Preface: Special issue in honor of Dr. Hirotugu Akaike

We deeply regret to announce that Dr. Hirotugu Akaike passed away on August 4, 2009. In 2007, because of his excellent contribution to the field of statistical science, we planned to publish "Special Issue of the Annals of the Institute of Statistical Mathematics in Honor of Dr. Hirotugu Akaike". We received the sad news of his death, just after all editorial process has completed. This issue begins with an article by Dr. Akaike's last manuscript.

Dr. Hirotugu Akaike was awarded the 2006 Kyoto Prize for his major contribution to statistical science and modeling with the Akaike Information Criterion (AIC) with the praise that "In the early 1970's, Dr. Hirotugu Akaike formulated the Akaike Information Criterion (AIC), a new practical, yet versatile criterion for the selection of statistical models, based on basic concepts of information mathematics. This criterion established a new paradigm that bridged the world of data and the world of modeling, thus contributing greatly to the information and statistical sciences" (Inamori Foundation).

In 1973, he proposed the AIC as a natural extension of the log-likelihood. The most natural way of applying the AIC was to use it as the model selection or order selection criterion. In the minimum AIC procedure, the model with the minimum value of the AIC is selected as the best one among many possible models. This provided a versatile and semi-automatic procedure for statistical modeling that is free from the ambiguities inherent in application of the hypothesis test procedure.

The impact of the AIC is not limited to the realization of a semi-automatic model selection procedure, but it eventually led to a shift of paradigm in statistical science. In conventional statistical inference, the theories of estimation and test are developed under the assumption of the presence of a true model. However, due to the development of information and communication technologies, we can now access to huge amounts of large-scale heterogeneous data in various fields of science, technology and society. In statistical modeling for signal extraction and knowledge creation from data, the model is usually not given a priori, and it should be constructed based on the entire knowledge such as the knowledge, experience, observations and even the objective

of the modeling. Immediately after the proposal of the AIC, Dr. Akaike realized the importance of the Bayesian modeling for such situation and presented a Bayesian modeling framework and a practical way of selecting the prior distribution using the ABIC.

Besides the proposal of the information criteria, Dr. Akaike contributed in various aspects of statistical modeling such as the frequency and time domain time series modeling, development of a series of time series analysis and control program packages, TIMSAC and applications to the statistical control of cement rotary kiln and electric power plant. For these great contributions he has received several honorary prizes such as Ishikawa Prize (1972), Okochi Memorial Technology Prize (1980), Asahi Prize (1988), Purple Ribbon Medal (1989) and Japan Statistical Society Prize (1996).

Dr. Akaike's pioneering research has had a major influence on the developments in statistical science. We would like to dedicate this special issue to Dr. Akaike in appreciation of his contributions and the role that he has played in the advancement of various fields of natural and social sciences.

The present special issue contains 12 articles written by some of the researchers who have contributed to statistical modeling. The topics include: the concept of plausibility and statistical thinking by H. Akaike, variable selection in latent class analysis, state-space approach for solving the neural decoding problem, smoothing algorithms for state-space models, multivariate time series model for discrete outcomes, the forecasting accuracy of model selection approaches by BIC, model averaging and model mixing, model averaging estimator based on model selection with AIC, estimating the intensity for earthquake occurrence data by ETAS model, hierarchical Bayesian procedure based on the distance between topologies, constructing an information criterion for discretely observed ergodic diffusion models, frequentist and Bayesian measures of confidence by the multiscale bootstrap, constructing information criteria by the bootstrap methods.

It is our great pleasure to present the Hirotugu Akaike special issue of the Annals of the Institute of Statistical Mathematics. Our sincere thanks go to all the authors who contributed to this issue and the referees for their help in evaluating the manuscripts.

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