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Inferring Planetary Transits Parameters with Physics-constrained Deep Learning Models

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Deep learning models offer several appealing properties for solving the inverse problem on transit light curves: they can learn arbitrary time-correlated noise distributions, provided there are enough examples; they are commonly scalable with respect to the number of examples and free parameters; they are highly flexible by allowing any differentiable module to be integrated. We discuss various existing or promising approaches to use neural networks for inferring planetary transit parameters, all circumventing the need for explicit likelihood estimation. In particular, we present a work in which we use an explicit forward transit model integrated as an additional constraint in the loss function in a deep learning framework. We show on simulated data how this approach reduces the prediction bias compared to otherwise physics-agnostic models, and finally discuss its applicability to real data and more generally the limitations of deep learning for this problem.

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