TZE LEUNG LAI

Professor of Statistics

University Address

Department of Statistics
Sequoia Hall
390 Serra Mall
Stanford, CA 94305-4065
Phone: (650) 723-2622
Fax: (650) 725-8977
Email: lait@stanford.edu

Born: June 28, 1945, Hong Kong

Marital status: Married, 2 children

Citizenship: U.S. Citizen

Website: http://lait.web.stanford.edu

Education

1967	University of Hong Kong, B.A. with First Class Honors
1970	Columbia University, M.A.
1971	Columbia University, Ph.D.

Professional Experience

1967–1968	Demonstrator of Mathematics, University of Hong Kong
1971–1974	Assistant Professor of Mathematical Statistics, Columbia University
1974–1977	Associate Professor of Mathematical Statistics, Columbia University
1975–1976	Visiting Associate Professor of Mathematics, University of Illinois
1977–1986	Professor of Mathematical Statistics, Columbia University
1979	Visiting Professor, Sonderforschungsbereich, Universität Heidelberg
1977–1981	Research Collaborator, Brookhaven National Laboratory
1983	Visiting Professor, Mathematical Sciences Research Institute, UC Berkeley
1985, 1989	Visiting Professor, Nankai Mathematics Institute, Nankai University
1977–1987	Statistical Consultant, Pediatric Pulmonary Division, Columbia Presbyterian Medical Center
1986–1987	Higgins Professor of Mathematical Statistics, Columbia University
1987–present	Professor of Statistics, Stanford University
1989–1993	External Examiner, National University of Singapore
1996–2006	Advisory Committee Member, National Health Research Institute, Taipei
1992–present	Advisory Committee Member, Institute of Statistical Science, Academia Sinica
1991–present	External Assessor, Chinese University of Hong Kong
1999–2014	Steering Committee Member, Interdisciplinary Program in Financial Mathematics, Stanford
2001–2004	Chair, Department of Statistics, Stanford
2005–2008	External Examiner, Risk Management Science Program, Chinese University of Hong Kong
2005–2008	Steering Committee Member, Methods of Analysis Program in the Social Sciences, Stanford
2005–2014	Director, Interdisciplinary Program in Financial Mathematics, Stanford
2005–present	Co-director, Biostatistics Core, Stanford Cancer Institute
2007–present	Professor, by courtesy, of Health Research and Policy, Stanford School of Medicine
2009–present	Professor, by courtesy, of the Institute of Computational and Mathematical Engineering, Stanford School of Engineering
2009–present	Co-director, Center for Innovative Study Design, Stanford School of Medicine
2010–present	International Advisory Committee Member, Center for Statistical Sciences, Peking University
2011–present	Advisory Board Member, Department of Statistics and Actuarial Sciences, University of Hong Kong
2011–present	Advisory Committee Member, Institute of Mathematical Research, University of Hong Kong
2011–present	Chair, Pao-Lu Hsu Distinguished Lecture Series in Statistics and Probability, Center for Mathematical Sciences, Tsinghua University, Beijing
2012–present	International Advisory Committee Member, Mathematical Sciences Center, Tsinghua University
2012–present	Director, Financial and Risk Modeling Institute, Stanford University
2014–present	Co-chair, Steering Committee, Mathematical and Computational Finance Program, Stanford

Professional Activities

1981–present	Editorial Board, *Sequential Analysis*
1977–2011	Editorial Board, *Journal of Statistical Planning and Inference*
1986–1989	Associate Editor, *Journal of The American Statistical Association*
1979–1986	Editorial Board, *Zeitschrift Wahrscheinlichkeitstheorie verw. Gebiete*
1987–1991	Editorial Board, *Probability Theory and Related Fields*
1977–1995	Editorial Board, *Journal of Multivariate Analysis*
1991–1999	Editorial Board, *Statistica Sinica*
2011–present	Co-chair, Advisory Board of FIPS (Finance, Insurance, Probability and Statistics) Section of Institute of Mathematical Statistics (IMS)

Memberships

Fellow, Institute of Mathematical Statistics
Fellow, American Statistical Association
Society of Financial Studies
Bernoulli Society
International Biometric Society
International Statistical Institute
International Chinese Statistical Association

Honors and Awards

1967	Chan Kai Ming Prize and Walter Brown Mathematics Prize, University of Hong Kong
1980	Special Invited Paper, Institute of Mathematical Statistics
1983–1984	John Simon Guggenheim Fellowship
1983	Committee of Presidents of Statistical Societies (COPSS) Award
1989	Y.C. Wong Lectures in Mathematical Sciences, University of Hong Kong
1994	Election to Academia Sinica
1999	Richard Anderson Lecture in Statistics, University of Kentucky
1999	Matsushita Lectures in Mathematical Finance, Fudan University
1999–2000	Center for Advanced Study in the Behavioral Sciences Fellowship
2001	C.V. Starr Lecture in Financial Mathematics, University of Hong Kong
2001	Distinguished Lecture Series in Statistical Science, Academia Sinica
2005	International Chinese Statistical Association Distinguished Achievement Award
2005	Abraham Wald Prize in Sequential Analysis
2010	Pao-Lu Hsu Lecture in Statistics, Peking University
2012	Saw Swee Hock Lecture in Statistics, University of Hong Kong
2013	Plenary Speaker, 9th International Chinese Statistical Association Conference
2014	Plenary Speaker, Fourth IMS Workshop on Finance, Insurance, Probability and Statistics
2016	Saw Swee Hock Visiting Professor, National University of Singapore, January–March

Books

1. T.L. Lai and D. Siegmund, eds. (1985). *Herbert Robbins: Selected Papers.* Springer-Verlag, Berlin.
2. T.L. Lai (1991). *Statistics: Inference and Decision* (in Chinese). University Mathematics Series, Luen-Ching Publishing Co., Taipei.
3. T.L. Lai and Z. Zheng (1993). *Survival Analysis* (in Chinese). Zhejiang Publishing House of Science and Technology, Hangzhou.
4. T.L. Lai, H. Yang and S.P. Yung, eds. (2004). *Probability, Finance and Insurance.* World Scientific, New Jersey.
5. H.C. Ho, C.K. Ing and T.L. Lai, eds. (2006). *Time Series and Related Topics. In Memory of Ching-Zong Wei.* IMS Lecture Notes–Monograph Series **52**.

