IC152 Assignment 9

Submission Instructions are the same as the previous assignment. Write an algorithm on pen and paper (-2 marks for each algorithm missing).

1. Create 10 random integers using numpy.random.randint. Now create the same set of random integers again. (Hint: use seed)

2. Create 20 random floating point numbers using numpy.random.normal. Now create the same set of random floating point numbers again. Repeat this exercise to generate a different set of 20 random floating point numbers, twice. (Hint: use different seeds for each repetition of numbers)

3. Plot Sin^2x, Cos^2x, and their sum in the same plot for 1000 common values of x ranging between -10 to 10 radians. Give adequate title, x-labels, y-labels and legends. Use a font size of 24 for all the text in your plot. (Using subplot is not allowed in this question).

4. Generate 100 random integers. Find their mean and median using numpy.mean() and numpy.median(). In the same figure write python code to create different subplots for:-
   a. Graphically showing that mean is minimizer of $\sum_{i=1}^{N} (x - x_i)^2$
   b. Graphically showing that median is minimizer of $\sum_{i=1}^{N} |x - x_i|$

5: Statistical Regularity and Central Limit Theorem

a. Consider an experiment where you pick up a ball at random out of four balls having numbers 0, 1, 2, and 3. Simulate the experiment of 50 trials using a random package (import random and then random.randint(0,3)) and plot the relative frequency of each observed value vs number of trials. Then repeat the experiment 500 times. Then repeat the experiment 5000 times and 50000 times. Save the four plots as problem5a_50.png, problem5a_500.png, problem5a_5000.png, and problem5a_50000.png. Share your observations with the lab TAs or lab Instructor.

b. Central Limit Theorem states that the distribution of sample means approximate the normal distribution as sample size gets larger. Plot the histograms of sample means (observed values) of 5 trials in the previous experiment, by repeating it 50000 times and verify. Save the plot as problem5b_5_50000.png.

   Run the code with 50 trials instead of 5 in each repetition of 50000. Save the plot as problem5b_50_50000.png. Share your observations with the lab TAs or lab Instructor.