Universität Rostock Traditio et Innovatio

SYSTEMS BIOLOGY BIOINFORMATICS ROSTOCK

SBI Research Seminar

Neural ODEs and Dynamical Optimal Transport for Developmental Transcriptomics Forecasting

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Abstract

Optimal transport (OT) and its unbalanced variants have emerged as powerful tools for modeling transcriptomic dynamics across developmental timepoints, with applications in frameworks such as MOSCOT, Dynamo, and Spateo. However, standard alignment and matching approaches are often insufficient for forecasting developmental trajectories beyond observed states.

In this talk, we will discuss how classical static balanced OT can be extended to dynamical and unbalanced settings, and how Neural ODE–based architectures can be used to learn and predict developmental trajectories over time. We will also outline broader design principles for constructing neural network models tailored to developmental transcriptomics, including extensions from bulk and single-cell transcriptomics to spatial transcriptomic data. These directions point toward a more general framework for integrating heterogeneous biological datasets and building flexible, task-specific models for developmental systems biology.

Tuesday, 26 May 2026 at 13:00 o'clock

Ulmenstr. 69, Haus 3, Raum 410

Zoom: https://uni-rostock-de.zoom.us/j/67422288014