Chen Wen-chen's academic contributions

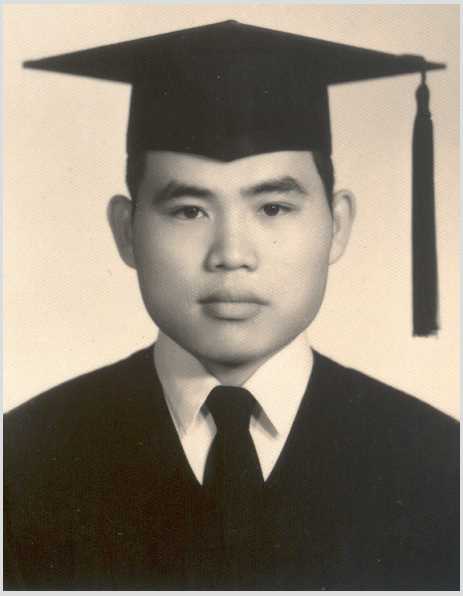
Chen Wen-chen and his collaborators wrote nine research papers over a short period of three to four years. These publications represent significant and innovative research in the areas of statistical inference, sequential analysis, and Bayesian analysis. From theoretical probability modelling to practical applications of information theory and cancer survival analysis, Chen has made influential contributions over a spectrum of methodological and applied topics.

Probability models for Zipf's law

Zipf's law is a prevalent empirical rule in many disciplines, including linguistics, biology, economics, evolution and social sciences. Many researchers have proposed various probability models to interpret the law. Chen's PhD thesis was mainly on the probability models and their applications. Chen extended the models presented in Hill's papers and proposed a unified framework based on the Dirichlet-multinomial urn model (equivalently, multivariate Pólya urn model) to interpret Zipf's law. His model represents the most general approach and includes many previous models as special cases; part of his thesis was published as a paper in the *Journal of Applied Probability*.[1]

Asymptotic theories in urn models

In a 1981 paper, Chen integrated the classic occupancy model, Bose–Einstein urn model, and Pólya urn model into a framework for the Dirichlet-multinomial urn models. Under this framework, he proved some asymptotic theories (including Poisson limit distributions and normal limit distributions) for the size distributions.[2] In a second paper that year, Chen further extended the Dirichlet-multinomial urn models to a more general model.[3] In both papers, his approach was based on an extended probability generating function and the saddle-point approximation method.



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From theoretical probability modelling to practical applications of information theory, Chen has made influential contributions over a spectrum of topics

His approach was also generalised to infinite Pólya urn models; the paper was submitted but not published due to his death.[4]

Optimal stopping-time theories in urn models

Chen and Starr applied sequential analysis to obtain some optimal stopping-time theories in urn models. Their research has inspired subsequent applications of Alan Turing's statistical work to biological sampling schemes and software debugging processes.[5]

When Chen joined Carnegie Mellon's Department of Statistics, he and DeGroot began working together on some optimal stopping issues. After Chen's death, DeGroot summarised their joint research and published the results in a book chapter.[6]

Inter-disciplinary collaboration

Chen also worked with professionals in other disciplines (radiology, information science and medical sciences) to develop highly useful mathematical/statistical methods and published papers in the pertinent fields.[7,8]

One of his submitted papers was eventually published in a conference proceedings and was dedicated to his memory.[9]

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References

1. Chen, W. C. (1980) On the weak form of Zipf's Law. *Journal of Applied Probability*, **17**, 611–622.

2. Chen, W. C. (1981) Some local limit theorems in the symmetric Dirichlet-multinomial urn models. *Annals of the Institute of Statistical Mathematics*, **33**, 405–415.

3. Chen, W. C. (1981) Limit theorems for general size distributions. *Journal of Applied Probability*, **18**, 139–147.

4. Chen, W. C. (1981) On the infinite Pólya urn model. Submitted but not published.

5. Chen, W. C. and Starr, N. (1980) Optimal stopping in an urn. *Annals of Probability*, **8**, 451–464.

6. Chen, W. C. and DeGroot, M. H. (1986) Optimal search for new types. In P. Goel and A. Zeller (eds), *Bayesian Inference and Decision Techniques: Essays in Honor of Bruno de Finetti* (pp. 443–458). Amsterdam: Elsevier.

7. Fayos, J. V., Chen, W. C., Kim, Y. H. and Votaw, M. L. (1979) Regression of Hodgkin's disease in the mediastinum: A mathematical model. *Radiology*, **133**, 731–735.

8. Chen, W. C. and Fontana, R. (1981) On total boundedness for existence of weakly minimax universal codes. *IEEE Transactions on Information Theory*, **27**, 781–784.

9. Chen, W. C., Hill, B. M., Greenhouse, J. B. and Fayos, J. V. (1985) Bayesian analysis of survival curves for cancer patients following treatment. In J. M. Bernardo, M. H. DeGroot, D. V. Lindley and A. F. M. Smith (eds), *Bayesian Statistics 2: Proceedings of the Second Valencia International Meeting* (pp. 299–328). Amsterdam: North-Holland.