Linear Dynamical Systems homework

Problem 1: simulation of LDS

Use the parameters in this file to sample N=10,000 states and observations from a LDS. Save the sampled values to use them on the next problem. Make a scatter plot with the first and second dimensions of the sampled states and obserfvations on the x- and y-axis, respectively.

The parameters in the previous file were used to generate the corresponding figure in the lectures notes. Hence your figure should be similar to the one on these notes.

Problem 2: inference in an LDS

Filter and smooth the simulated observations from the previous problem. The following Python module provides incomplete code to perform Kalman filtering and smoothing. You may want to complete this code to solve this problem.

Generate a first scatter plot as in the previous problem, showing the state vertical and horizontal positions, the vertical and horizonal observation, and the filtered and smoothed observations.

Generate a second scatter plot displaying the state, filtered and smoothed vertical and horizontal velocities as a function of sample number. This plot should contain six traces: `state_vel_x`, `filtered_vel_x`, `smoothed_vel_x`, `state_vel_y`, `filtered_vel_y` and `smoothed_vel_y`.

Generate a third scatter plot displaying the state, filtered and smoothed vertical and horizontal acelerations as a function of sample number.