A new deep-learning framework for stellar dynamics: predicting mass, distance and age of globular clusters

Paolo Bianchini*[1]

[1]ObAS – Observatoire Astronomique de Strasbourg – France

Résumé

The measurement of the mass of stellar systems is one of the main goals of astrophysics. However, even for simple and well studied systems like globular clusters (GCs), mass measurements rely on multi-parametric dynamical models that are often degenerate and suffer from an uncertainty of up to a factor of _˜2. In this talk, I will present the algorithm π-DOC (Predicting Images for the Dynamics Of stellar Clusters, Chardin & Bianchini 2021), based on the combination of a deep-learning framework and direct N-body simulations run on GPUs. The algorithm is made of two convolutional networks trained to learn the non-trivial transformation between an observed GC luminosity map and its associated mass distribution, age, and distance. Preliminary tests on a set of observed GCs demonstrate that π-DOC is able to predict, almost instantaneously, the dynamical properties of GCs while avoiding the measurement biases of traditional dynamical models.
These encouraging results demonstrate that our deep-learning framework offer a viable method to exploit and maximise the information contained in expensive N-body simulations.
In the future, we plan to apply the algorithm π-DOC to systematically measure precise properties of GCs, both in the MW and in external galaxies, from current and future observations.

*Intervenant