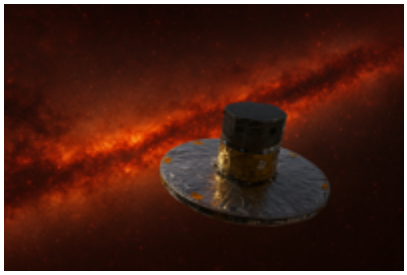

Contribution ID: **79** Type: **not specified**

# Stellar Parameters Using J-PLUS DR4 Photometry and Gaia Parallaxes via PCA

*Wednesday 28 January 2026 12:35 (7 minutes)*

Accurately deriving stellar parameters Teff, log g, [Fe/H], and [α/M] for millions of stars is critical for unraveling the Milky Way's formation and evolution, yet spectroscopy remains costly and prone to selection biases. We present a purely algebraic method that recovers these quantities from a combination of multifilter photometry and parallax from Gaia DR3: a principal-component analysis (PCA) of colours and distance modulus followed by low-order polynomial regression. The approach is flexible, easy to interpret, requires only a modest spectroscopic training set from LAMOST, and can be applied to any survey. Applied to J-PLUS DR4, which images around 5000 deg² with 12 bands (seven of them narrow), it yields a catalogue of fifteen million stars whose parameters reproduce independent LAMOST measurements with precision comparable to that of low-resolution spectra, where parallaxes from Gaia allow us to predict surface gravity. This photometric catalogue enables science that would be difficult with spectroscopy alone, such as systematic selection of metal-poor ([Fe/H] ⊠ −1.5) populations to trace ancient merger debris and study them with Gaia astrometry, mapping of stellar streams across thousands of square degrees, or automatic flagging of white dwarfs through their distinctive location in the [α/M]–[Fe/H] and log (g) –Teff planes. Because the model is survey-agnostic and lightweight, it remains effective even when only a handful of spectra are available, making it ideal for sparsely sampled regions.

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