

---

# Search for galaxy-scale strong lenses in DES and CFIS

Frédéric Courbin\*<sup>2,1</sup>

<sup>2</sup>EPFL – Switzerland

<sup>1</sup>Laboratoire d'astrophysique, Ecole Polytechnique Fédérale de Lausanne (EPFL) – Observatoire de  
Sauverny, CH-1290 Versoix, Switzerland, Switzerland

## Abstract

Galaxy-scale strong lenses, if discovered in sufficient numbers, consist in a laboratory to study galaxy evolution and to measure the Hubble parameter in the late universe in a single-step process using time delays in strongly lensed sources: galaxies, quasars, supernovae. These very rare objects are hard to find not only because they are rare but also because their morphology on the plane of the sky can be mimicked by other objects such as spiral galaxies, mergers, ring galaxies or simply fortuitous clustering of unrelated galaxies. I will show how machine learning can be used to find these objects in single band from the CFIS survey and in multi-band using DES and I will illustrate the challenges faced and how (some of them) can be circumvented. Our machine learning tools are complemented with new techniques to deblend the lens and source plane using either autoencoders or generalized morphological component analysis. We then devise an automated MCMC modeling pipeline to enable science with new large samples of lenses, not only the present CFIS+DES one but also the ones to come with Euclid, Rubin and Roman. When Euclid will be on sky, any lens-find and modeling pipeline will have to be able to find 50-70 lenses per days among 200'000 galaxies below a VIS magnitude of 21.

Slides: in PDF and Keynote

Video: <https://youtu.be/zL3w3K5Az-E>

**Keywords:** cosmological parameter,  $H_0$ , galaxy evolution

---

\*Speaker