6. T.L. Lai, L. Qian and Q. Shao, eds. (2007). *Asymptotic Theory in Probability and Statistics with Applications*. Higher Education Press and International Press, Beijing and Cambridge, MA.

7. T.L. Lai and H. Xing (2008). *Statistical Models and Methods in Financial Markets*. Springer, New York.

8. V. de la Peña, T.L. Lai and Q.M. Shao (2009). *Self-Normalized Processes: Limit Theory and Applications*. Probability and Its Applications. Springer, New York.

9. J. Bartroff, T.L. Lai and M.C. Shih (2013). *Sequential Experimentation in Clinical Trials: Design and Analysis*. Springer, New York.

10. X. Guo, T.L. Lai, H. Shek and S.P. Wong (2016). *Quantitative Trading: Algorithms, Analytics, Data, Models, Optimization*. Chapman & Hall/CRC Press.

11. T.L. Lai and H. Xing (2017). *Risk Analytics and Management in Finance and Insurance*. Forthcoming from Chapman & Hall.

12. J. Chen, J. Heyse and T.L. Lai (2017). *Medical Product Safety Evaluation: Biological Models and Statistical Methods*. Forthcoming from Chapman & Hall.

13. A. Choi, A.S. Deng, T.L. Lai and K.W. Tsang (2018). *Data Science and Decision Analytics in Healthcare, Information Technology and Manufacturing* forthcoming from Wiley.

14. T.L. Lai, P.W. Lavori and K.W. Tsang (2018). *Innovative Study Designs and Statistical Analysis in Precision Medicine and Comparative Effectiveness Research*. Forthcoming from Chapman & Hall.

Publications

1. (1973) Space-time processes, parabolic functions and one-dimensional diffusions. *Trans. Amer. Math. Soc.* **175**, 409–438.
2. (1973) Optimal stopping and sequential tests which minimize the maximum expected sample size. *Ann. Statist.* **1**, 659–673.
3. (1973) Limiting behavior of weighted sums of independent random variables. *Ann. Probab.* **1**, 810–824 (with Y.S. Chow).
4. (1973) Gaussian processes, moving averages and quick detection problems. *Ann. Probab.* **1**, 825–837.
5. (1973) On Strassen-type laws of the iterated logarithm for delayed averages of the Wiener process. *Bull. Inst. Math., Academia Sinica* **1**, 29–39.
6. (1974) Control charts based on weighted sums. *Ann. Statist.* **2**, 134–147.
7. (1974) Limit theorems for delayed sums. *Ann. Probab.* **2**, 432–440.
8. (1974) Martingales and boundary crossing probabilities for Markov processes. *Ann. Probab.* **2**, 1152–1167.
9. (1974) Reproducing kernel Hilbert spaces and the law of the iterated logarithm for Gaussian processes. *Z. Wahrscheinlichkeitstheorie verw. Gebiete* **29**, 7–19.
10. (1974) Summability methods for independent, identically distributed random variables. *Proc. Amer. Math. Soc.* **45**, 253–261.
11. (1974) Convergence rates in the strong law of large numbers for random variables taking values in Banach spaces. *Bull. Inst. Math., Academia Sinica* **2**, 67–85.
12. (1975) One-sided theorems on the tail distribution of sample sums with applications to the last time and largest excess of boundary crossings. *Trans. Amer. Math. Soc.* **208**, 51–72 (with Y.S. Chow).
13. (1975) Termination, moments and exponential boundedness of the stopping rule for certain invariant sequential probability ratio tests. *Ann. Statist.* **3**, 581–598.
14. (1975) On Chernoff-Savage statistics and sequential rank tests. *Ann. Statist.* **3**, 825–845.
15. (1975) A note on first exit times with applications to sequential analysis. *Ann. Statist.* **3**, 999–1005.
16. (1975) Uniform integrability in renewal theory. *Bull. Inst. Math., Academia Sinica* **3**, 99–105.

17. (1976) Asymptotic moments of random walks with applications to ladder variables and renewal theory. *Ann. Probab.* **4**, 51–66.

18. (1976) Maximally dependent random variables. *PNAS USA* **73**, 286–288 (with H. Robbins). doi: 10.1073/pnas.73.2.286

19. (1976) On confidence sequences. *Ann. Statist.* **4**, 265–280.

20. (1976) Boundary crossing probabilities for sample sums and confidence sequences. *Ann. Probab.* **4**, 299–312.

21. (1976) On the last time and the number of boundary crossings related to the strong law of large numbers and the law of the iterated logarithm. *Z. Wahrscheinlichkeitstheorie verw. Gebiete* **34**, 59–71 (with K.K. Lan).

22. (1976) On r-quick convergence and a conjecture of Strassen. *Ann. Probab.* **4**, 612–627.

23. (1976) Uniform Tauberian theorems and their applications to renewal theory and first passage problems. *Ann. Probab.* **4**, 612–627.

