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Analysis of classical liquids using functional renormalization group

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The development of theoretical methods for classical liquids is a longstanding problem in statistical mechanics. Accurate and efficient methods for classical liquids benefit, for instance, analysis of chemical reactions. In this talk, I will present an application of the functional renormalization group to classical liquids. We develop a formulation suitable for a hard-core repulsion and introduce the Kirkwood superposition approximation to truncate the hierarchy of the flow equations in the vertex expansion. In a numerical test on a one-dimensional solvable model, the functional renormalization group shows more accurate results than the integral-equation methods such as the hypernetted chain and the Percus-Yevick equation, which are conventional methods for classical liquids.

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