Fall 2018 EE511 Simulation

Project #6: due 5pm, Friday November 30

The attached datasheet represents a set of 100 independent samples from some population.

a) Compute the sample mean, m, and the sample variance, s^2.

b) Use the data to generate a discrete approximation to the Cumulative Distribution Function – the empirical distribution, $F_{X^*}(x)$. Plot this distribution.

c) By splitting the data into equal size intervals (0-5, 6-10, etc), generate a discrete approximation to the distribution and determine the values of the Probability Mass Function for this discrete approximation.

d) Use the bootstrapping technique to generate M bootstrap samples based on the empirical distribution found in part b) and compute the sample mean and sample variance for each Bootstrap sample. Use $M = 50$ and $M = 100$.

e) Find the value of the MSE of the sample mean.

$$MSE_F(m) = E_F\left[(\mu - m)^2\right]$$

And compare to the variance of the sample means based on the bootstrap samples.

f) Calculate the (population) variance of the empirical distribution – call this $\sigma^2_{F^*}$.

We could evaluate

$$MSE_{F^*}(s^2) = E_{F^*}\left[\left(s^2 - \sigma^2_{F^*}\right)^2\right]$$

by computing s^2 for all possible n^n samples that can be generated from the empirical distribution. That is a formidable computational task, so we consider only a (random) subset of such samples – i.e. the set of Bootstrap samples in part d) and use the sample variances found in part d) to estimate the MSE.

37.12	8.45	28.96	0.27	36.22
2.78	3.98	32.79	0.14	24.87
1.33	33.25	19.91	30.43	25.84
33.55	31.10	1.86	30.57	5.34
45.39	28.67	7.12	35.38	1.92
9.25	12.55	27.49	33.72	2.30
28.32	30.92	32.62	24.10	33.56
35.62	27.88	20.71	36.62	24.03
28.00	31.44	33.32	5.01	1.30
4.56	2.28	11.33	0.24	8.53
5.27	18.52	7.63	31.03	4.06
12.83	15.43	8.75	4.65	5.21
7.90	26.48	6.81	32.20	25.69
18.18	4.48	30.33	1.68	28.44
23.26	3.35	0.17	8.90	13.29
31.54	26.16	22.79	6.89	27.92
30.99	6.93	13.27	10.08	28.95
13.40	4.57	34.10	0.76	36.40
0.60	39.74	1.11	2.40	1.05
34.10	29.95	1.94	0.16	1.43