National Taiwan University
Institute of Industrial Engineering
Jakey BLUE

# Time Series Analytics

111-1 Homework #09

**Due at 23h59, December 15, 2022; files uploaded to NTU-COOL**

1. (20%) Simulate three random variables with length 1024, following standard Normal, $t$-distribution ($df = 10$), and exponential distribution (rate = 1.6), respectively.
   (a) Perform FFT (Fast Fourier Transform) over the three random variables and plot the amplitudes.
   (b) Perform STFT (Short-Time Fourier Transform) over the three random variables and plot the time-frequency contours.
   (c) What do you observe in (a) and (b)?

2. (20%) Simulate a seasonal time series following the model SARIMA$(2,1,0) \times (0,1,1)_{12}$.
   (a) Perform FFT (Fast Fourier Transform) over the time series and plot the amplitudes.
   (b) Perform STFT (Short-Time Fourier Transform) over the time series and plot the time-frequency contours.
   (c) What do you observe in (a) and (b)?