

### Nonparametric Statistics Homework I.

Due date: Two weeks from today. Worth 5% of your final grade. Please write clearly. Computer printouts should be included but do not dump everything.

1. We have 10 numbers  $X_1 = 0.1, X_2 = 0.2, \dots, X_9 = 0.9, X_{10} = 1.0$ . Test if 10 numbers come from a standard normal distribution with mean 0.5 at 5% level.
2. You have a random binary sequence 0110110110110110 (16 numbers), which comes from a Bernoulli distribution. Test

$$H_0 : \mu = 0.4 \text{ vs. } H_1 : \mu > 0.4,$$

where  $\mu$  is the population mean. Justify your answer by computing P-value.

3. Let  $X \sim \text{Unif}(0, 1)$ . Let  $Y$  be a random variable whose probability density function is  $f(x) = 2x$  for  $0 < x < 1$ . Generate 10,000  $Y$ 's from  $X$ . What formula did you use? Plot the histogram with 100 bins (do not print out 10,000 numbers).
4. Let  $X_i \sim N(0, 1)$ . Plot the probability density functions of  $X_{(1)}$  and  $X_{(10)}$  by computing the empirical distributions of  $X_{(1)}$  and  $X_{(10)}$  (Follow the example of Lecture 4).
5. From Problem 4, numerically estimate  $\mathbb{E}X_{(1)}$  and  $\mathbf{Var}X_{(1)}$ .