# Sparse-Input Neural Network Augmentations for Differentiable Simulators

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- Insert neural network connections at any place inside a differentiable rigid-body physics engine to learn unmodeled effects from data
- Simplify neural augmentations via sparse-group lasso loss $\mathcal{L}$ used for training **Sp**arse-**I**nput **N**eural **N**etworks (SPINN)
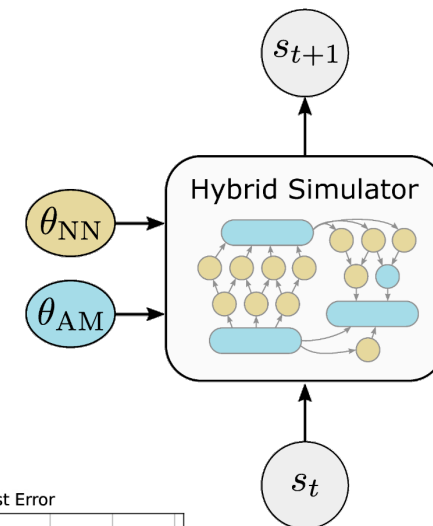

Experiment: discover friction force (τ) dependence on joint velocity $\dot{\mathbf{q}}$
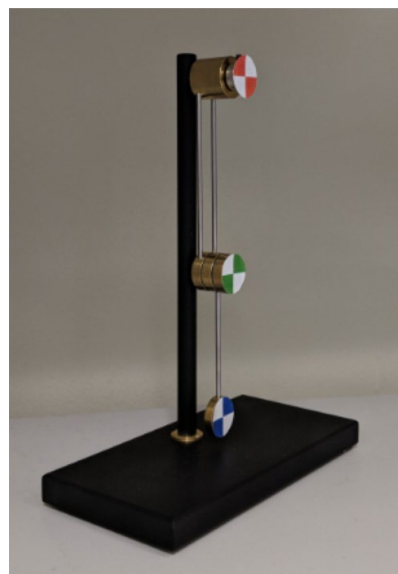
IBM Dataset [Asseman 2018]
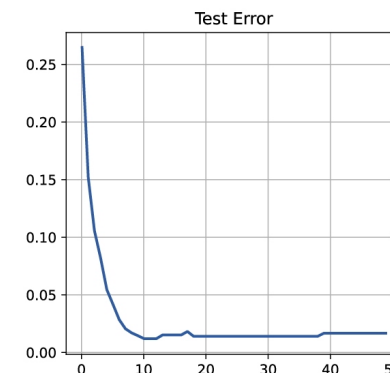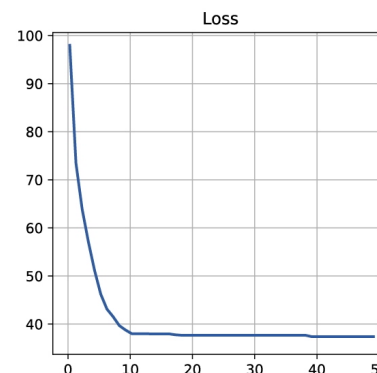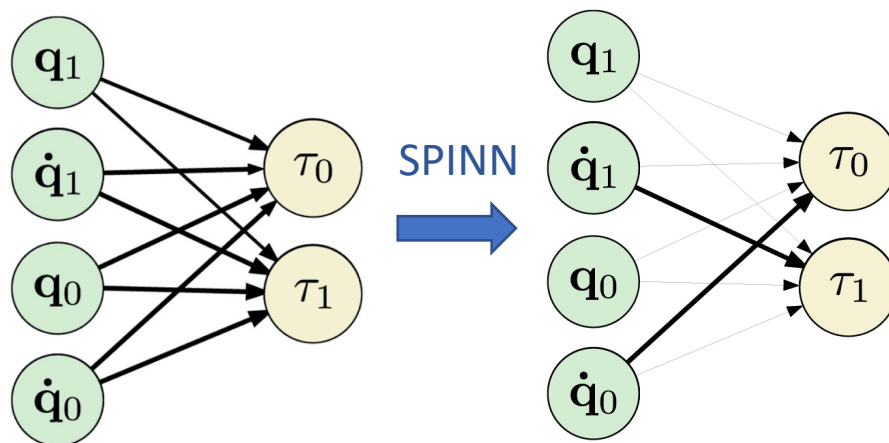
Sparse-group lasso loss: $\mathcal{L} = \sum_t ||f_\theta(s_{t-1}) - s_t^*||_2^2 + \kappa||\theta_{[:1]}||_1 + \lambda||\theta_{[1:]}||_2^2$

Extended version with more experiments on our project website: *https://sites.google.com/usc.edu/neuralsim*

github.com/google-research/tiny-differentiable-simulator