24. (1977) First exit times from moving boundaries for sums of independent random variables. *Ann. Probab.* **5**, 210–221.

25. (1977) Sequential decision about a normal mean. In *Statistical Decision Theory and Related Topics II* (S.S. Gupta, ed.), 213–221. Academic Press, New York (with H. Robbins and D. Siegmund).

26. (1977) Power-one tests based on sample sums. *Ann. Statist.* **5**, 866–880.

27. (1977) Strong consistency of least-squares estimates in regression models. *PNAS USA* **74**, 2667–2669 (with H. Robbins). doi: 10.1073/pnas.74.7.2667

28. (1977) A non-linear renewal theory with applications to sequential analysis I. *Ann. Statist.* **5**, 946–954 (with D. Siegmund).

29. (1977) Convergence rates and r-quick versions of the strong law for stationary mixing sequences. *Ann. Probab.* **5**, 693–706.

30. (1978) Pitman efficiencies of sequential tests and uniform limit theorems in nonparametric statistics. *Ann. Statist.* **6**, 1027–1047.

31. (1978) Adaptive design in regression and control. *PNAS USA* **75**, 586–587 (with H. Robbins). doi: 10.1073/pnas.75.2.586

32. (1978) Limit theorems for weighted sums and stochastic approximation processes. *PNAS USA* **75**, 1068–1070 (with H. Robbins). doi: 10.1073/pnas.75.3.1068

33. (1978) A class of dependent random variables and their maxima. *Z. Wahrscheinlichkeitstheorie verw. Gebiete* **42**, 89–111 (with H. Robbins). doi: 10.1007/BF00536046

34. (1978) Paley-type inequalities and convergence rates related to the law of large numbers and extended renewal theory. *Z. Wahrscheinlichkeitstheorie verw. Gebiete* **45**, 1–19 (with Y.S. Chow).

35. (1978) The law of the iterated logarithm and upper-lower class tests for partial sums of stationary Gaussian sequences. *Ann. Probab.* **6**, 731–750 (with W. Stout).

36. (1978) Strong consistency of least squares estimates in multiple regression. *PNAS USA* **75**, 3034–3036 (with H. Robbins and C.Z. Wei). doi: 10.1073/pnas.75.7.3034

37. (1979) Sequential tests for hypergeometric distributions and finite populations. *Ann. Statist.* **7**, 46–59.

38. (1979) A non-linear renewal theory with applications to sequential analysis II. *Ann. Statist.* **7**, 60–76 (with D. Siegmund).

39. (1979) Extended renewal theory and moment convergence in Anscombe's theorem. *Ann. Probab.* **7**, 304–318 (with Y.S. Chow and C.A. Hsiung).

40. (1979) On the first exit time of a random walk from the stopping bounds $f(n) \pm cg(n)$ with applications to obstructive distributions in sequential analysis. *Ann. Probab.* **7**, 672–692 (with R.A. Wijsman).

41. (1979) Moments of ladder variables for driftless random walks. *Z. Wahrscheinlichkeitstheorie verw. Gebiete* **48**, 253–257 (with Y.S. Chow).

42. (1979) Local convergence theorems for adaptive stochastic approximation schemes. *PNAS USA* **76**, 3065–3067 (with H. Robbins). doi: 10.1073/pnas.76.7.3065

43. (1979) Adaptive design and stochastic approximation. *Ann. Statist.* **7**, 1196–1221 (with H. Robbins). doi: 10.1214/aos/1176344840

44. (1979) Strong consistency of least squares estimates in multiple regression II. *J. Multivariate Anal.* **9**, 343–361 (with H. Robbins and C.Z. Wei). doi: 10.1016/0047-259X(79)90093-9

45. (1979) On the maximal excess in boundary crossings of random walks related to fluctuation theory and laws of large numbers. *Bull. Inst. Math., Academia Sinica* **7**, 271–289 (with Y.S. Chow).

46. (1980) Limit theorems for sums of dependent random variables. *Z. Wahrscheinlichkeitstheorie verw. Gebiete* **51**, 1–14 (with W. Stout).

47. (1980) On random Fourier series. *Trans. Amer. Math. Soc.* **261**, 53–80 (with J. Cuzick).

48. (1980) Sequential medical trials. *PNAS USA* **79**, 3135–3138 (with B. Levin, H. Robbins and D. Siegmund).

49. (1980) Sequential selection procedures based on confidence sequences for normal populations. *Commun. Statist.–Theor. Method.* **9**, 1657–1676 (with S.C. Kao).

50. (1980) Heart rate and heart rate variability during sleep in aborted Sudden Infant Death Syndrome. *J. Pediatrics* **97**, 51–55 (with R.A. Epstein, M.A.F. Epstein, G.G. Haddad, H.L. Leistner and R.B. Mellins). doi: 10.1016/S0022-3476(80)80129-6

51. (1981) Ventilation and ventilatory pattern during sleep in aborted Sudden Infant Death Syndrome. *Pediatric Research* **15**, 879–883 (with G.G. Haddad, H.L. Leistner and R.B. Mellins). doi: 10.1203/00006450-198115050-00011

52. (1981) Asymptotic optimality of invariant sequential probability ratio tests. *Ann. Statist.* **9**, 318–333.

