

Z112r Differentiable Physical Models for Astronomy

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Abstract: The technology that underpins machine learning – differentiable programming – is poised to revolutionise astronomy and astrophysics, making it possible for the first time to fit very high dimensional models: hierarchical models describing every star in a survey; the sensitivity of millions of pixels in a detector; models of images or spectra with very many free parameters; or neural networks that represent physics we cannot easily solve in closed form.

It also enables fundamental information-theoretic quantities like the Fisher information to be calculated, allowing for determination and optimization of the information content of an experiment.

I will give an overview of recent work applying this to astronomy and in particular exoplanet science, giving examples from imaging and time series data.