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Stochastic Modeling of Neuronal Transport in Various Cellular Geometries

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2019 SIAM Conference on Computational Science and Engineering

Part of MS73 Student Days: Student Chapter Presentations - Part II of II
Stochastic Modeling of Neuronal Transport in Various Cellular Geometries

Abstract. We present a mathematical framework to analyze the transport processes inside a neuron. Our model captures spatial dynamics and interactions of a motor and cargo particles through a system of coupled stochastic differential equations. We study the transport on a parallel arrangement of microtubules inside axon (axonal transport), as well as various tangled networks of microtubules inside soma (somatic transport). In all cases, we derive the effective velocity and diffusion coefficient at the macroscopic scale.

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