53. (1981) Consistency and asymptotic efficiency of slope estimates in stochastic approximation schemes. *Z. Wahrscheinlichkeitstheorie verw. Gebiete* **56**, 329–360 (with H. Robbins). doi: 10.1007/BF00536178

54. (1981) Convergence systems and strong consistency of least squares estimates in regression models. *J. Multivariate Anal.* **11**, 319–333 (with G.C. Chen and C.Z. Wei). doi: 10.1016/0047-259X(81)90078-6 [Reprinted (1983) in *Kexue Tongbao* **28**, 16–20. WOS: A1983QF00600004]

55. (1982) A law of the iterated logarithm for double arrays of independent random variables with applications to regression and time series models. *Ann. Probab.* **10**, 320–335 (with C.Z. Wei). doi: 10.1214/aop/1176993860

56. (1982) Least squares estimates in stochastic regression models with applications to identification and control of dynamic systems. *Ann. Statist.* **10**, 154–166 (with C.Z. Wei). doi: 10.1214/aos/1176345697

57. (1982) Adaptive design and the multiperiod control problem. In *Statistical Decision Theory and Related Topics III* (S.S. Gupta, ed.), Vol. 2, 103–120. Academic Press, New York (with H. Robbins).

58. (1982) Breath-to-breath variations in rate and depth of ventilation in sleeping infants. *Amer. J. Physiology* **243**, R164–R169 (with G.G. Haddad, M.A.F. Epstein, R.A. Epstein, H.L. Leistner, R.B. Mellins and K.F. Yu). WOS: A1982NX81500079

59. (1982) Iterated least squares in multiperiod control. *Adv. Appl. Math.* **3**, 50–73 (with H. Robbins).

60. (1982) Asymptotic properties of projections with applications to stochastic regression problems. *J. Multivariate Anal.* **12**, 346–370 (with C.Z. Wei). doi: 10.1016/0047-259X(82)90071-9

61. (1982) Determination of ventilatory pattern in REM sleep in normal infants. *J. Appl. Physiology* **53**, 52–56 (with G.G. Haddad and R.B. Mellins). WOS: A1982NX42800008

62. (1982) Convergence properties of some recursive identification schemes and adaptive predictors. In *Proc. Amer. Control Conf.*, 176–180 (with C.Z. Wei and Y.G. Zhang).

63. (1983) Lacunary systems and generalized linear processes. *Stochastic Processes and Applications* **14**, 187–199 (with C.Z. Wei).

64. (1983) Stochastic regression models and consistency of the least squares identification scheme. In *Mathematical Learning Models – Theory and Algorithms* (U. Herkenrath, D. Kalin and W. Vogel, eds.), 118–125. Springer-Verlag, Berlin.

65. (1983) Some asymptotic properties of general autoregressive models and strong consistency of least squares estimates of their parameters. *J. Multivariate Anal.* **13**, 1–23 (with C.Z. Wei). doi: 10.1016/0047-259X(83)90002-7

66. (1983) Fixed accuracy estimation of an autoregressive parameter. *Ann. Statist.* **11**, 478–485 (with D. Siegmund).

67. (1983) Sequential design of comparative clinical trials. In *Recent Advances in Statistics* (J. Rustagi et al., eds.), 51–68. Academic Press, New York (with H. Robbins and D. Siegmund).

68. (1983) A note on martingale difference sequences satisfying the local Marcinkiewicz–Zygmund condition. *Bull. Inst. Math., Academia Sinica* **11**, 1–13 (with C.Z. Wei).

69. (1983) Enkephalin-induced changes in ventilation and ventilatory pattern in adult dogs. *J. Appl. Physiology* **15**, 1311–1320 (with G.G. Haddad, M.R. Gandhi and G.M. Hochwald). WOS: A1983RL96500040

70. (1983) Adaptive choice of mean or median in estimating the center of a symmetric distribution. *PNAS USA* **80**, 5803–5806 (with H. Robbins and K.F. Yu). doi: 10.1073/pnas.80.18.5803

71. (1983) Heart rate pattern during sleep in an infant with congenital prolongation of the Q-T interval (Romano-Ward Syndrome). *Chest* **84**, 191–194 (with G.G. Haddad, H.L. Leistner and R.B. Mellins). doi: 10.1378/chest.84.2.191

72. (1984) Moment inequalities with applications to regresion and time series models. In *IMS Monograph Series: Inequalities in Statistics and Probability* (Y.L. Tong, ed.) **5**, 165–172 (with C.Z. Wei).

73. (1984) Optimal sequential sampling from two populations. *PNAS USA* **81**, 1284–1286 (with H. Robbins). doi: 10.1073/pnas.81.4.1284

74. (1984) Asymptotically optimal allocation of treatments in sequential experiments. In *Design of Experiments, Ranking and Selection: Essays in Honor of Robert E. Bechhofer* (T.J. Santner and A.C. Tamhane, eds.), 127–142. Marcel Dekker, New York (with H. Robbins).

75. (1984) Incorporating scientific and economic considerations in the design of clinical trials in the pharmaceutical industry — A sequential approach. *Commun. Statist.–Theor. Method.* **13**, 2355–2368.

76. (1984) Rhythmic variations in R-R interval during sleep and wakefulness in puppies and dogs. *Amer. J. Physiology: Heart and Circulatory Physiology* **247**, H67–H73 (with G.G. Haddad, H.J. Jeng and S.H. Lee). WOS: A1984TG24800009

77. (1984) Some thoughts on stochastic adaptive control. In *Proc. 23rd IEEE Conf. Decision and Control* **1**, 51–56.

78. (1985) Asymptotic properties of multivariate weighted sums with applications to stochastic regression and linear dynamic systems. In *Multivariate Analysis VI* (P.R. Krishnaiah, ed.), North Holland Publishing Company, Amsterdam, 375–393 (with C.Z. Wei).

