

## Machine Learning

ECE 4332 / ECE 5332  
Spring 2019

### Project 2

1. Generate the training set:
  - a.  $N^{Train} = 10$
  - b.  $X^{Train}$  contains samples from a uniform distribution  $\mathcal{U}(0,1)$ .
  - c.  $t^{Train} = \sin(2\pi X^{Train}) + \varepsilon$ , where  $\varepsilon$  is drawn from a Gaussian (Normal) distribution  $\mathcal{N}(0, \sigma = 0.3)$ .
2. Generate the test set:
  - a.  $N^{Test} = 100$
  - b.  $X^{Test}$  contains samples from a uniform distribution  $\mathcal{U}(0,1)$ .
  - c.  $t^{Test} = \sin(2\pi X^{Test}) + \varepsilon$ , where  $\varepsilon$  is drawn from a Gaussian distribution  $\mathcal{N}(0, \sigma = 0.3)$ .
3. Use the method of linear regression with non-linear models to fit polynomials of degree  $M = 0, 1, 2, \dots, 9$  to the training set.
4. Record the training and testing errors for each of the 10 cases.
5. Produce the plot as shown below, where

$$E_{RMS} = \sqrt{J(\underline{w})/N}$$

6. Repeat the exercise for  $N^{Train} = 100$ .

Upload your .m or .py file to Blackboard before midnight on Feb 10<sup>th</sup>.

