FOUNDATION FOR RESEARCH AND TECHNOLOGY – HELLAS (FORTH)
INSTITUTE OF COMPUTER SCIENCE

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https://www.forth.gr/

Project: TITAN – Frugal Artificial Intelligence and Application in Astrophysics. An ERA Chair HORIZON EUROPE grant funded by the EU.

Position: Ph.D. student position
Start date: September 1st, 2023
Duration: 3 years with possibility of extension
Salary: 15.000-17.000 €/year (gross income depending on family status)

Description **Morphology and Spatial Distribution of the Dust Emission using Deep Learning Methods:** Energetic quasar feedback from super massive black holes (SMBH) is commonly postulated as the necessary mechanism to explain the observed dearth in the number of ultra-massive galaxies predicted by the currently favored CDM cosmology. And yet, while the paradigm for the origin of quasars is thought to be well understood in the nearby Universe, it is still unclear how SMBH accretion events are commonly triggered at high redshift, beyond cosmic noon (redshift z>3), where the physical conditions of the gas and dust in quasar host galaxies were significantly different from those at low redshift. The HORIZON project "TITAN – Frugal Artificial Intelligence and Application in Astrophysics", funded under the HORIZON-WIDERA-2022-TALENTS-01 program aims to develop novel approaches for morphology and spatial distribution estimation of dust emission using (deep) machine learning methods.

Within this project, we seek one Ph.D. student who will study different models for imaging (2D) as well as spectral cube (3D) data analysis and source decomposition, in order to separate the different structural components (galaxy disk, compact clumps, tidal streamers, and diffuse emission) both in dust continuum and in gas. To perform these tasks, novel blind source decomposition approaches will be developed based on advanced signal processing, and (deep) machine learning techniques. These techniques will be employed for separating the different components contained in the data, depending on both their spectral and spatial morphologies. The study will focus on data from ALMA, VLT/MUSE and JWST IFU observations for the archetype of the high-z obscured quasar population, WISEJ 2246-0526, a multiple-merger system of galaxies at z = 4.6.

The doctoral student will be located at the premises of FORTH with a strong collaboration with the CosmoStat Laboratory at CEA Saclay. The doctoral student will be supervised by Jean-Luc Starck (FORTH/CEA), Vassilis Charmandaris (FORTH), and Tanio Diaz Santos (FORTH).

Required qualifications:
- BSc and MSc in Physics, Computer Science, or a related field
- Good Knowledge of English
- Willingness and ability to work cooperatively within a team, to learn, and to adapt to the project
- Physical presence at FORTH, Heraklion, Crete for the duration of the position

Desired qualifications:
- Experience with the analysis of radio and/or optical observations

FORTH is the largest and most prestigious research center in Greece with modern facilities and highly qualified personnel. It comprises ten research institutes located throughout Greece. The Institute of Computer Science (FORTH-ICS) and the Institute of Astrophysics (FORTH-IA) are located in the main campus, around 5km south of Heraklion on the island of Crete, Greece. Members from both FORTH-ICS and FORTH-IA are involved in the TITAN project. The group is committed to diversity and equality, encourages applications from women and underrepresented minorities, and supports a flexible and family-friendly work environment. Benefits for this position include retirement, health care, and parental leave. **CEA Paris-Saclay** is located 20 km south of Paris, France, near various universities and other research centers. The CosmoStat group is a diverse and multi-disciplinary team of researchers working on various topics in cosmology and data science.

Interested candidates are invited to communicate with J.-L. Starck jstarck@cea.fr , V. Charmandaris vassilis@physics.uoc.gr and T. Diaz Santos tanio@ia.forth.gr, sending a cover letter, their CV, and 2 recommendation letters by **November 15, 2022**.