# CALL FOR GRANT APPLICATIONS
# (AE2025-0259)

INESC TEC is now accepting grant applications to award 1 Research Grant (BI) within the scope of the within the TSP2Net project with reference 2023.13039.PEX, Funded by National Funds through the FCT - Foundation for Science and Technology, I.P.

## 1. GRANT DESCRIPTION

**Type of grant:** Research Grant (BI)

**General scientific area:** COMPUTER SCIENCE

**Scientific subarea:** Programming,Informatics

**Area of Work:** Time Series, Complex Networks, Algorithms

**Grant duration:** 8 months, starting on 2025-09-01, with the possibility of being renewed until the end of the project.

**Scientific advisor:** Maria Eduarda Silva

**Workplace:** INESC TEC, Porto, Portugal

**Maintenance stipend:** € 1040.98, according to the table of monthly maintenance stipend for FCT grants , paid via bank transfer. Grant holders may be awarded potential supplements, according to a quarterly evaluation process (Articles 19, 21 and 22 of the Regulations for Grants of INESC TEC and Annex II), up to a maximum limit of 50% of the monthly maintenance stipend.

INESC TEC supports costs with registration, enrolment or tuition fees, during the grant duration, under the terms established in the internal document: "Payment of Tuition fees to grant holders".

The grant holder will benefit from health insurance, supported by INESC TEC.

## 2. OBJECTIVES:

Explore inverse mapping approaches for reconstructing synthetic multivariate time series from Multilayer Quantile Graph representations, with applicability in preserving the privacy of sensitive information.
Develop a novel inverse mapping method in a multivariate context, capable of reconstructing synthetic multivariate time series data from multilayer graphs derived from original time series data.
The overall objective is to study and leverage the information embedded in transition probabilities and multilayer graph structures to generate synthetic multivariate time series data that preserves the temporal dynamics and inter-variable dependencies of the original data, while concealing sensitive information.

## 3. BRIEF PRESENTATION OF THE WORK PROGRAMME AND TRAINING:

The research work to be carried out will involve the following steps:
Study and analyze existing methods for synthetic data generation in multivariate time series contexts, particularly those based on GANs, noise-based perturbation, and graph-based representations.
Explore the theoretical foundations of quantile graphs, multilayer network models, and Markov models for representing the temporal dynamics of time series data.
Adapt, refine, and expand existing inverse quantile graph mapping methods by incorporating higher-order temporal lags and higher-order structural dependencies, based on information from Multilayer Quantile Graphs.
Compare the developed method with state-of-the-art techniques for synthetic data generation, such as TimeGAN, DoppelGANger, and noise-based perturbation techniques. Evaluate performance based on metrics of distributional similarity, correlations, dynamic behavior preservation, and privacy evaluation measures.
Test the developed method and demonstrate its applicability on different real-world datasets (e.g., energy consumption and physiological data), where temporal dynamics, inter-variable interactions, and the presence of

sensitive information are critical factors.
Compile findings into a final report.

**4. REQUIRED PROFILE:**

**Admission requirements:**
Bachelor degree in Data Science, Mathematics, Computer Science, or a related field.
The awarding of the fellowship is dependent on the applicants' enrolment in study cycle or non-award courses of Higher Education Institutions.

**Preference factors:**
Previous work involving time series analysis and/or graph analysis.
Knowledge of tensor analysis and algebraic manipulation methods, as well as time series mapping techniques into graph structures.
Experience with the R or Python programming languages.

**Minimum requirements:**
Familiarity with methods of time series modelling, Markov models, and graph theory concepts.
Ability to work independently, critical thinking, and interest in scientific research.

**5. EVALUATION OF APPLICATIONS AND SELECTION PROCESS:**

**Selection criteria and corresponding valuation:** the first phase comprises the Academic Evaluation (AC), based on the criteria referred to in Article 12 of the Regulations for Grants of INESC TEC, while the second phase comprehends the Individual Interview (EI). All factors are evaluated on a scale of 0 to 100, taking into account the applicants' merit, suitability and conformity with the preference factors.
The weight of the AC factors are as follows: Academic Qualifications (FA, 60%), Scientific Publications (PC, 0%), Experience (EX, 25%) and Motivation Letter (CM, 15%).
Candidates who score less than 50 points in the AC average will be considered excluded on absolute merit. The top five candidates approved on absolute merit will be qualified for the individual interview. The Final Grade (CF) is obtained by the weighted average of AC (80%) and EI (20%).

**DISABILITY INCENTIVE**

Candidates who present a degree of disability equal to or greater than 90% will benefit from an incentive (20) in the score of the CV Assessment.
Candidates who present a degree of disability equal to or greater than 60% and less than 90% will also benefit from an incentive (10) in the score of the CV Assessment.
Said score may, in these cases, exceed 100 points.
Candidates must demonstrate the degree of disability during the application, namely through the submission of the Multi-Purpose Medical Certificate of Disability, issued in accordance with Decree-Law no. 202/96, of October 23 - currently in effect.
Candidates must declare, in the application form, the type of disability used throughout the selection process, in order to proceed with the required adaptations.

**The Selection Jury is composed of the following members:**
President of the Jury: Maria Eduarda Silva
Full member: Vanessa Freitas Silva
Full member: Pedro Manuel Ribeiro
Substitute member: Fernando Silva

**Release of results and prior hearing:** the results of the selection process, as well as the terms and procedures for prior hearing, will be released to the applicants by email, under the terms referred to in Article 13 of the Regulations for Studentships and Fellowships of INESC TEC.

**6. FORMALISATION OF APPLICATIONS:**

**Application Documents:**

1. Motivation letter;

2. Curriculum Vitae (must include the list of previous fellowships, their type, beginning and end dates, funding entities and host institutions);
3. Certificate or diploma degree;
4. Proof of enrollment in a degree awarding study cycle or in a non degree awarding Higher Education program.
    - The proof of enrollment may be presented just during the grant hiring stage.
5. Signed declaration stating the infringement of the grant holder's duties (article 14, no. 4)
6. Documental evidence to support the country of residence, residence permit or other legally equivalent document, in cases where the applicant is a foreigner or non-resident in Portugal - valid until the beginning of the grant.
7. Other supporting documents relevant to the final assessment.

Failure to deliver the required documents within the 90-day period after the date of the notice of the conditional awarding of the grant implies its cancellation.

**Application period:** From 2025-06-26 to 2025-07-09

**Submission of applications:** the application will be formalised by submitting the form available in the *Work With Us* section of INESC TEC website.

**7. BINDING LEGISLATION AND REGULATION**

The hiring process shall comply with the current legislation regarding the Research Grant Holder Statute, approved by Law no. 40/2004 of August 18, in its current wording, as well as by the Regulations for Grants of INESC TEC and for FCT Grants Regulation in force.

For more information, please check the Regulations for Grants of INESC TEC and relevant annexes at www.inesctec.pt/bolsas