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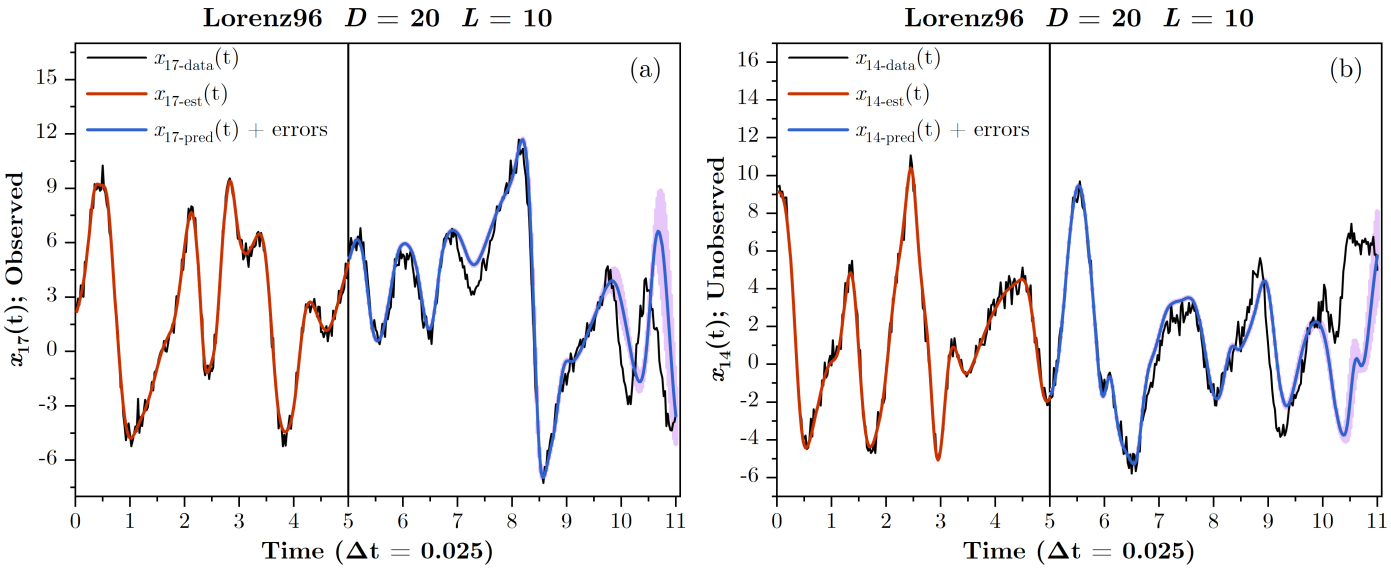
- Research: theory and algorithms for nonlinear dynamics and deep learning using ideas from statistical physics.
- Computational tasks: non-convex optimization; (Hamiltonian) Monte Carlo.
- Problem size: from 10^4 to 10^7 (degrees of freedom).



- Computational challenge: to perform high-dimensional integrals of the form

$$\langle G(\mathbf{X}) \rangle = E\left[G(\mathbf{X}) \,|\, \mathbf{Y}\right] = \frac{\int d\mathbf{X}\, G(\mathbf{X})\, e^{-A(\mathbf{X})}}{\int d\mathbf{X}\, e^{-A(\mathbf{X})}},$$

- Parallelization is needed for Hamiltonian Monte Carlo calculations.
- Would like to learn more about general HPC and GPU programming at the Summer Institute.