79. (1985) Asymptotically efficient adaptive allocation rules. *Adv. Appl. Math.* **6**, 4–22 (with H. Robbins). doi: 10.1016/0196-8858(85)90002-8

80. (1985) Stochastic approximation and sequential search for optimum. In *Proc. Berkeley Conf. in Honor of Jerzy Neyman and Jack Kiefer* (L. LeCam and R.A. Olshen, eds.) **2**, 557–577. Wadsworth, Monterey.

81. (1985) Orthonormal Banach systems with applications to linear processes. *Z. Wahrscheinlichkeitstheorie verw. Gebiete* **70**, 381–394 (with C.Z. Wei). doi: 10.1007/BF00534870

82. (1985) Regression analysis of compartmental models. *NBS J. Research* **90**, 525–530.

83. (1986) On the concept of excitation in least squares identification and adaptive control. *Stochastics* **16**, 227–254 (with C.Z.Wei).

84. (1986) Asymptotically efficient adaptive control in stochastic regression models. *Adv. Appl. Math.* **7**, 23–45.

85. (1986) The contributions of Herbert Robbins to mathematical statistics. *Statist. Sci.* **1**, 276–284 (with D. Siegmund).

86. (1986) Effect of endorphins on heart rate and blood pressure in adult dogs. *Amer. J. Physiology: Heart and Circulatory Physiology* **250**: H796–H805 (with G.G. Haddad and H.J. Jeng). WOS: A1986C334900015

87. (1986) Extended least squares and their applications to adaptive control and prediction in linear systems. *IEEE Trans. Automat. Contr.* **31**, 898–906 (with C.Z. Wei). WOS: A1986D920600003

88. (1986) Stochastic approximation and adaptive control. In *Adaptive Statistical Procedures and Related Topics* (J. Van Ryzin, ed.), IMS Lecture Notes–Monograph Series, **8**, 266–282.

89. (1986) Within-breath electromyographic changes during loaded breathing in adult sheep. *Amer. J. Physiology* **61**, 1316–1321 (with G.G. Haddad, H.J. Jeng and A. Bazzy). WOS: A1986E439900010

90. (1987) Asymptotically efficient self-tuning regulators. *SIAM J. Contr. Optimizat.* **25**, 466–481 (with C.Z. Wei). doi: 10.1137/0325026

91. (1987) Adaptive treatment allocation and the multi-armed bandit problem. *Ann. Statist.* **15**, 1091–1114.

92. (1987) Determination of sleep state in infants using respiratory variability. *Pediatric Research* **21**, 556–562 (with G.G. Haddad, H.J. Jeng and R.B. Mellins). doi: 10.1203/00006450-198706000-00010

93. (1987) Heart rate variability during respiratory pauses in puppies and dogs. *Pediatric Research* **22**, 306–331 (with G.G. Haddad and H.J. Jeng). doi: 10.1203/00006450-198709000-00014

94. (1987) Optimal stopping and dynamic allocation. *Adv. Appl. Probab.* **19**, 829–853 (with F. Chang).

95. (1988) On Bayes sequential tests. In *Statistical Decision Theory and Related Topics IV* (S.S. Gupta and J. Berger, eds.) **2**, 131–143. Springer-Verlag, Berlin.

96. (1988) Asymptotic solutions of bandit problems. In *Stochastic Differential Systems, Stochastic Control Theory and Applications* (W. Fleming and P.L. Lions, eds.), 275–292. Springer-Verlag, Berlin.

97. (1988) Boundary crossing problems for sample means. *Ann. Probab.* **16**, 375–396.

98. (1988) Nearly optimal sequential tests of composite hypotheses. *Ann. Statist.* **16** 856–886.

99. (1988) Open bandit processes and optimal scheduling of queueing networks. *Adv. Appl. Probab.* **20**, 447–472 (with Z. Ying).

100. (1988) Stochastic integrals of empirical-type processes with applications to censored regression. *J. Multivariate Anal.* **27**, 334–358 (with Z. Ying).

101. (1989) Extended stochastic Lyapunov functions and recursive algorithms in stochastic linear systems. In *Stochastic Differential Systems: Proc. 4th Bad Honnef Conf.* (N. Christopeit et al., eds.), 206–220. Springer-Verlag, Berlin.

102. (1990) Functional laws of the iterated logarithm for the product-limit estimator of a distribution function under random censorship or truncation. *Ann. Probab.* **18**, 160–189 (with M.G. Gu).

103. (1990) T.W. Anderson and the strong consistency of least squares estimators in dynamic models. In *The Collected Papers of T.W. Anderson: 1943–1985* (G.P.H. Styan, ed.), 1615–1617. Wiley, New York.

104. (1991) Asymptotic optimality of generalized sequential likelihood ratio tests in some classical sequential testing problems. In *Handbook of Sequential Analysis* (B.K. Ghosh and P.K. Sen, eds.), 121–144. Marcel Dekker, New York. (2002) Reprinted in *Sequential Anal.* **21**, 219–247.

105. (1991) Adaptive prediction in nonlinear autoregressive models and control systems. *Statistica Sinica* **1**, 309–334 (with G. Zhu).

106. (1991) Estimating a distribution function with truncated and censored data. *Ann. Statist.* **19**, 417–442 (with Z. Ying).

107. (1991) Rank regression methods for left-truncated and right-censored data. *Ann. Statist.* **19**, 531–556 (with Z. Ying).

108. (1991) Large sample theory of a modified Buckley–James estimator for regression analysis with censored data. *Ann. Statist.* **19**, 1370–1402 (with Z. Ying).

109. (1991) Weak convergence of time-sequential censored rank statistics with applications to sequential testing in clinical trials. *Ann. Statist.* **19**, 1403–1433 (with M.G. Gu).

