# Computer Science
# Defense

## *Optimal Control Approaches for Designing Neural Ordinary Differential Equations*

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**Abstract:** Neural network design encompasses both model formulation and numerical treatment for optimization and parameter tuning. Recent research in formulation focuses on interpreting architectures as discretizations of continuous ordinary differential equations (ODEs). These neural ODEs in which the ODE dynamics are defined by neural network components, benefit from reduced parameterization and smoother hidden states than traditional discrete neural networks but come at high computational costs. Training a neural ODE can be phrased as an ODE-constrained optimization problem, which allows for the application of mathematical optimal control (OC). The application of OC theory leads to design choices that differ from popular high-cost implementations. We improve neural ODE numerical treatment and formulation for models used in time-series regression, image classification, continuous normalizing flows, and path-finding problems.

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https://emory.zoom.us/j/98688786075?pwd=ampLTG4reEV3ak5nbEJZUVdwRnljQT09

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