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Learning latent dynamics models from complex and high-dimensional data

There is an abundance of dynamical systems around us, including physical systems, biological networks, industrial processes, population dynamics, and social graphs, which we would like to model and control. While models in some applications can be derived analytically, there are many systems whose governing equations cannot be derived from the first principles because their behavior is too complex and poorly understood or dimensionality far too high. In this talk, I will present our recent work on developing methods to learn latent continuous-time dynamics models from complex and high-dimensional (spatio)temporal data. Our approach builds on formulating these models as neural net parameterized generative differential equation systems that can be learned using efficient amortized variational inference methods and used for long-term predictions as well control approaches.

This is joint work with Valerii Iakovlev, Cagatay Yildiz, and Markus Heinonen.