**V Conference on Active Galactic Nuclei
and Gravitational Lensing
June 13-17, 2022, Topola, Serbia**

EMULART: EMULATING RADIATIVE TRANSFER WITH AUTO-ENCODERS

João Rino-Silvestre

Centra, Instituto Superior Técnico, Av. Rovisco Pais, 1049-001 Lisboa, Portugal

E-mail: joao.silvestre@tecnico.ulisboa.pt

Dust is a major component of the interstellar medium. Through scattering, absorption and thermal re-emission, it can profoundly alter our observations. Models for dust composition and distribution are necessary to better understand and curb the impact of dust on observations. Furthermore, dust emission is important for understanding various astrophysical objects which it surrounds.

Radiative transfer modelling is a critical tool in the study of the impact of attenuation and reddening by dust on the observed properties of galaxies and active galactic nuclei. From comparing the resulting simulations with real observations in the corresponding wavelengths we can infer physical properties. These simulations present, however, approximately a linear computational cost increase with the desired information resolution.

We propose the use of an autoencoder, for dimensionality reduction, combined with a spatial approximate Bayesian inference method to emulate radiative transfer high information models from low information models.

We show, for a simple spherical dust shell model with anisotropic illumination, that our approach successfully emulates the reference

simulation starting from less than 1% of the information. Our emulations of the model at different viewing angles present median residuals under 15% across the spectral dimension, and under 48% across spatial and spectral dimensions; furthermore, it infers estimates for ∼85% of information not present on the input, all within a total running time around 20 minutes, estimated to be 6× faster than the present target high information resolution simulations, but up to 50× faster when applied to more complicated simulations.