Borsa di Ricerca – Piano Formativo

Title of the Project: Finding cosmic voids in weak lensing observations

Durata: 4 mesi

Supervisor: Lauro Moscardini

Piano Formativo:

Dense and underdense regions of the Universe provide a valuable window into the evolution of cosmic structures from early times to the present. Specifically, weak gravitational lensing enables us to map the total projected matter density along the line of sight. While galaxy clusters trace the dense nodes of large-scale filamentary structures, cosmic voids represent the underdense regions within the cosmic web. This project aims to optimize a two-dimensional void finder using projected maps from light-cone numerical simulations and to characterize their properties through weak lensing observations. We anticipate that the shapes and profiles of weak lensing voids will be sensitive to modifications of gravity, as described by the Hu-Sawicky model in the f(R) formalism. The goal of this project is to contribute to a deeper understanding of cosmological models beyond the standard ΛCDM framework and to prepare the tools to analyze the data from the ongoing Euclid wide-field survey.

The candidate must possess a good knowledge of the scientific topics related to the research project (documented by the academic CV and/or the Master's thesis and/or any other publication): gravitational lensing, modelling of cosmic voids and cosmological simulations.

During the fellowship, the candidate will extend his/her knowledge on cosmological exploitation of cosmic voids and on the treatment of mock and real weak lensing observational data. Moreover, the candidate will also acquire the basic elements for writing and editing a scientific article, in English, regarding the above-mentioned topic, with the aim of submitting this work to a peer-reviewed scientific journal.

Contact:
Lauro Moscardini (lauro.moscardini@unibo.it)