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THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON STATISTICS

A class of new symmetric distributions based on scale mixtures of normal distribution and mean regression models by using N-EM and US algorithms

By

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Abstract

In this paper, we propose a class of new symmetric distributions as candidates or alternatives to model continuous data on the real line, when existing distributions (such as normal, Student's *t*, two-parameter Laplace, logistic and so on) perform the data-fitting not well enough. Motivated by the *stochastic representation* (SR) of the *random variable* (r.v.) following Student's *t*-distribution, the authors study the *general mixture of normal* (Ge-N) distribution, which is defined by an SR involving a normal r.v. with zero mean and a positive r.v. with an arbitrary distribution. The Ge-N distribution includes the commonly-used *t*, two-parameter Laplace, logistic distributions as three special cases and possesses a clear statistical interpretation. In the Ge-N framework, we first address the issue of identifiability of parameters, then develop three specific scale mixtures of normal distribution and corresponding mean regression models for analyzing continuous data with covariates. We apply the *normalized expectation-maximization* (N-EM) algorithm aided by the *upper-crossing/solution* (US) algorithm to calculate maximum likelihood estimates of parameters. Simulation studies on model comparisons showed that the proposed three new models extend the application scope of existing models. Two real data sets are analyzed to illustrate the proposed methods.

[This is a joint work with Mr. Yuefan WU, Mr. Yuanfan ZHAO, Prof. Zudi LU, Prof. Hua ZHOU, Dr. Xun-Jian LI]

Bio *: Dr. Guoliang Tian has been engaged in medical statistics research at the University of Maryland at Baltimore for six years, and served as an Associate Professor in the Department of Statistics and Actuarial Science at the University of Hong Kong for eight years. From June 2016 to present, he has been a Full Professor at the Department of Statistics and Data Science in Southern University of Science and Technology. His current research directions include the application of EM/MM/US/SeLF algorithms in statistics, statistical analysis of continuous proportional data on (0,1) intervals and multivariate continuous proportional data, and multivariate zero inflation data analysis. He has published over 160 SCI papers, 3 English monographs, and 2 English textbooks published by Science Press. He was the AE of four international statistical journals and is currently the AE of the SII (Statistics and Its Interface). Hosted two National Natural Science Foundation general projects, and participated in one National Natural Science Foundation key project.*

Date : 05 November 2025 (Wednesday)

Time : 4:00p.m. - 5:00p.m.

Venue : Room 2304 (near Lift 17 & 18)

All are welcome!