

CS571: Lab 4

September 7, 2021

For all plots, ensure that the axis, labels, legends etc are proper and legible. Submit screenshots of the plots and code as a PDF file on Moodle. Assignment is due by **20 Sept 2021**.

1. Plot $y = \sin(x)$ for two cycles using a scatter plot. x here is in radians.
2. Plot $x_1(t) = 3\sin(2\pi 50t)$ and $x_2(t) = 5\sin(2\pi 75t)$ as upper and lower subplots. Plot 3 cycles of each. Make sure that the time is aligned in both subplots. Here, the angular frequency ω_0 is in radians/sec, and $\omega = 2\pi F$, where F is the frequency in cycles/sec.
3. Generate a noisy sine wave $x(t) = \sin(2\pi 50t) + \epsilon(t)$, where $\epsilon \sim \mathcal{N}(0, 0.06)$. On top of this, plot the clean sine wave $y(t)$. In a bottom subplot, plot the error between $x(t)$ and $y(t)$. Make sure the time is aligned.
4. Plot a histogram of the error from the previous question.
5. Plot the lines $x + 5y = 7$ and $3x + 4y = 10$. Where do they intersect?
6. Solve the above linear system by hand, and also with Numpy. Compare your answers.
7. Simulate 10000 throws of a biased die. The die shows odd-numbered faces with double the probability of the even number of faces. Plot the histogram of the outcome. In the same plot, overlay the histogram of 10000 throws of an unbiased die.
8. Two unbiased die are thrown N times. Display the outcomes of this as a scatter plot. The size of the marker should be proportional to the count. Repeat, in a new plot for two biased dies. The plots must be self-explanatory.