# Inference of Stochastic Dynamical Systems from Population Data using the Fokker-Planck equation

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## ABSTRACT

Inferring the driving equations of a dynamical system from population or time-course data is important in several scientific fields such as biochemistry, epidemiology, financial mathematics and many others. We employ and then computationally infer the Fokker-Planck equation which describes the evolution of the population's probability density. Then, following the USDL approach[1], we project the Fokker-Planck equation to a proper set of data-driven functions, transforming it into a linear system of equations. Finally, we apply sparse inference methods to induce the driving forces of the dynamical system. Our approach is illustrated in both synthetic and real data including non-linear, multimodal stochastic differential equations, biochemical reaction networks as well as mass cytometry biological measurements.

## REFERENCES

[1] Y. Pantazis and I. Tsamardinos, A Unified Approach for Sparse Dynamical System Inference from Temporal Measurements. 2019. *Bioinformatics,* **35(18)**:3387 – 3396.