國科會「鋰離子電池衰變數據的可靠度分析」整合型計畫特邀演講 II

NSTC "Reliability Analysis on the Degradation Data of Li-Ion Battery" Integrated Project Discussion Meeting Special Invited Talk II

Speaker : Professor William Q. Meeker (Distinguished Professor of Statistics, Iowa State University, U.S.A.)

Topic : (1) Reliability in the 21st Century

(2) Specifying Prior Distributions in Reliability Applications

Date : Taiwan Standard Time: 2022/10/27 (Thursday) 19:30—21:00

USA Iowa Time: 2022/10/27 (Thursday) 6:30—8:00

Meeting WEBEX web link :

https://nckucc.webex.com/nckucc/j.php?MTID=m1d900d7478183e2c6b639229d57e8721

(In the link page, you may just select "join from your browser" "從您的瀏覽器加入" without installing WEBEX)

Abstract (1)

Reliability is an engineering discipline that relies heavily on the application of probability and statistics. Changes in sensor, communications, and storage technologies are changing the nature of reliability field data. An increasing number of modern systems are being outfitted with sensors that capture information about how and when and under what environmental and operating conditions individual systems are being used. In some cases, the physical/chemical state of critical system components can also be quantified and reported. For many systems, such information is being downloaded continuously into data farms. In addition, improvements in computing capabilities and investment in developing physics-based models for failure provide another important dimension of reliability information. There are many potential applications for using such data to improve safety and reduce costs but existing statistical methods for reliability assessment and prediction are inadequate for the tasks. This talk reviews some particular applications where modern field reliability data are used and explores some of the opportunities to use modern reliability data to provide stronger statistical/physical methods that can be used to operate and predict the performance of systems in the field. We also provide some examples of recent technical developments designed to be used in such applications and outline remaining challenges.

Abstract (2)

Especially when facing reliability data with limited information (e.g., a small number of failures), there are strong motivations for using Bayesian inference methods. These include the option to use information from physics-of-failure or previous experience with a failure mode in a particular material to specify an informative prior distribution. Another advantage is the ability to make statistical inferences without having to rely on specious (when the number of failures is small) asymptotic theory needed to justify non-Bayesian methods. Users of non-Bayesian methods are faced with multiple methods of constructing uncertainty intervals (Wald, likelihood, and various bootstrap methods) that can give substantially different answers when there is little information in the data. For Bayesian inference, there is only one method with equal tail probabilities---but it is necessary to provide a prior distribution to fully specify the model. Much work has been done to find default or objective prior distributions that will provide inference methods with good (and in some cases exact) frequentist coverage properties. This paper reviews some of this work and provides, evaluates, and illustrates principled extensions and adaptations of these methods to the practical realities of reliability data (e.g., non-trivial censoring).

歡迎參加!! Welcome to join!

主持人：樊采虹教授（中央大學統計研究所）
鄭順林教授（成功大學統計系）

Meeting Hosts :

Prof. Tsai-Hung Fan (Institute of Statistics, National Central University)
Prof. Shuen-Lin Jeng (Department of Statistics and Institute of Data Science, National Cheng Kung University)

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