# PROPAGATION OF CHAOS AND CORRECTIONS TO MEAN FIELD FOR CLASSICAL INTERACTING PARTICLES

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We consider a system of classical particles, interacting via a smooth, long-range potential, in the mean-field regime, and we analyze the propagation of chaos in form of sharp estimates on many-particle correlation functions. While approaches based on the BBGKY hierarchy are doomed by uncontrolled losses of derivatives, we propose a novel non-hierarchical approach that relies on discrete stochastic calculus with respect to initial data. This result allows to rigorously truncate the BBGKY hierarchy to an arbitrary precision on the mean-field timescale, thus justifying the so-called Bogolyubov corrections to mean field. As a by-product, we also discuss the justification of the Lenard-Balescu relaxation for a spatially homogeneous system.