A Kaczmarz approach to Galactic Archaeology

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Abstract

We consider the problem of reconstructing a galaxy's stellar population distribution function from spectroscopy measurements. These quantities can be connected via the single-stellar population spectrum, resulting in a very large scale integral equation with a system structure. To solve this problem, we propose a projected Nesterov-Kaczmarz reconstruction (PNKR) method, which efficiently leverages the system structure and incorporates physical prior information such as smoothness and non-negativity constraints.

Keywords: Astrophysics, Galactic Archaeology, Inverse and Ill-Posed Problems, Kaczmarz Method, Nesterov Acceleration, Large Scale Problems