UCSB

Numerical Scouts

Mathematical Snowflakes Part I

Cory N. Brown

October 24, 2019

Koopman time-series analysis has made dynamical systems analysis of data more computable; this is due to the fact that in the Koopman view of dynamical systems, we trade nonlinear dynamics for linear dynamics without losing any information of the original system. As we know, there is no free lunch, and in this case this saying is represented by the increased dimensionality of this new linear system - often infinite dimensional in practice. But since linear algebra is the language of computation science, this view of dynamical systems has landed itself in the sexy field of machine learning.

In this talk I give I plan to give a light introduction to the Koopman view of dynamical systems. The main topics here will be the Koopman operator and the Koopman mode decomposition (the Koopman mode decomposition is the centerpiece of Koopman time-series analysis). I will then demonstrate how the Koopman view can be used to characterize the simplest examples of dynamical systems - finite autonomous deterministic (FAD) dynamical systems. In this special case, the Koopman operator is finite and only knowledge of linear algebra is necessary. FAD dynamical systems have applications in biology and computation, and can be represented by directed graphs - these graphs happen to look somewhat like snowflakes.

Location and Time

Engineering II 2319 ME conference room @ 6pm

Pre-requisites

Linear algebra and freshman calculus