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Exploring the effects of external photoevaporation in Trumpler 14, with the use of neural networks

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Stellar clusters often host massive stars interacting with the circumstellar material around low-mass stars. The large amounts of far-ultraviolet radiation (FUV) produced by these massive stars cause the effect of external photoevaporation, where gas from the outer layers of the disk around a low-mass star gets depleted. It has been shown that this process could directly affect the evolution of the circumstellar disk and, therefore, planet formation. We have investigated the effects of external photoevaporation in disks around young stars in Trumpler 14. This region contains more than 20 OB-type stars and shows very low extinction, making it a perfect target to investigate the effect. Using MUSE/VLT optical Integral Field Spectroscopic data, we obtained low-resolution optical spectra for several thousand stars in the cluster. We used a conditional invertible neural network (cINN) developed by Kang et al. (2023) to classify the young low-mass stars and estimate their photospheric parameters. The network was trained using synthetic spectra, together with some well-characterized observed spectra from class III template stars. In its initial form, the network takes as input the spectrum of a star and derives the effective temperature (Teff), the gravity (log g), the extinction (AV), and the veiling (rveil). We have shown that this technique effectively classifies young low-mass stars, but the classification becomes challenging as the stellar effective temperature increases above ~4200K. We will report on the results of our investigation of improving the network's classification methodology, including a more accurate treatment of the effect of veiling.

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