PyAutoFit: Classy Probabilistic Programming for Cosmology & Cancer

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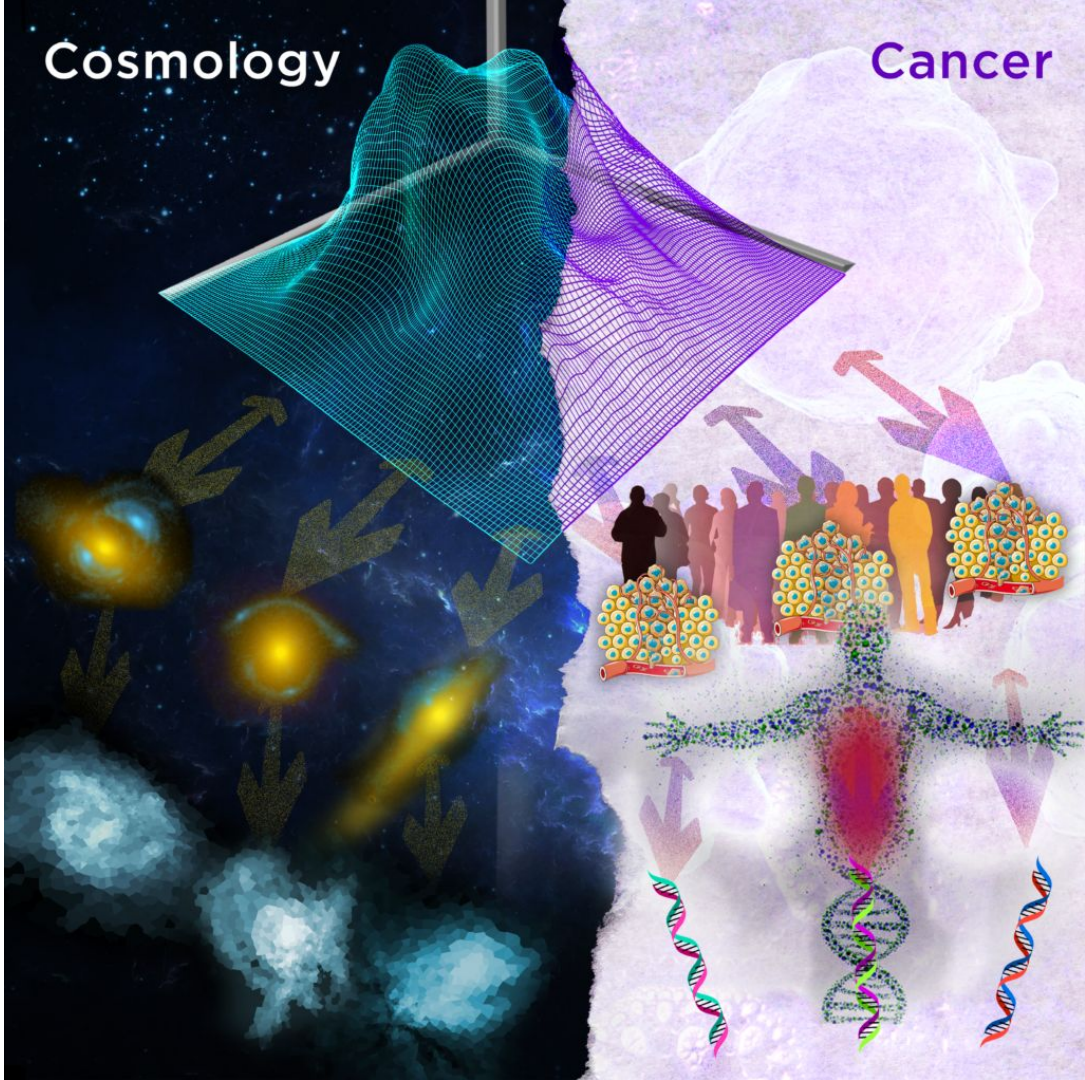


PyAutoFit: Classy Probabilistic Programming

A probabilistic programming language (PPL) provide a framework that allows users to easily specify a probabilistic model and perform inference automatically (e.g. STAN, PyMC3, Pyro).

PyAutoFit is a PPL made by Astronomers, for Astronomers!

