Bayesian Filtering and Smoothing: Exercise Set 9

1. Estimate the car positions in `car_demo` using a stationary fixed-interval smoother.

2. Estimate the states in `pendulum_demo` using fixed-lag smoothing based on EKF. Explore how different lags influence the RMSE.

3. Estimate the states in `pendulum_demo` using the *unscented* fixed-interval smoother.

4. Smooth the EKF estimates obtained in question 3 of set 6.

5. Smooth the EKF estimates obtained in question 5 of set 6.

6. Let $\mathbf{P}_k$ and $\mathbf{P}_k^s$ denote the state covariance matrices of the Kalman filter and the RTS fixed-interval smoother, respectively. Show that $\mathbf{P}_k - \mathbf{P}_k^s$ is a positive semidefinite matrix for every $k \in \{0, 1, \ldots, T\}$.