TOSCA PhD position

Machine learning for gravitational lensing analysis of massive radio surveys

Keywords: Machine learning, gravitational lensing, imaging methods in radio astronomy, artificial intelligence, inverse problems, SKA.

Observatoire de la Côte d'Azur invites applications for a PhD position in machine learning for astrophysics. The successful candidate will work with Dr. Simon Prunet and Prof. André Ferrari in J.-L. Lagrange Laboratory, within the ANR funded project TOSCA on weak lensing statistics for cosmology, which investigates synergies between optical and radio surveys, with partners in CEA Saclay, Nice, Caen and Geneva. The successful candidate will be based in Nice (F) with regular visits to Saclay, and will collaborate very closely with all TOSCA members, at CEA, Nice, Caen and Geneva.

PhD project summary: Weak gravitational lensing effects by large scale structures in the Universe entail small, coherent perturbations in the shape of background galaxies. Revealed about twenty years ago in large optical galaxy surveys, weak gravitational lensing has been only recently measured with reasonable accuracy in radioastronomical data.

The SKA radio-telescope, and in particular its high frequency component, will allow to map the emission of radiogalaxies with unprecedented accuracy, and will thus pave the way to studying weak gravitational lensing by large scale structures with radio datasets. This program is challenging, since it entails developing shape measurement methods that are both precise and applicable to massive radio surveys. Indeed, shape measurement methods developed for optical surveys are inapplicable as such, because of the complexity of the radio point spread function.

Starting from the radio visibilities (Fourier space samples), the PhD student will develop novel imaging methods in radio astronomy, with a particular emphasis on galaxy shape measurements and their statistical properties. These methods will rely

on state of the art machine learning and artificial intelligence algorithms, and will be validated on realistic simulations of SKA data.

The candidate should hold a Master degree in data processing or astrophysics with a knowledge in machine learning basics. Applicants should send a CV, a cover letter and a transcript of records to Simon Prunet simon.prunet@oca.eu and André Ferrari andre.ferrari@univ-cotedazur.fr.

The successful candidate will join the SI team of J.-L. Lagrange laboratory which gathers experts in data science, image processing and astrophysics. The team is located in Parc Valrose in the center of Nice.

Contacts:
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Deadline for applications: 31st May 2023
Start date: October 2023 or earlier if available.
Contract duration: 3 years