ThinkBS 306 Statistics Applied in Engineering, Biology, Chemistry and Medicine (Advanced)

Offered in Universitatea Politehnica Din Bucurresti

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Course Objectives:

Course Contents:

a) General results in statistics:

1. Statistical population, samples, sample size, parameters  
2. Descriptive statistics (central tendencies, variation, representations)  
3. Inferential statistics (estimations, confidence intervals, parametric and non-parametric tests)  
4. Applications in engineering and bio-chemistry (MATLAB)

b) Monte Carlo methods:

1. Generating sequences distributed according to a given probability distribution  
2. Gillespie's type stochastic algorithms with applications in biology, chemistry and medicine (MATLAB)

c) Advanced statistical methods and algorithms for bias-reducing in non-randomized trials (with applications in engineering and medicine)

Bibliography:

1. Knuth,E.D (1997). The Art of Computer Programming, Vol.1, Fundamental Algorithms, Third Edition (Reading, Massachusetts: Addison-Wesley), xx+650pp. ISBN 0-201-89683-4  
2. Gillespie, Daniel T. (1976). A General Method for Numerically Simulating the Stochastic Time Evolution of Coupled Chemical Reactions. Journal of Computational Physics. 22 (4): 403–434. doi:10.1016/0021-9991(76)90041-3.  
3. Ramaswamy, Rajesh; González-Segredo, Nélido; Sbalzarini, Ivo F. (2009). A new class of highly efficient exact stochastic simulation algorithms for chemical reaction networks. Journal of Chemical Physics. 130 (24): 244104. doi:10.1063/1.3154624.  
4. Rosenbaum P.R., Rubin D.B. (1983). The central role of the propensity score in observational studies for causal effects. Biometrika. ;70:41–55.  
5. Austin P. C. (2011). An Introduction to Propensity Score Methods for Reducing the Effects of Confounding in Observational Studies. Multivariate behavioral research, 46(3), 399–424. doi:10.1080/00273171.2011.568786.  
6. N.G. Van Kampen (2011). Stochastic Processes in Physics and Chemistry. Elsevier. ISBN 978-0-08-047536-3.