

# The Continuing Advances of Differentiable Simulation

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## **Abstract:**

Differentiable simulation techniques are the core of scientific machine learning methods which are used in the automatic discovery of mechanistic models through infusing neural network training into the simulation process. In this talk we will start by showcasing some of the ways that differentiable simulation is being used, from discovery of extrapolatory epidemic models to nonlinear mixed effects models in pharmacology. From there, we will discuss the computational techniques behind the training process, focusing on the numerical issues involved in handling differentiation of highly stiff and chaotic systems. The viewers will leave with an understanding of how compiler techniques are being infused into the simulation stack to provide the future of differentiable simulators.e.g., bridges and wind turbines and museum exhibits are discussed.