CALL FOR GRANT APPLICATIONS
(AE2024-0411)

INESC TEC is now accepting grant applications to award 1 Research Grant (BI) within the scope of the IBEX funded by National Funds through FCT - Portuguese Foundation for Science and Technology, I.P., project reference PTDC/CCI-COM/4280/2021.

1. GRANT DESCRIPTION

Type of grant: Research Grant (BI)

General scientific area: COMPUTER SCIENCE

Scientific subarea: Programming

Area of Work: Theory of Programming Languages

Grant duration: 8 months, starting on 2024-11-05, with the possibility of being renewed until the end of the project.

Scientific advisor: Renato Jorge Neves

Workplace: INESC TEC, Braga, Portugal

Maintenance stipend: € 990,98, 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:

- Study of metric lambda-calculus in the context of quantum computing;
- Extension of metric lambda-calculus with disjunctive types and respective conditional operators;
- Study of quantitative modalities in the context of quantum computing;
- Exercise the grantee's critical spirit in evaluating the research process and the results obtained.

3. BRIEF PRESENTATION OF THE WORK PROGRAMME AND TRAINING:

The current notions of approximate equivalence for (higher-order) quantum programming do not take important operations into account. Specifically the corresponding mathematical model does not include measurements, nor classical control flow, nor discard operations. Also the corresponding typing system is often times too strict, and cannot properly handle multiple uses of the same resource.
The overarching goal of this project is to tackle the aforementioned limitations. A successful completion of this goal will provide a fully-fledged quantum programming language on which to study approximate program equivalence in various scenarios. This includes not only quantum algorithmics – where for example the number of iterations in Grover's algorithm involves approximations – but also in quantum information theory, where for example quantum teleportation and the problem of the discrimination of quantum states have important ro■les.

The first two months of this project are devoted to a background study on the topics of programming theory, lambda-calculus, and (graded) typing systems that are suited to the use of a resource multiple times. The next three months are allocated to extending suitable (higher-order) approximate quantum models with measurement, classical control flow, and discard operations. The subsequent two months will be dedicated to

enriching the respective typing system so it can properly support multiple uses of the same resource. Finally the last month will be devoted to writing a report that sums up all the results obtained. Throughout the whole project we will use a number of simple case-studies to illustrate and benchmark the prospective results.

4. REQUIRED PROFILE:

Admission requirements:

- MSc student in physical engineering or 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:

- M.Sc. course with focus on the three topics that were previously mentioned;
- High overall grade in the M.Sc. degree.

Minimum requirements:

- Experience with quantum computing, lambda-calculus, and functional programming.
- B.Sc. completed with overall grade >= 15;
- Current overall grade M.Sc. degree >= 15;

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, 50%), Scientific Publications (PC, 0%), Experience (EX, 30%) and Motivation Letter (CM, 20%).
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: Renato Jorge Neves
Full member: Luís Soares Barbosa
Full member: José Nuno Oliveira
Substitute member: Luís Paulo Santos

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 2024-10-03 to 2024-10-16

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