Automated Algebra for the Few-Body Problem via Trotter-Suzuki Factorization

The goal of the project is to generalize an approach recently put forward by Prof. Joaquin Drut and PhD student Yaqi Hou, to calculate the thermodynamics of few- and many-body systems, using automated algebra approaches. Usually, analytic approaches to interacting multi-particle quantum mechanics are restricted to the few-body problem at best. Numerical approaches are essentially always used for all $N > 3$ particles. In our approach, we use an automated algebra method which, via a controlled coarse-lattice approximation, computes virial coefficients analytically up to $N = 7$ particles. The research reported provides efficient and robust codes that support important functions in the front end of the computations. The main challenge will be addressed in a forthcoming paper.