UNIVERSIDADE DE ÉVORA

DEPARTMENT OF MECHATRONICS ENGINEERING

DOCTORAL SCHOLARSHIP - 1 VACANCY

20 of november of 2023

A call for tenders is open for one Scholarship doctoral within the scope of the project Agenda Mobilizadora: New Space Portugal (Ref.ª C644936537-00000046, Aviso ACC02/CO5-i01/2022, financed by the "Mobilising Agendas for Business Innovation" through the "Recovery and Resilience Programme (PRR) and by Portugal 2020 through the Competitiveness and Internationalisation Operational Programme and the Lisbon Regional Operational Programme and co-financed by the "ERDF", under the following conditions:

Scientific area: Mechanical Engineering, Aeronautical Engineering or Aerospace Engineering, Space and Defense Missions (Santa Maria, Azores, satellite launcher base safety monitorization).

A competition is open for the award of a PhD Scholarship, to deal with a monitoring system for the Santa Maria, Azores, satellite launcher base safety monitorization, to guarantee the security (neutralization of possible threats) of the launch port in the event of airspace intrusion by aircraft, birds, and other obstacles to the safe launch of satellites. The aim is to design and implement hardware and software for detection, classification and identification of targets measuring 10 cm, up to a minimum of 5 km away and subsequent application of countermeasures (C-UAV).

Admission requirements:

1) Be enrolled in a PhD in Mechanical Engineering; 2) Knowledge of Python; 3) Knowledge of convolutional neural networks; 4) Knowledge of image and video processing in the visible and infrared domains; 5) Knowledge of control for trajectory following; 6) Knowledge of sensors and cameras; 7) Knowledge of electronic control instrumentation; 8) Knowledge in designing electronic systems for signal acquisition; 9) Knowledge of sensor fusion.

As set forth FCT Research Scholarship Regulation No. 950/2019 of December 16, 2019, article 3 and 6, candidates for "**BI**" (Research Grants) must comply as a rule condition for the award of the scholarship, the effective inclusion in study cycles leading to the attribution of academic degrees or in courses not leading to an academic degree. Courses that do not confer an academic degree correspond to the courses provided for in subparagraph e) of paragraph 3 of article 4 of Decree-Law No. 74/2006 of 24 March and must be developed in a higher education institution in association with at least one R&D unit, including a course plan in one or several research areas of the unit.

Work plan:

1) Review of the state of the art in the scope of systems and solutions for detecting aircraft and other dangers to flight (C-UAV), namely: laser tracking systems; camera systems in the visible and infrared domains; radar systems; countermeasure systems to neutralize possible threats; distributed computing solutions; aircraft detection and identification algorithms using neural networks.
2) Definition of critical specifications for the system (C-UAV), which allow meeting the needs for the safe launch of satellites.
3) Definition of the system architecture.
4) Subsystem design, namely:
    4.1) high-level sizing of the optical detection system, based on a matrix of cameras (number, resolution, field of view, orientation, and bandwidth of cameras).
    4.2) Design of the control system for the optical detection system, using a multi-agent system or solution that guarantees equivalent performance and concession of the distributed computing system.
    4.3) Design of the gimbal system and zoom cameras (camera stabilizer, camera with magnification and respective control for target tracking).
    4.4) Image processing using artificial intelligence techniques for detection, classification and identification of flying objects, aircraft, birds, and other dangers when launching satellites.
    4.5) Support in the design of a countermeasure system to neutralize possible threats due to intrusion into the port's airspace.
5) System implementation:
    5.1) Implementation of the optical system and respective software.
    5.2) Programming neural networks to identify hazards and aircraft.
6) Field testing and system characterization, including merging information from the various systems.
7) Selection and implementation of the hardware necessary to apply countermeasures.
8) Writing the thesis and publications.

