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(BL202/2025-IST-ID)

Research Studentships (for students of a Master or Integrated Master students)

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Applications are open for one Research Studentship, within the framework of 1801P.01295.1.01- MIA-BREAST (2022.04485.PTDC) - IST-ID, financed by national funds through FCT/MCTES, under the following conditions:

Scientific Area: Artificial Intelligence

Admission Requirements: *To be enrolled at an integrated master or a master.*

Workplan: Until now, we have been using neural networks with traditional architectures, namely the so-called Convolutional Neural Networks (CNNs). These networks are employed as the backbone of the Multiple Instance Learning (MIL) methodology. Although the results obtained are generally acceptable, we have observed that CNN performance declines in certain specific situations. Specifically, in cases where the breast contains small-area mass lesions. It is also evident that CNNs have some difficulty in detecting all calcifications (small bright spots in the image) present. This difficulty in identifying nearly imperceptible lesions tends to worsen when the breast tissue is dense.

However, through human visual inspection, and despite the subtlety of the lesions, the human visual system is still capable of recognizing them. Therefore, we aim to approximate the behavior of CNNs to that of the human visual system, with the goal of improving classification and detection performance in the aforementioned scenarios. Based on a review of the literature, it is evident that CNN models with a single neural hidden layer show greater similarity to the primary visual cortex (V1) of primates and are also more robust to so-called adversarial attacks. In the context of this project, these adversarial attacks can be interpreted as the presence of lesion patterns that "disturb" the pattern of healthy tissue. Thus, the aim of this research is to develop neural networks inspired by this observation.

Legislation and Regulations: Statute of Scientific Research Fellow, approved by Law nr. 40/2004, of August 18, as worded by Decree-Law nr. 123/2019, of August 28; FCT Regulation for Research Studentships and Fellowships, available on https://www.fct.pt/apoios/bolsas/docs/RegulamentoBolsasFCT2019.pdf and https://dre.pt/application/file/a/127230968 .

Workplace: The work will be developed at Instituto de Sistemas e Robótica, under the scientific supervision of Prof. Tiago Marques e Prof. Jacinto C. Nascimento

Duration: The research fellowship(s) will have a duration of 6 months. It's expected to begin in September/2025 and may be eventually renewed up to the maximum of 24 months, including the duration of the initial contract.

Monthly maintenance allowance: According to the values for Research Fellowships awarded by FCT in Portugal (https://www.fct.pt/fct-atualizou-o-valor-das-bolsas-para-2025/), the amount of the monthly maintenance allowance is € 1040.98, being the payment method of the Fellow by wire transfer.

Selection methods: The selection methods will be the following: *Curriculum evaluation, individual interview* with the respective weight of 60% and 40%, respectively.

Composition of the selection Jury: Profs. Fábio Faria, Francisco Calisto e Jacinto Nascimento.

Announcement/ notification of the results: The final evaluation results will be communicated to all applicants by email.

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Deadlines and procedures of complaint and appeal. A complaint may be lodged from the final decision within 15 working days, or an appeal to the Executive Board of IST-ID within 30 working days, both counted from the respective notification.

Application deadline and formalization: The call is open from August 22 until September 4, 2025.

It is mandatory to formalize applications with the submission of the following documents: i) B1 Form – Fellowship application (https://ist-id.pt/concursos/bolsas); ii) *Curriculum Vitae*; iii) academic degree certificate, where applicable; iv) proof of enrollment at an academic degree course (Master, Integrated Master); v) motivation letter;

Applications must be submitted through the website*: https://welcome.isr.tecnico.ulisboa.pt/opportunities/*