110. (1991) Recursive identification and adaptive prediction in linear stochastic systems. *SIAM J. Contr. Optimizat.* **29**, 1061–1090 (with Z. Ying).

111. (1991) Parallel recursive algorithms in asymptotically efficient adaptive control of linear stochastic systems. *SIAM J. Contr. Optimizat.* **29**, 1091–1127 (with Z. Ying).

112. (1991) Some almost sure convergence properties of weighted sums of martingale difference sequences. In *Proc. Conf. on Almost Everywhere Convergence in Probability and Ergodic Theory II* (A. Bellow and R. Jones, eds.), 179–190. Academic Press, New York.

113. (1991) Information bounds, certainty equivalence and learning in asymptotically efficient adaptive control of time-invariant stochastic systems. In *Stochastic Systems, Modelling, Estimation and Adaptive Control* (L. Gerenesér and P.E. Caines, eds.), 335–368. Springer-Verlag, Berlin.

114. (1991) Rank tests based on censored data and their sequential analogues. *Amer. J. Math. Manag. Sci.* **11**, 147–176 (with M.G. Gu and K.K.G. Lan).

115. (1992) Linear rank statistics in regression analysis with censored or truncated data. *J. Multivariate Anal.* **40**, 13–45 (with Z. Ying).

116. (1992) Recursive solutions of estimating equations and adaptive spectral factorization. *IEEE Trans. Automat. Contr.* **37**, 240–243 (with Z. Ying).

117. (1992) Asymptotically efficient estimation in censored and truncated regression models. *Statistica Sinica* **2**, 17–46 (with Z. Ying).

118. (1992) Recursive estimation in ARMAX models. In *New Directions in Time Series Part II* (D. Brillinger, P. Caines, J. Geweke, E. Parzen, M. Rosenblatt, M. Taqqu, eds.), 263–288. Springer-Verlag, Berlin.

119. (1992) Bootstrap confidence bands for spectra and cross-spectra. *IEEE Trans. Signal Process.* **40**, 1206–1215 (with D. Politis and J. Romano).

120. (1992) Asymptotic theory of a bias-corrected least squares estimator in truncated regression. *Statistica Sinica* **2**, 519–539 (with Z. Ying).

121. (1992) Certainty equivalence with uncertainty adjustments in stochastic adaptive control. In *Stochastic Theory and Adaptive Control* (T. Duncan and B. Pasik-Duncan, eds.), 270–284. Springer-Verlag, Berlin.

122. (1992) An empirical Bayes approach to modeling and control of stochastic systems with time-varying parameters. In *Proc. 31st IEEE Conf. Decision and Control*, 1072–1076. IEEE Publications.

123. (1993) Edgeworth expansions for symmetrical statistics with applications to bootstrap methods. *Statistica Sinica* **3**, 517–542 (with J.Q. Wang).

124. (1994) Adaptive estimation via martingales. In *Statistical Decision Theory and Related Topics V* (S.S. Gupta and J.O. Berger, eds.), 489–501. Springer-Verlag, Berlin.

125. (1994) Statistical analysis of ligand-binding experiments. *Biometrics* **50**, 782–797 (with L. Zhang).

126. (1994) A modification of Schwarz's sequential likelihood ratio tests in multivariate sequential analysis. *Sequential Anal.* **13**, 79–96 (with L. Zhang).

127. (1994) Asymptotic expansions of stopped random walks and first passage times. *Ann. Probab.* **22**, 1957–1992 (with J.Q. Wang).

128. (1994) A missing information principle and M-estimators in regression analysis with censored and truncated data. *Ann. Statist.* **22**, 1222–1255 (with Z. Ying).

129. (1994) Nearly optimal generalized sequential likelihood ratio tests in multivariate exponential families. In *Multivariate Analysis and Its Applications* (T.W. Anderson, K.T. Fang and I. Olkin, eds.), IMS Lecture Notes–Monograph Series **24**, 331–346 (with L. Zhang).

130. (1994) Asymptotic properties of nonlinear least squares estimates in stochastic regression models. *Ann. Statist.* **22**, 1917–1930.

131. (1995) Asymptotic normality of a class of adaptive statistics with applications to synthetic data methods for censored regression. *J. Multivariate Anal.* **52**, 259–279 (with Z. Ying and Z. Zheng).

132. (1995) Machine learning and nonparametric bandit theory. *IEEE Trans. Automat. Contr.* **40**, 1199–1209 (with S. Yakowitz).

133. (1995) Computer-based screening of patients with HIV/AIDS for clinical-trial eligibility. *Online J. Current Clinical Trials* **4**, Doc. No. 179 (with R.W. Carlson, S.W. Tu, N.M. Lane, C.A. Kemper, M.A. Musen and E.H. Shortliffe).

134. (1995) Sequential change-point detection in quality control and dynamical systems (with discussion). *J. Roy. Soc. Ser. B* **57**, 613–658.

135. (1995) Boundary crossing problems in sequential analysis and time series. *Bull. Internat. Stat. Inst.* **56**, 499–515.

136. (1995) Estimators with prescribed precision in stochastic regression models. *Sequential Anal.* **14**, 179–192 (with V. Konev).

137. (1995) Change of measures, likelihood ratio martingales and some applications. In *Five Decades as a Mathematician and Educator — On the 80th Birthday of Professor Yung Chow Wong* (K.Y. Chan and M.C. Liu, eds.), 117–135. World Scientific, New Jersey.

