

EEL 6616 Spring 2020 Homework 1

- 1) Given the system

$$u = mw(t) + d(t)$$

with $w(t) = \sin(t)$ and $d(t)$ is measurement noise/disturbance. Let true value of mass $m = 2$. Design a gradient estimator, simulate it and comment on the performance of the estimator under low and high values of adaptation gain when (a) $d(t) = 0$, and (b) $d(t) = 0.5 \sin(20t)$. $d(t)$ is immeasurable, so your estimator cannot use any knowledge of $d(t)$.

- 2) If the mass is time-varying, e.g., $m = 1 + 0.5 \sin(0.5t)$, illustrate via simulation how the gradient estimators work both in the absence and presence of noise. Comment.
- 3) Repeat Problem 1 with a least square estimator. Use $P(0) = 2$ and $P(0) = 10$ for the adaptation gain initial values.
- 4) Repeat Problem 2 with a least square estimator.