COMPUTATIONAL ALGEBRAIC GEOMETRY AND BIOCHEMICAL REACTION NETWORKS

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ABSTRACT. Our aim is to report and to advertise the introduction of techniques from computational algebraic geometry to address mathematical challenges in systems biology. (Bio)chemical reaction networks define systems of ordinary differential equations with (in general, unknown) parameters. Under mass-action kinetics, these equations depend polynomially on the concentrations of the chemical species. The nonlinearities usually prevent a mathematical analysis of network behaviour, which has largely been studied by numerical simulation and lacks a more comprehensive study of the dependence on the parameters. The algebraic theory of chemical reaction systems aims to understand the dynamical behavior of chemical reaction systems by taking advantage of the inherent algebraic structure in the kinetic equations, and does not need a priori determination of the parameters, which can be practically and theoretically impossible.

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