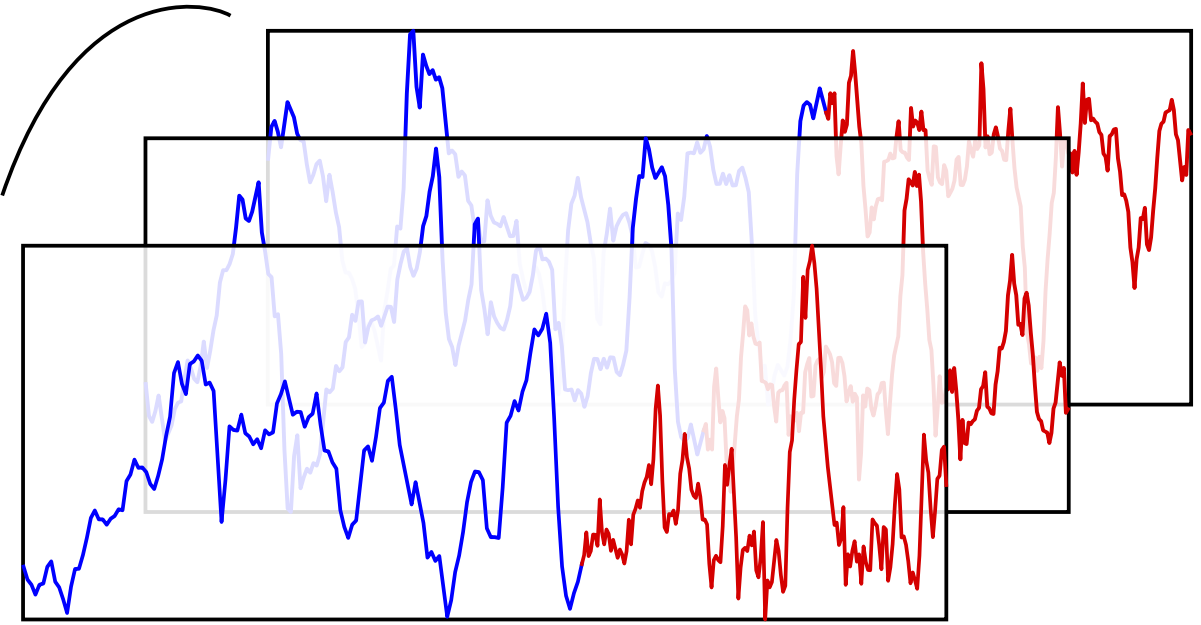


# Overview for Machine Learning practitioners

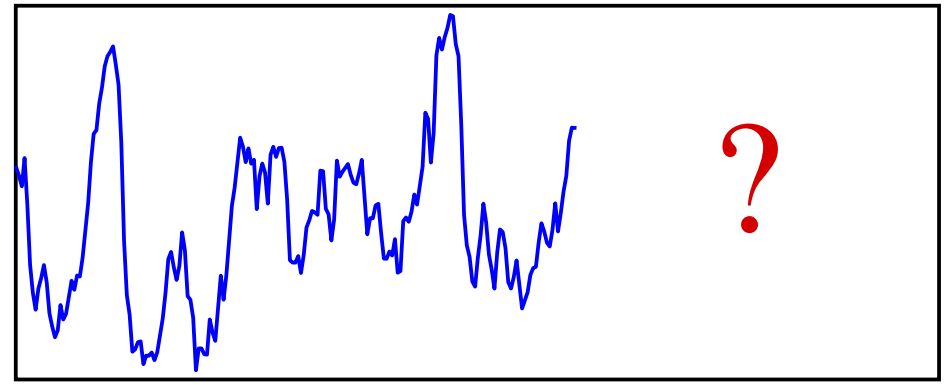
**Data**  
possibly heterogenous

Green = inferred from data

Samples = (past series, future series) pairs



Observation = new series → predict future



Non-Linear functional dependency

## RKHS

Reproducing Kernel Hilbert Space  
 $\infty$ -dimension pseudo-basis = data span

Reproducing Kernel  
Distributions  $P(\text{future} | \text{past})$

Distributions = points  
Same  $P(\text{future} | \text{past})$  = same consequences for past causes  
Geometry of the causal structure?

Kernel application

Distribution over reference points

Functional Mapping

$\mathbb{E}[\text{future}]$   
↑  
Reproducing property

## Causal states representation

Coordinates on a reduced basis

Diffusion Map  
Projection onto an eigen basis

Dimension, topology, densities, trajectories, attractor...

Distribution of states

Projection

Linear evolution operator

Predicted distribution of states

