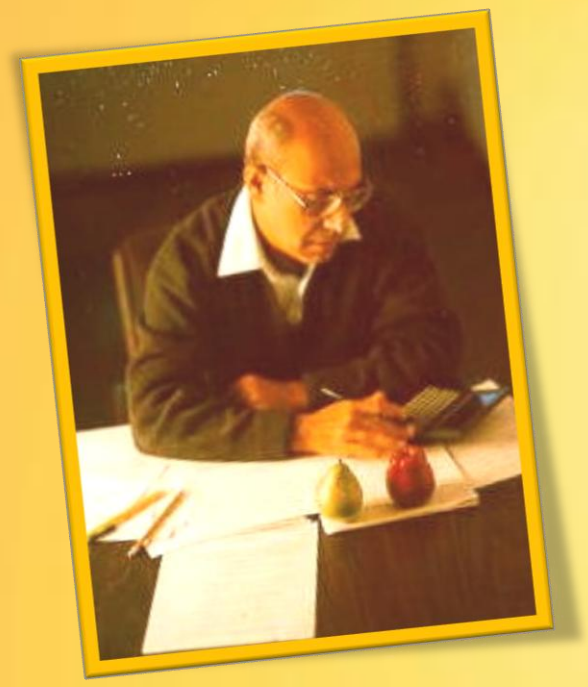
Summer 2013

2013 NCTS Summer Course on Statistics



Prof. Nozer D. Singpurwalla

is a Chair Professor at the City University Hong Kong and an Emeritus Professor of Statistics and Distinguished Research Professor at the George Washington University in Washington, D.C. He has been Visiting Professor at Carnegie-Mellon University, Stanford University, the University of Florida at Tallahassee, the University of California at Berkeley, the Santa Fe Institute and Oxford University (UK). During Fall 1991, he was the first C. C. Garvin Visiting Endowed Professor in the Mathematical Sciences at the Virginia Polytechnic Institute and State University. He is Fellow of the Institute of Mathematical Statistics, the American Statistical Association, and the American Association for the Advancement of Science, and he is an elected member of the International Statistical Institute. He is the 1984 recipient of the U.S. Army's S. S. Wilks Award for Contributions to Statistical Methodologies in Army Research, Development and Testing, and the first recipient of The George Washington University's Oscar and Shoshana Trachtenberg Prize for Faculty Scholarship. He has coauthored two books in reliability and has published over 175 papers on reliability theory, warranties, failure data analysis, Bayesian statistical inference, dynamic models and time series analysis, quality control and statistical aspects of software engineering. In 1993 he was selected by the National Science Foundation, the American Statistical Association and the National Institute of Standards and Technology as the ASA/NIST/NSF Senior Research Fellow. In 1993 he was awarded a Rockefeller Foundation Grant as a Scholar in Residence at the Bellagio, Italy Center.

Time: 7/25(Thu.)、7/26(Fri.)、7/29(Mon.), AM 9:30-10:30

Place: Lecture Room A, NCTS, 4th Floor,
The 3rd General Building, National Tsing Hua University

(1) The Bayesian Paradigm for Uncertainty Assessment

In this expository talk, I will give an overview of the Bayesian paradigm for assessing uncertainty and statistical inference. I will address issues such as the meaning and interpretations of probability, subjective probability and its operationalisation, de Finetti's theorem, the essence of a probability model and how it comes about, the meaning of parameters, the likelihood function, the principle of conditionalization and its role in statistical inference. I will illustrate the underlying notions using simple examples and if time permits discuss the essentials of Bayesian hypothesis testing. The material is intended for a broad audience of scientists and engineers, including statisticians who would like an appreciation of the essence of Bayesian ideas and thinking.

(2) The Hazard Potential of Items and Individuals

In this talk I will introduce the notion of the hazard potential of items and individuals as an exponentially distributed resource that an item is endowed with at inception. The notion enables one to develop models for failure in reliability and in survival analysis by looking at the cumulative hazard as a consumer of the endowed resource. The cumulative hazard under random environments can be modelled as a continuously increasing stochastic process which upon hitting the random hazard potential produces a failure of the item. The material here offers a new perspective on failure modelling in both the engineering and the biological sciences and should be of interest to reliability theorists as well as survival analysts. Furthermore it offers the potential of modelling maintenance, repair, replacement and medical interventions under a unified platform in the sense that the effect of the above remedial functions is de facto the lowering of the cumulative hazard.

(3) Filtering Reliability and Tracking Survivability

Using the phenomenon of reliability growth tracking for complex systems and software as a motivating scenario, I make the case that reliability is a propensity (in the sense of Popper) or chance in the sense of de Finetti; it is not a probability!. But propensity and chance are metaphysical and thus practical interest should focus on ones assessment of these quantities. I call this assessment survivability and propose a Kalman Filter like model for tracking survivability. The above ideas constitute a fundamental change in the way we think about reliability and survival analyses.

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