An Implementation of the Method of Moments on Chemical Systems with Constant and Time-dependent Rates

Emmanuel Adara¹,* , Roger B. Sidje¹

¹Department of Mathematics, The University of Alabama, Tuscaloosa, Alabama
eoadara@crimson.ua.edu

Among numerical techniques used to facilitate the analysis of biochemical reactions, we can use the method of moments to directly approximate statistics such as the mean numbers of molecules. The method is computationally viable in time and memory, compared to solving the chemical master equation (CME) which is notoriously expensive. In this study, we apply the method of moments to a chemical system with a constant rate representing a vascular endothelial growth factor (VEGF) model, as well as another system with time-dependent propensities representing the epidemic model with periodic contact rate. We assess the accuracy of the method using comparisons with approximations obtained by the stochastic simulation algorithm (SSA) and the chemical Langevin equation (CLE).