

CRUNCH Seminars at Brown, Division of Applied Mathematics

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**Towards Foundational Dynamics: From Invariant Neural ODEs to PINNs for Stroke to Mechanics
Neural Networks**

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While in the past 30 years AI had mostly focused on static data and tasks, like classifying images of cats and dogs or reconstructing 3D point clouds, in the last years we have witnessed a grand shift towards learning of dynamics, with notable examples being the emergence of ground-breaking Physics Informed Neural Networks, Neural ODEs, Symbolic Regression, Siamese Trackers and so on. What is more, the last six months have marked a seismic shift in artificial intelligence and a phase transition from monolithic AI models to foundational AI systems, which begs the question. What is the role of dynamics in this new era? With an eye toward Foundational, Embodied, and Interactive AI, in this talk I will discuss recent advances in our lab: from how to disentangle invariant static from variant temporal information in Neural ODEs, to how one can extend PINNs for blood flow modelling with notable practical improvements in stroke, to briefly touching on our recent work on Mechanistic Neural Networks.