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GalaPy, the highly optimised C++/Python spectral modelling tool for galaxies

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Fostered by upcoming data from new generation observational campaigns, we are about to enter a new era for the study of how galaxies form and evolve.
The unprecedented quantity of data that will be collected, from distances only marginally grasped up to now, will require analysis tools designed to target the specific physical peculiarities of the observed sources and handle extremely large datasets.
One powerful method to investigate the complex astrophysical processes that govern the properties of galaxies is to model their observed spectral energy distribution (SED) at different stages of evolution and times throughout the history of the Universe.
To address these challenges, we have developed GalaPy, a new library for modelling and fitting galactic SEDs from the X-ray to the radio band, as well as the evolution of their components and dust attenuation/reradiation.
On the physical side, GalaPy incorporates both empirical and physically-motivated star formation histories, state-of-the-art single stellar population synthesis libraries, a two-component dust model for extinction, an age-dependent energy conservation algorithm to compute dust reradiation, and additional sources of stellar continuum such as synchrotron, nebular/free-free emission and X-ray radiation from low and high mass binary stars.
On the computational side, GalaPy implements a hybrid approach that combines the high performance of compiled C++ with the user-friendly flexibility of Python, and exploits an object-oriented design via advanced programming techniques.
GalaPy is the fastest SED generation tool of its kind, with a peak performance of almost 1000 SEDs per second.
The models are generated on the fly without relying on templates, thus minimising memory consumption.
It exploits fully Bayesian parameter space sampling, which allows for the inference of parameter posteriors and thus facilitates the study of the correlations between the free parameters and the other physical quantities that can be derived from modelling.
The API and functions of GalaPy are under continuous development, with planned extensions in the near future.
In this talk, I will introduce the project and showcase the photometric SED fitting tools already available to users.

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