Learning the Smoothness of Weakly Dependent Functional Times Series

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Abstract. We consider functional time series where the sample paths are observed with error at possibly random discrete points in the domain. We reconsider the local regularity estimator proposed by Golovkine et al. (2022) in the context of weakly dependent curves, under the assumption of $L^p - m-$approximability. In this new framework, we derive non asymptotic exponential bounds for the concentration of the regularity estimators. This will further allow to diagnose a change of regularity along the sample paths, to build optimal estimator of mean and (auto)covariance functions, *etc.* An extensive simulation study illustrate the good performance of our estimators with finite time series. The simulation experiments also provide guidance for the choice of the hyperparameters involved in our estimation method.

Keywords. Concentration bounds, Kernel smoothing, Nagaev inequality, Stochastic processes.