**Homework 1**

**Statistical Genomics**

**CROPS 545, Spring 2020**

Professor: Zhiwu Zhang

Due on Febuary 3, 2020, Monday, 3:10PM, PST

**Objectives**: 1) random variables; 2) derivation of random variables; 3) distribution of random variables; 4) derive statistics from samples; 5) sample statistics; and 6) define R functions.

**Hand in:** Email your report (PDF, limited to five page) and R source code (text file) with subject of “CROPS545 HW1” to [Zhiwu.Zhang@WSU.edu](mailto:Zhiwu.Zhang@WSU.edu). Name your files as following:

Homework1\_ firstname\_lastname.pdf and Homework1\_ firstname\_lastname.R

**Grade components**: 1) Result presentations; 2) Result interpretation; 3) R source code (clarity, simplicity and documenting comments).

1. Define a random variable that is functions of random variables with known distributions such as uniform, binomial, Poison, normal, Chi square, F, or t distributions. Name the distribution of your new random variable as your last name and develop a R function to generate the random variables. The input of your R function should include n, which is number variables to be generated, and parameters for the distribution you defined. Your distribution should be different from the listed known distributions (20 points).
2. Sample ten thousand observations from the distribution you defined. Make scatter, histogram, density and cumulative density plots (20 points).
3. Create tables for your variable at different percentile (1%, 5%, 10%, 50%, 90%, 95% and 99%), and describe the impact of the parameters of your distribution (20 points).
4. Give an example to make sense out of your distribution (**Extra credit**: 20 points, report is limited to one extra page).
5. Generate one or multiple samples with sizes of your choices from the distribution you defined, and define a novel statistic (not mean, sd, range) from your samples (20 points).
6. Create ten thousand replicates of your statistics and make the same plots in (2) (20 points).
7. Give an example to make sense out of your statistics if it has a distribution that is not in the known distribution list (**Extra credit**: 20 points, report is limited to one extra page).