Checkout the following links for a complete overview of how PyAutoFit works:

GitHub: https://github.com/rhayes777/PyAutoFit

Readthedocs: https://pyautofit.readthedocs.io/en/latest/

JOSS Paper: https://joss.theoj.org/papers/10.21105/joss.02550

You can try **PyAutoFit** right now, without any installation, at the following Binder link:

Binder: https://mybinder.org/v2/gh/Jammy2211/autofit_workspace/master?filepath=introduction.ipynb

Cosmology: Graphical Models of the Universe

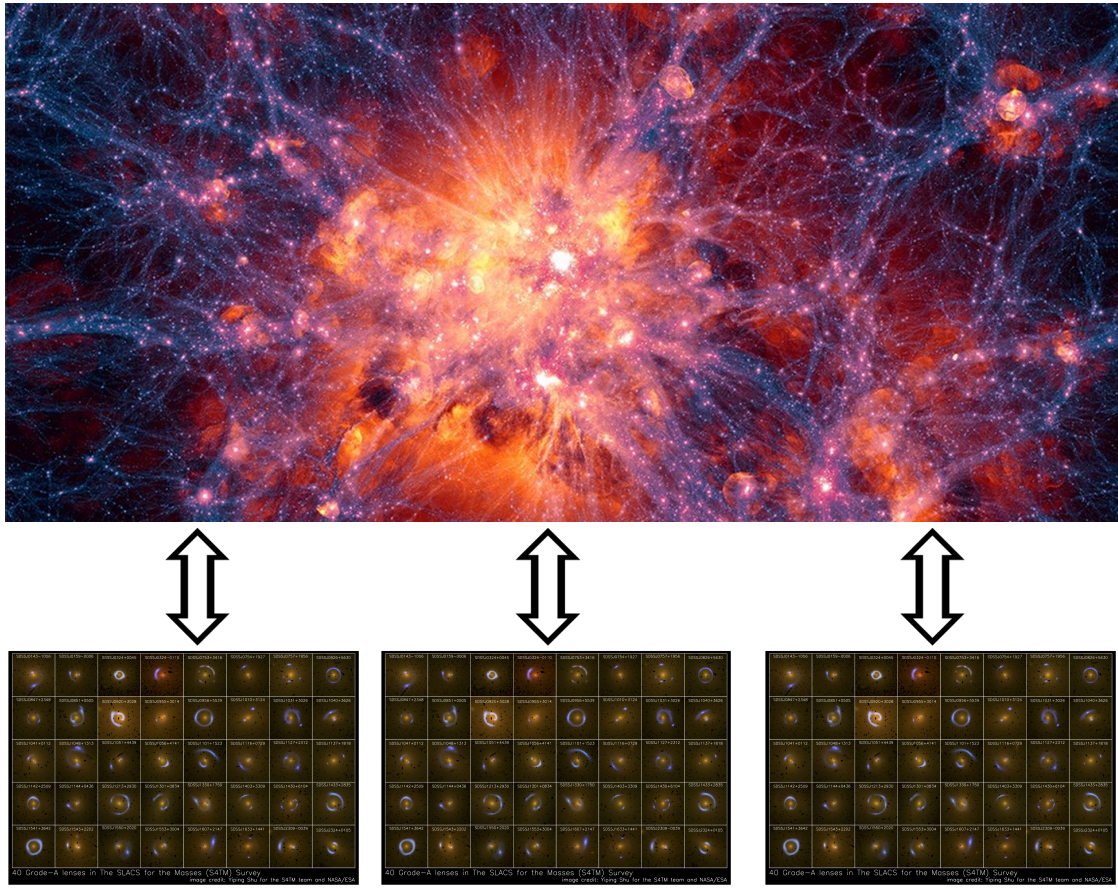
PyAutoFit can compose multi-level graphical containing hundreds of model components and thousands of free parameters.

For **Cosmology:**

- The **lower levels** of the graphical model fit the light and mass distributions of strongly lensed galaxies to imaging datasets.

- The **higher levels** are the Universe's cosmological parameters.

To overcome the **curse of dimensionality**, graphical model-fitting uses an [expectation propagation framework].



Cancer: Improving Diagnosis and Treatment

Using **PyAutoFit**, we are fitting graphical models of cancer growth which separate the multi-scale complexity of biochemistry:

- The **lower levels** represent how (epi-)genetic profiles of a variety of cancers respond to treatments and model tumour evolution and dynamics.

- The **higher levels** describe patient outcomes during cancer treatment.

The goal is to perform this analysis on a large sample of patients and create an evidence based and predictive model of effective cancer treatments.