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Stochastic Modeling and Numerical Simulation of Gene Regulatory Networks with Protein Bursting

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Highlights

- We propose a model for gene regulatory networks (involving multiple genes with self and cross regulations) based on partial integro-differential equations
- Assuming that proteins are produced in bursts, the model provides an accurate description of the systems and allows for an effective numerical solution by a semilagrangian method
- We apply our model and methods to study the phenomenon of competence in *Bacillus subtilis*.
- Our analysis reveals a characteristic probability distribution function for cell cultures in the competence regime, which can be clearly distinguished from bimodal distributions obtained in stochastic toggle-switches.

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