

MECH 5970/6970 (GPS)

Homework #1

Due: 1/28/2022

1. Chapter 1, Problem 3-4

2. Generate two random sequences that are 100 long and randomly comprised of +1 and -1. There are several ways to do this using the normal Gaussian random signal generator (randn) or the uniformly distributed random signal generator (rand):

```
>>2*ceil(rand(100,1)-0.5)-1
```

```
>>2*ceil(0.1*randn(100,1))-1
```

- a) Plot the histogram on each sequence
- b) Plot the spectral analysis on each sequence

There are multiple methods to make the Power Spectral Density (PSD):

```
>>periodogram(X)
>>pwelch(X>window_filter)
>>plot(abs(fft(X)))
```

- c) Plot the autocorrelation each sequence with itself (i.e. a sequence delay cross correlation)
 - d) Plot the cross autocorrelation between the two sequences
- Bonus: Repeat for a sequence that is 1000 long

3. Generate 3 sequences 1000 long:

```
A=3+3*randn(1000,1)
```

```
B=5+5*randn(1000,1)
```

```
C=A+B
```

```
DATA=[A B C]
```

- a) Find the mean and variance for A, B, and C
- b) Find the mean of DATA (>>mean)
- c) Find the Covariance Matric of DATA (>>cov)

4. Develop the Taylor Series linearized approximation the following equation

$$r(x, y) = \sqrt{(x - a)^2 + (y - b)^2}$$