Kernel Machines in Time

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───── **Abstract** ─────

Kernel machines is a powerful class of models in machine learning with solid foundations and many existing application fields. The scope of this talk is kernel machines in time with a main focus on least squares support vector machines, and other related methods such as kernel principal component analysis and kernel spectral clustering. For dynamical systems modelling different possible input-output and state space model structures will be discussed. Applications will be shown on electricity load forecasting and temperature prediction in weather forecasting. Approximate closed-form solutions can be given to ordinary and partial differential equations. Kernel spectral clustering applications to identifying customer profiles, pollution modelling and detecting topological changes in time-series of bridges will be shown. Finally, new synergies between kernel machines and deep learning will be presented, leading for example to generative kernel machines, with new insights on disentangled representations, explainability and latent space exploration. Application of these models will be illustrated on out-of-distribution detection of time-series data.