

(BL273/2024\_IST-ID)

### Research Studentships (for PhD students)

Applications are open for 2 (two) Research Studentships for PhD students, within the framework of CENTRA/IST-ID, UIDP/00099/2020, financed by national funds through FCT/MCTES (PIDDAC), under the following conditions:

**Scientific Area:** Physics and Astronomy (FIS-AST)

**Admission Requirements:** To be enrolled in a PhD.

**Workplan:** Collapse Project: Despite recent progress, the threshold of black hole formation in vacuum gravity is still poorly understood. The aim of this project is to further develop analytic and numerical methods to treat such spacetimes. Key to this will be the study of model problems and the use of coordinates, within the pseudospectral code bumps, adapted to the dynamics of extreme spacetimes. Within the project we aim to (finally) give a complete characterization in the axisymmetric setting before moving on to treat general 3d initial data.

Hyperboloidal' Project: The main deliverable from astrophysical numerical relativity are gravitational wave signals. From a theoretical point of view, these should be computed 'out to infinity'. In this project the student will work on the implementation of a scheme to do so from first principles. This will be performed by building on existing work in spherical symmetry, studying a number of test cases of increasing sophistication.

Ultimately the two projects will slot together to allow numerical computations of extreme spacetimes including future null infinity, and potentially serving as counterexamples to cosmic censorship.

Naturally, in both projects the students are expected to perform high-level original research to be published in prestigious international Journals.

**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 CENTRA - Centro de Astrofísica e Gravitação of IST – Instituto Superior Técnico, under the scientific supervision of Prof. David Hilditch and Dr. Edgar Gasperin.

**Duration:** The research fellowships will have a duration of 12 months. These are expected to begin in December 2024, and cannot be renewed.

**Monthly maintenance allowance:** According to the values for Research Fellowships awarded by FCT in Portugal ([https://www.fct.pt/wp-content/uploads/2024/02/Tabela-de-Valores-SMM\\_atualizacao-2024.pdf](https://www.fct.pt/wp-content/uploads/2024/02/Tabela-de-Valores-SMM_atualizacao-2024.pdf)), the amount of the monthly maintenance allowance is €1259,64 being the payment method an option of the Fellow by Wire Transfer.

**Selection methods:** The selection methods will be the following: Curriculum evaluation and individual interview, with the respective weight of 50%+50%.

**Composition of the selection Jury:** Ilídio Lopes, Vitor Cardoso, David Hilditch.

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

**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



Fundação  
para a Ciência  
e a Tecnologia

**Application deadline and formalization:** The call is open from November 8 until November 21, 2024.

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 (PhD);

Applications must be submitted to the email: [david.hilditch@tecnico.ulisboa.pt](mailto:david.hilditch@tecnico.ulisboa.pt)



Fundação  
para a Ciência  
e a Tecnologia