

TAM 598 Lecture 19 :

State Space Models - Filtering

Announcements:

- HW 5 covers lectures 17-20; due on Fri Apr 18

State Space Models - Filtering

* given a dynamical system, we observe a noisy measurement of the system's state and want to figure out the actual state

our stochastic dynamical system is described by **state variables** \underline{x}_t at discrete time steps $t=0, 1, 2, \dots, n$.

This means:

$$P(\tilde{x}_{0:1}) =$$

$$P(\tilde{x}_{0:2}) =$$

$$P(\tilde{x}_{0:3}) =$$

Now we introduce observations - sensors that measure something y_t at each time step.

Assume y_t only depends on the state of the system at time t , \hat{x}_t

Next we introduce controls - at every timestep, we pass a control command u_t to the system that affects where the system state goes in the next time step.

Filtering Problem - estimate the current state given all data

Smoothing - estimating all states (including the past) given all data

Example: linear transitions and gaussian emission probabilities
via equations

↳ initial conditions

↳ transitions

↳ emissions

Example: linear transitions and gaussian emission probabilities
via probabilistic modeling

↳ initial conditions

↳ transitions

↳ emissions