QUBIC OBSERVATORY

CALL FOR A PHD FELLOWSHIP IN ASTROPHYSICS.
UNIVERSIDAD NACIONAL DE SAN MARTIN, ARGENTINA WITH COTUTELLE AND STAYS IN THE UNIVERSITY OF HARVARD, USA.

DEVELOPMENT OF MACHINE-LEARNING TECHNIQUES FOR THE SEARCH OF PRIMORDIAL GRAVITATIONAL WAVES WITH QUBIC

The quest for B-mode polarization of the Cosmic Microwave Background is among the main challenges in Observational Cosmology. Measurement of B-mode polarization in the CMB will be clear evidence of the presence of primordial gravitational waves which are theoretically expected to be produced during inflation about 10^{-35} seconds after the Planck epoch. The B-mode measurement is perhaps the most difficult cosmological challenge because the expected signal is very small. It requires high sensitivity and negligible instrument systematic effects with wide frequency coverage in order to separate the primordial signal from foreground emissions.

QUBIC (Q&U Bolometric Interferometer for Cosmology https://www.qubic.org.ar/) is a novel instrument concept dedicated to the search for B-modes by measuring the Q and U polarization modes. It brings together the advantages of bolometers with high sensitivity and those of interferometers that have an excellent control of instrument systematic effects and signal identification. The interferometric nature of QUBIC (together with broadband observation and beam frequency dependence) also allows spectro-imaging and improved spectral resolution with respect to imagers, providing a significant advantage concerning foreground removal. The Technological Demonstrator has been installed at the QUBIC site at 5000 m.a.s.l. in the province of Salta in Argentina in 2022.

Subtracting the foregrounds components from the observations is of great importance for measuring the primordial B-mode component. The main objective of this thesis workplan is to develop a method to remove the astrophysical foregrounds from the acquired signal by using artificial intelligence and machine-learning techniques.

It is also intended to develop data analysis techniques also based machine-learning for the QUBIC data analysis pipeline. These includes: the separation between astrophysical and atmospheric signals; map-making; and polarized angular power spectrum measurement.

Additional information: Evaluation of applicants will start on January 1st, 2023 and continue until the position is filled. The PhD student will, at least, have two six-month stays at the University of Harvard, EE.UU.

Requirements: Candidates must have a degree in astronomy or physics at the time of taking the fellowship.

Selection process: all applications will be reviewed by a panel of experts. Following this round, a shortlist of candidates will be interviewed and the best candidate will be offered the opportunity to join the PhD program.

Application: Please send in a resume, relevant information and the e- mail addresses of two references all in a single PDF file at your earliest convenience.

The working place will be ITeDA (CNEA, CONICET, UNSAM), Centro Atómico Constituyentes, Comisión Nacional de Energía Atómica, Av. Gral. Paz 1499, San Martín, Buenos Aires with at least two six-month stays in Harvard University, 17 Oxford Street, Cambridge, MA 02138, USA.

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