Smooth kernel machines for environment and finance

M. Aminian Shahrokhabadi*, **E. Perracchione****, M. Polato**, M. Putti**

*Allameh Tabataba'i University, Teheran, Iran
**Department of Mathematics Tullio Levi-Civita, University of Padova, Italy

Machine learning [1, 2] is a widely used tool for extracting features from given data. In this context, there are many available techniques that are able to predict, within a certain tolerance, the evolution of time series, i.e. the dynamics of the considered quantities. Focusing on Support Vector Regression (SVR), the main drawback is that measurements are usually affected by noise/errors and might have gaps. Since in those cases the learning and prediction steps for capturing the *trend* of time series become very hard, we first construct a reduced kernel-based approximant [4]. Such approximant, which is indeed a model, has a double aim: at first, it fills the gaps and then it is also able to filter noisy data. The so-constructed smoother samples are used as training sets, improving the performances of kernel machines. Our claims are supported by environmental [3] and financial applications.

References

[1] N. Cristianini, J. Shawe-Taylor (2000). *An Introduction to Support Vector Machines and Other Kernel-based Learning Methods*, Cambridge University Press.

[2] G.E. Fasshauer, M.J. McCourt (2015). *Kernel-based Approximation Methods Using* MATLAB, World Scientific.

[3] E. Perracchione, M. Polato, D. Tran, F. Piazzon, F. Aiolli, S. De Marchi, M. Carsten, S. Kollet, A. Sperduti, M. Vianello, M. Putti (2018). *Modelling and processing services and tools*, GEOEssential Deliverable 1.3.

[4] D. Wirtz, N. Karajan, B. Haasdonk (2015). *Surrogate modelling of multiscale models using kernel methods*, Int. J. Numer. Met. Eng. **101**, 1–28.