138. (1995) The nonparametric bandit approach to machine learning. In *Proc. 34th IEEE Conf. Decision and Control*, 568–572. IEEE Publications (with S. Yakowitz).

139. (1996) Convergence rate in the strong law of large numbers for Markov chains. In *Convergence in Ergodic Theory and Probability* (V. Bergelson, P. March and J. Rosenblatt, eds.), 185–192. W. deGruyter, Berlin (with C.D. Fuh).

140. (1996) Bootstrap methods for truncated and censored data. *Statistica Sinica* **6**, 509–530 (with S. Gross).

141. (1996) A multivariate Chernoff–Savage theorem with applications to rank statistics from multivariate populations. In *Research Developments in Probability and Statistics* (E. Brunner and M. Denker, eds.), 125–140. VSP International Science Publishers, Leiden (with Z. Govindarajulu).

142. (1996) Nonparametric estimation and regression analysis with left truncated and right censored data. *JASA* **91**, 1166–1180 (with S. Gross).

143. (1996) On uniform integrability and asymptotically risk-efficient sequential estimation. *Sequential Anal.* **15**, 237–251.

144. (1997) Wald's equation and asymptotic bias of randomly stopped U-statistics. *Proc. Amer. Math. Soc.* **125**, 917–925 (with V. de la Peña).

145. (1997) Valuation of discrete barrier and hindsight options. *J. Financial Engineering* **6**, 169–177 (with F. AitSahlia).

146. (1997) Information and prediction criteria for model selection in stochastic regression and ARMA models. *Statistica Sinica* **7**, 285–309 (with C.P. Lee).

147. (1997) Inference from grouped data in three-parameter Weibull models with applications to breakdown voltage experiments. *Technometrics* **39**, 199–210 (with H. Hirose).

148. (1997) On optimal stopping problems in sequential hypothesis testing. *Statistica Sinica* **7**, 33–51.

149. (1997) Asymptotically efficient adaptive choice of control laws in controlled Markov chains. *SIAM J. Contr. Optimizat.* **35**, 715–743 (with T.L. Graves).

150. (1997) Moments of randomly stopped U-statistics. *Ann. Probab.* **25**, 2055–2081 (with V. de la Peña).

151. (1998) Resampling methods for confidence intervals in group sequential trials. *Biometrika* **85**, 317–332 (with C.S. Chuang).

152. (1998) Repeated significance testing with censored rank statistics in interim analysis of clinical trials. *Statistica Sinica* **8**, 411–423 (with M.G. Gu).

153. (1998) Wald's equations, first passage times and moments of ladder variables in Markov random walks. *J. Appl. Probab.* **35**, 566–580 (with C.D. Fuh). doi: 10.1239/jap/1032265205

154. (1998) Information bounds and quick detection of parameter changes in stochastic systems. *IEEE Trans. Inform. Theory* **44**, 2917–2929.

155. (1998) Random walk duality and the valuation of discrete lookback options. *Appl. Math. Finance* **5**, 227–240 (with F. AitSahlia).

156. (1998) Sequential analysis. In *Encyclopedia of Biostatistics* **5**, 4074–4079. Wiley, New York.

157. (1998) Stochastic adaptive control of linear time-varying systems using auxiliary variables. In *Proc. 37th IEEE Conf. Decision and Control*, 3445–3450. IEEE Publications (with Z. Li).

158. (1999) Robust regression with censored and truncated data. In *Multivariate Analysis, Design of Experiments and Survey Sampling* (S. Ghosh, ed.), 231–263. Marcel Dekker, New York (with C.K. Kim).

159. (1999) Regression smoothers and additive models for censored and truncated data. *Commun. Statist.–Theor. Method.* **28**, 2717–2747 (with C.K. Kim).

160. (1999) Efficient recursive algorithms for detection of abrupt changes in signals and control systems. *IEEE Trans. Automat. Contr.* **44**, 952–966 (with J.Z. Shan).

161. (1999) Determination of power and sample size in the design of clinical trials with failure-time endpoints and interim analyses. *Contr. Clin. Trials* **20**, 423–438 (with M.G. Gu). doi: 10.1016/S0197-2456(99)00021-5

162. (1999) A canonical optimal stopping problem for American options and its numerical solution. *J. Comput. Finance* **3**, 33–52 (with F. AitSahlia).

163. (2000) Hybrid resampling methods for confidence intervals (with discussion and rejoinder). *Statistica Sinica* **10**, 1–50 (with C.S. Chuang).

164. (2000) Sequential multiple hypothesis testing and efficient fault detection-isolation in stochastic systems. *IEEE Trans. Inform. Theory* **46**, 595–608.

165. (2000) Efficient score estimation and adaptive M-estimators in censored and truncated regression models. *Statistica Sinica* **10**, 731–749 (with C.K. Kim).

166. (2000) Incomplete learning from endogenous data in dynamic allocation. *Econometrica* **68**, 1511–1516 (with M. Brezzi).

167. (2000) Moment bounds for self-normalized martingales. In *Progress in Probability: Proceedings of High-Dimensional Probability II.* (E. Giné, D. Mason and J. Wellner, eds.), 1–11. Birkhauser, Boston (with V. de la Peña and M.J. Klass).

168. (2000) Asymptotic approximations for error probabilities of sequential or fixed sample size tests in exponential families. *Ann. Statist.* **28**, 1638–1669 (with H.P. Chan).

169. (2000) Learning and forecasting with stochastic neural networks. In *Statistics and Finance: An Interface* (W.S. Chan, W.K. Li and H. Tong, eds.), 279–301. Imperial College Press, London (with S.P. Wong).

