

## **Dynamic relations in sampled processes**

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In this talk we present some joint work with Tryphon Georgiou. Linear dynamical relations that may exist in continuous-time, or at some natural sampling rate, are not directly discernable at reduced observational sampling rates. Indeed, at reduced rates, matrix-valued spectral densities of vector-valued time series have maximal rank and thereby cannot be used to ascertain potential dynamic relations between their entries. This hitherto undeclared source of inaccuracies appears to plague off-the-shelf identification techniques seeking remedy in hypothetical observational noise. In this talk we explain the exact relation between stochastic models at different sampling rates and show how to construct stochastic models at the finest time scale that data allows. We then point out that the correct number of dynamical dependences can only be ascertained by considering stochastic models at this finest time scale, which in general is faster than the observational sampling rate. Thus, the principle contribution of this work is to introduce the idea of lifting identified models to a finer time-scale before assessing their complexity.