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Towards optimal extraction of dark matter signal from the Ly-alpha forest

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The Ly-alpha forest traces the cosmic structure formation on smaller scales than complementary probes such as 21cm intensity mapping or CMB measurements. It is therefore well suited to study modern theories of fuzzy dark matter. However, the extraction of small scale structure information from the Ly-alpha forest poses some challenges as some of the observables become degenerate with the temperature of the IGM, the unknown peculiar velocities affect the spectral shapes of observed absorption features, the line saturation limits the range of observable densities and instrumental noise affects the predictive power of parameter estimations. In this presentation, I will discuss potential ways to overcome these challenges, achieve a full reconstruction of the underlying density field, and make optimal use of highest spectral resolution Ly-alpha forest data for constraining modern theories of dark matter.

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