Title:
Realising the potential of large spectroscopic surveys with machine-learning

Abstract:
Over the last decade, the community put strong efforts in building massive spectroscopic surveys, for instance RAVE, Gaia-ESO, and APOGEE. The on-going and next generation of spectroscopic surveys, such as SDSS-V, Gaia-RVS, 4MOST and WEAVE will gather several million spectra, opening new challenges in terms of data analysis and precision/accuracy of the desired abundances. To deal with the sheer number of stellar spectra, ML methods are crucially needed for a precise and fast stellar parameterisation. In this talk, I will present past and recent developments in the field of machine-learning applied to Gaia-ESO and RAVE surveys. I will also focus on Gaia DR3, which provided the community with one million RVS spectra covering the CaII triplet region. One third of the spectra have a signal-to-noise ratio from 15 to 25 per pixel. I will demonstrate that precise parameterisation can be achieved for such a type of dataset by using a hybrid Convolutional Neural-Network (CNN) and the full Gaia data product. This approach is designed to effectively combine the Gaia DR3 RVS spectra, photometry (G, Bp, Rp), parallaxes, and XP coefficients and is able to extract information from non-spectral inputs to supplement the limited spectral coverage of the RVS spectrum. We manage to characterize the [α/M] − [M/H] bimodality from the inner regions to the outer part of the Milky Way, which has never been characterized using RVS spectra or similar datasets. I will also discuss on the benefits to use CNNs for future large scale spectroscopic surveys such as 4MOST.