltage (MV) distribution networks. Distance protection is commonly used in transmission systems but is gaining relevance in MV networks, particularly with the increasing integration of Distributed Generation (DG). The intern will learn the fundamentals of distance protection relays, implement a basic scheme in Matlab/Simulink of a standard distribution network with protection, and simulate different fault scenarios, evaluating the challenges associated with DG integration and the possibilities of using distance protection and/or developing protection schemes using it.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Everton Alves

Ref. [PES08]

Development and analysis of APIs for interaction with electric vehicles

This internship aims to explore the APIs provided by leading electric vehicle manufacturers, conducting a detailed survey of the functionalities offered by each. Additionally, a market study will be carried out on existing platforms that act as intermediaries for integration with multiple manufacturers, identifying their key differentiating factors. Finally, the intern will develop a

custom API capable of interacting with various manufacturers' web services, similar to the platforms analyzed, focusing on creating a robust and integrated solution.

Research Center: CPES - Power and Energy Systems

Internship location: INESC TEC headquarters, Porto

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Gil Sampaio

Ref. [PES00]

Generic Topic – Power and Energy Systems

Digital network communications underpin the Internet and the myriad of services we increasingly depend on, indispensable for the widespread digital transformation.

About Power and Energy Systems at INESC TEC: more information [here](#)

Robótica

Ref. [ROB01]

Detection and tracking of an underwater acoustic sources

This internship focuses on the underwater detection and tracking of acoustic sources, a critical area for underwater monitoring and maritime surveillance. The primary objective is to develop and optimize algorithms and methodologies for identifying and tracking various acoustic sources, such as vessels, underwater vehicles, and divers, based on their acoustic signatures. The project involves the study and application of signal processing techniques, including filtering, spectral analysis, and beamforming (using multiple sources), to accurately detect and localize acoustic sources in underwater environments. Key challenges include noise reduction, multi-source differentiation, and maintaining tracking accuracy in dynamic underwater conditions.

Internship location: [CRAS] [INESC TEC_FEUP]

Type: Curricular internship for completion of bachelor degree, 162 hours

Supervisors: Bruno Ferreira

Ref. [ROB00]

Generic Topic – Robotics

Robotics provides new tools and paradigms to enable robots to operate in complex and dynamic environments, shared with humans.

About Robotics at INESC TEC: more information [here](#)