EPSC Abstracts
Vol. 12, EPSC2018-266, 2018
European Planetary Science Congress 2018

EPSC European Planetary Science Congress

ExoAI: Deep learning in exoplanet spectroscopy

Ingo Waldmann (1), Tiziano Zingales (1)
(1) Dept. Physics & Astronomy, University College London, Gower Street, London, WC1E 6BT, UK (ingo@star.ucl.ac.uk)
(2) INAF – Observatorio Astronomico di Palermo, Piazza del Parlamento 1, 90134 Palermo, Italy

Abstract

The field of exoplanetary spectroscopy is as fast moving as it is new. Analysing currently available observations of exoplanetary atmospheres often invoke large and correlated parameter spaces that can be difficult to map or constrain. This is true for both: the data analysis of observations as well as the theoretical modelling of their atmospheres. Modelling both sets of correlations in data and modelling is key to understanding the nature of exoplanet atmospheres.

In recent years, bayesian atmospheric retrieval algorithms have become the norm in exoplanet characterization.
Traditional atmospheric retrievals are limited by the sampling time required to fully map the likelihood space of the solution. Such large sampling processes do consequently require the atmospheric forward model to be fast, and hence simplistic. Whilst simple forward models are sufficient for the resolution and signal-to-noise of currently available Hubble data, this will not be the case in the era of JWST or Ariel. Though, more complex forward models require more computation time, making them the paramount bottleneck of next generation atmospheric retrievals.

In this talk I will discuss how these improvements in deep learning can be applied to solve correlations in the models as well as speeding up the statistical sampling.

By designing deep neural networks, we can significantly speed up data analysis and interpretation and allow our current models to ‘learn from experience’. Such AI driven systems will help to resolve model correlations, and allow us to incorporate complex forward models in the atmospheric retrieval of extrasolar planets.