Applicable legislation and regulations: The granting of the Research Scholarship will be carried out upon the signing of a contract between the University of Évora and the scholarship holder, as set in the template former.fct.pt/apoios/Minuta_Contrato_Bolsa.docx , pursuant to the Research Scholarship Statute (Law No. 40/2004 of August 18 and Decree-Law No. 123/2019 of August 28) and in accordance with the legislation and Regulation of Research Grants of the Foundation for Science and Technology, IP in force, regulation nº950/2019 of December 16, 2019: https://files.dre.pt/2s/2019/12/241000000/0009100105.pdf and other applicable rules.

Place of work: The work will be carried out in the IDMEC Laboratories, Instituto Superior Técnico, University of Lisbon; from CENTRA, Faculty of Sciences, University of Lisbon; from AEROG, University of Beira Interior; and the Instituto Superior de Engenharia de Lisboa, Instituto Politécnico de Lisboa, under the scientific guidance of Doctor Rui Melício, Doctor Paulo Gordo, and Doctor Duarte Valério.

Duration of the scholarship(s): The scholarship will have a duration of 6 six months, starting on january of 2024. The scholarship contract may be renewed up to a maximum of 31 months or until the end of the funding project's budget allocation.

Amount of monthly maintenance allowance: The amount of the scholarship corresponds to €1 199,64, according to the table of scholarships awarded directly by FCT, I.P. in Portugal (https://www.fct.pt/wp-content/uploads/2023/02/Tabela-de-Valores-SMM_2023.pdf), payments being made monthly, by check or bank transfer.

Selection methods: The selection methods to be used will be based on the following parameters: Curriculum evaluation (100%)
The selection interview will be held in the event of a tie between the first 2 candidates, with the respective scores being: Curriculum evaluation (85%) and selection interview (15%).

Composition of the Selection Jury:

President: Prof. Rui Melício (IDMEC, Centro de Ciências e Tecnologias Aeronáuticas e Espaciais, Instituto Superior Técnico e Universidade de Évora)
1st Member: Prof. Paulo Gordo (CENTRA, Center for Astrophysics and Gravitation, University of Lisbon)
2nd Member: Prof. Doutor Duarte Valério (IMDEC, Instituto Superior Técnico, Universidade de Lisboa)
1st Alternate: Prof. Luís Santos (AEROG, Astronautics Research Center, University of Beira Interior and ISEC Lisbon, Instituto Superior de Educação e Ciências)
2nd Alternate: Prof. Leandro Barbosa Magalhães (AEROG, Astronautics Research Center, University of Beira Interior and ISEC Lisbon, Instituto Superior de Educação e Ciências)

Advertising/notification of results: The final results of the evaluation will be publicized, through an ordered list by final grade obtained posted in a visible and public place (University of Évora, Colégio Luis António Verney, Rua Romão Ramalho, nº59, Évora 7000-671), being the candidate (a) approved notified through email.

To ensure the right of prior hearing of interested parties, the Final Classification project will be announced by any written means to all interested parties.

After communicating the provisional list of the results of the evaluation, candidates have a period of 10 working days to express their opinion in a preliminary hearing of interested parties.

Application deadline and submission of applications: The tender is open from 28 of November to 14 of December of 2023 and the results of the selection will be published by 18 of December of 2023.

Applications must be formalized, obligatorily, by sending an application letter with the following documents: Curriculum Vitae, certificate of qualifications and other supporting documents considered relevant.

For the purposes of application, the evidence may be replaced by a declaration of honor signed by the candidate, but the failure to demonstrate that evidence, in the contracting phase,

possession of the required degree on the deadline for application or the non-presentation of proof of enrollment in the study cycle or non-degree course, for scholarships with this component, imply the cancellation of the candidate's application.

Academic degrees obtained in foreign countries require registration by a Portuguese Institution in accordance with Decree-Law no. 66/2018, of August 16 and Ordinance No. 33/2019, of January 25th.

The presentation of the certificate is mandatory for the signing of the contract. More information can be obtained at: https://www.dges.gov.pt/pt/pagina/recognition?plid=374

Applications must be sent by email to:

Subject: "Application for a doctoral scholarship for the New Space Portugal project"
Prof. Rui Melício
Mechatronics Engineering Department of the University of Évora
email: ruimelicio@uevora.pt