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How much useful cosmological information can we capture beyond the linear regime of structure formation?

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During the nonlinear evolution from Gaussian initial conditions, Fourier modes of the cosmological matter density field gradually develop statistical dependence. A precise understanding of this cosmic (co)variance is essential for the ultimate success of the ambitious upcoming wide-field surveys targeting cosmic acceleration or modified theories of gravity. I will discuss the dynamics of the information within the dark matter field and how its affects the power spectrum, and implications for cosmological parameter inference. I'll show how to design from first principles simple yet efficient analysis of the matter field, that eventually must rely on a non-linear transformation of the field. These transformations such as the logarithmic transformation and its generalization the A* transformation are typically much better tracers of the linear density and recover up to a factor of a few more information.

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