

Building new brains for Adaptive Optics on giant optical telescopes.

jeudi 11 juillet 2024 16:00 (45 minutes)

The field of experimental astronomy is entering an exciting new era, with the emergence of extremely large telescopes, hosts to primary mirrors the size of several basketball courts. Among the many challenges associated with the construction and operations of such giant scientific infrastructures, the complexity of embedded computing facilities is notably heavy. In particular, the real-time control of adaptive optics (AO) systems, the core components of giant telescopes used to compensate the strong blur induced by stochastic fluctuations of the atmospheric turbulence, is becoming a key challenge. These multi-million euros engineering marvels, require extreme computing facilities to control the thousands of actuators they host, adjusting the wavefront locally with a stroke of a few microns, from the thousands of measurements produced every thousandth of a second by high speed and low noise sensors. To make these unique facilities operational, billions of numbers have to be crunched at high accuracy and in real-time. Our team at Observatoire de Paris has developed novel approaches based on deep connectionist architectures able to augment the classical control workflows used in these facilities. I will review the various methods we currently use to denoise sensors data, implement non-linear wavefront reconstruction and realize predictive control based on both supervised and reinforcement learning. I will also review the several ways to build trust in such extreme data processing context and discuss future challenges as we design systems able to observe rocky exoplanets around other stars.

Orateur: GRATADOUR, Damien (Observatoire de Paris)

Classification de Session: Astrophysics

Classification de thématique: Invited talks