

# 21cm foreground removal with machine learning

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Observation of the 21cm signal through intensity mapping is a promising probe of large-scale structures in the universe. The central challenge of 21 cm intensity mapping is that the method is highly sensitive to the bright astrophysical foregrounds. Traditional component separation requires exquisite spectral purity to subtract the foreground components with smooth spectral responses from the HI signal with fluctuating spectral features. However, such methods are sensitive to systematics that distort the spectral smoothness, resulting in foreground residuals in the cleaned data. In this work, we explore the possibility of using machine learning to subtract both foreground and systematics from data. We test our machine learning network on a number of sky simulation models and instrumental effects. We compare our foreground subtraction results with those obtained using traditional approaches like the principle component analysis (PCA). We found that our network outperforms PCA in terms of signal loss and the results are robust against different sky models and instrumental responses.

**Primary author:** CHEN, Tianyue (EPFL)

**Presenter:** CHEN, Tianyue (EPFL)

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