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Discovering the governing PDE of an active nematic system from video data

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Within each animal cell is a complex infrastructure of microtubules and motor proteins that translate energy from ATP cycles into a complex fluid flow. Although this process is vital for intracellular transport of nutrients, a quantitative mathematical model for this system remains elusive. Recent experimental work has produced high-resolution video of this system and made possible attempts to derive a model directly from data. In this poster, I will discuss the application of a data-driven model discovery method called "PDE-Find" to this complex system. I will describe the accuracy and robustness of PDE-Find for the simplified task of reconstructing a proposed model from simulation data and discuss the corresponding challenges. I will also propose methodologies for overcoming those challenges and future steps to utilize the experimental data.

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