



Contribution ID : 78

Type : **Contributed talk**

WEAVE-Pristine survey: NLTE-Informed Machine Learning for Stellar Parameters and Abundances in Pristine-selected metal-poor stars.

Wednesday, 28 October 2026 12:45 (10)

Homogeneously analysing the chemical signatures of the Milky Way's most pristine metal-poor stars is essential to reconstruct its early assembly and first-star nucleosynthetic yields. Over the next few years, WEAVE in the North and 4MOST in the South will enable high-resolution, multi-object spectroscopic follow-up of millions of Gaia stars. We present a machine learning pipeline for the WEAVE-Pristine survey to automate analysis of high-resolution ($R \sim 20,000$) spectra of very ($[\text{Fe}/\text{H}] < -2$) to extremely ($[\text{Fe}/\text{H}] < -3$) metal-poor star candidates in the Pristine Data Release 2. The neural network is trained on +100,000 synthetic spectra interpolated from the MARCS atmosphere grid and varying 15 elements of which 9 of them were computed in Non-Local Thermal Equilibrium (NLTE) using the MPA/1DNLTE spectral synthesis code. To reduce the synthetic gap, we augment the spectra on-the-fly during training with WEAVE instrumental effects. Thus, we have an end-to-end pipeline that spans from the generation of raw synthetic spectra to the final prediction of stellar labels and their uncertainties, including atmospheric parameters (T_{eff} , $\log g$, $[\text{Fe}/\text{H}]$, microturbulence) and individual chemical abundances $[\text{X}/\text{Fe}]$ for 15 species: alpha-elements (O, Mg, Si, Ca, Ti), iron-peak (Cr, Mn, Ni), light elements (Na, Al), neutron-capture (Sr, Ba, Eu), and C/N. The pipeline is tested on both synthetic and observed spectra from early internal release of WEAVE observations, including stars in the very metal poor globular cluster M15 and the solar metallicity open cluster NGC 6819.

Did you give a contributed talk at CASCA 2026?

No

If you are selected for a poster, would you be interested in giving a short flash talk on your work?

Yes

What is your career level?

MSc

Which keyword describes the area of focus of this talk?

Stars & stellar clusters

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Session Classification : Galaxies, Gas/dust, Solar system & Stars