170. (2001) Theory and applications of decoupling. In *Probability and Statistical Models with Applications* (C.A. Charalambides, M.V. Koutras and N. Balakrishnan, eds.), 115–145. Chapman and Hall, New York (with V. de la Peña).

171. (2001) Sequential analysis: Some classical problems and new challenges (with discussion and rejoinder). *Statistica Sinica* **11**, Celebrating the New Millennium: Editors' Invited Article I, 303–408.

172. (2001) Stochastic neural networks with applications to nonlinear time series. *JASA* **96**, 968–981 (with S.P. Wong). doi: 10.1198/016214501753208636

173. (2001) Asymptotic expansions in multidimensional Markov renewal theory and first passage times for Markov random walks. *Adv. Appl. Probab.* **33**, 652–673 (with C.D. Fuh).

174. (2001) One-sided tests in clinical trials with multiple endpoints. *Biometrics* **57**, 1039–1047 (with D. Bloch and P. Tubert-Bitter).

175. (2001) Exercise boundaries and efficient approximations to American option prices and hedge parameters. *J. Comput. Finance* **4**, 85–103 (with F. AitSahlia).

176. (2002) Optimal learning and experimentation in bandit problems. *J. Econ. Dyn. Control* **27**, 87–108 (with M. Brezzi).

177. (2002) Comparison of treatments with multiple outcomes. In *Statistical Design, Measurement and Analysis of Health Related Quality of Life* (M. Mesbah, B.F. Cole and M.L. Ting, eds.), 102–115. Kluwer Academic Publishers, Norwell, MA (with D. Bloch and P. Tubert-Bitter).

178. (2002) Sequential optimization under uncertainty. In *Modeling Uncertainty: An Examination of Stochastic Theory, Methods, and Applications* (M. Dror, P. L'Ecuyer, F. Szidarovszky, eds.), 35–55. Kluwer Academic Publishers, Norwell, MA.

179. (2002) Detection and estimation in stochastic systems with time-varying parameters. In *Stochastic Theory and Control* (B. Pasik-Duncan, ed.), 251–265. Springer, New York.

180. (2002) Boundary crossing probabilities for scan statistics and their applications to change-point detection. *Method. Comput. Appl. Probab.* **4**, 317–336 (with H.P. Chan).

181. (2003) Stochastic approximation. *Ann. Statist.* **31**, 391–406.

182. (2003) Saddlepoint approximations and nonlinear boundary crossing probabilities of Markov random walks. *Ann. Appl. Probab.* **13**, 395–429 (with H.P. Chan).

183. (2003) Statistics in pharmacology and pre-clinical studies. In *Advanced Medical Statistics* (J.Q. Fang and Y. Lu, eds.), 409–442. World Scientific, New Jersey (with M. Shih and G. Zhu).

184. (2003) Singular stochastic control in optimal investment and hedging in the presence of transaction costs. In *Probability, Statistics and Their Applications: Papers in Honor of Rabi Bhattacharya* (K. Athreya, M. Majumdar, M. Puri and E. Waymire, eds.), IMS Lecture Notes–Monograph Series **41**, 209–227 (with T.W. Lim).

185. (2003) Nonparametric estimation in nonlinear mixed effects models. *Biometrika* **90**, 1–13 (with M. Shih).

186. (2003) Fast and accurate valuation of American barrier options. *J. Comput. Finance* **7**, 129–145 (with F. AitSahlia and L. Imhof).

187. (2003) A hybrid estimator in nonlinear and generalized linear mixed effects models. *Biometrika* **90**, 859–879 (with M. Shih).

188. (2004) Exercise regions and efficient valuation of American lookback options. *Math. Finance* **14**, 249–269 (with T.W. Lim).

189. (2004)Valuation of American options via basis functions. *IEEE Trans. Automat. Contr.* **49** (Special Issue on Financial Engineering), 374–385 (with S.P. Wong).

190. (2004) Pricing and hedging of American knock-in options. *J. Derivatives* **11**, 44–50 (with F. AitSahlia and L. Imhof).

191. (2004) Self-normalized processes: Exponential inequalities, moment bounds and iterated logarithm laws. *Ann. Probab.* **32**, 1902–1933 (with V. de la Peña and M.J. Klass).

192. (2004) Limit theorems for moving averages. In *Probability, Finance and Insurance* (T.L. Lai, H. Yang and S.P. Yung, eds.), 1–14. World Scientific, New Jersey.

193. (2004) Interim and terminal analyses of clinical trials with failure-time endpoints and related group sequential designs. In *Applications of Sequential Methodologies* (N. Mukhopadhyay, S. Datta and S. Chattopadhay, eds.), 193–218. Marcel Dekker, New York.

194. (2004) Likelihood ratio identities and applications to sequential analysis (with discussion and response). *Sequential Anal.* **23**, 467–556.

195. (2004) Power, sample size and adaptation considerations in the design of group sequential trials. *Biometrika* **91**, 509–528 (with M.C. Shih).

196. (2005) Optimal stopping for Brownian motion with applications to sequential analysis and option pricing. *J. Statist. Plan. Infer.* **130**, 21–47 (with T.W. Lim).

197. (2005) Autoregressive models with piecewise constant volatility and regression parameters. *Statistica Sinica* **15**, 279–301 (with H. Liu and H. Xing).

198. (2005) Clinical trials for drug development: Some statistical problems. *ICSA Bulletin* for January, 20–42.

199. (2005) Importance sampling for generalized likelihood ratio procedures in sequential analysis. *Sequential Anal.* **24**, 259–278 (with H.P. Chan).

200. (2005) Sequential analysis – Further developments. In *Encyclopedia of Biostatistics*, 2nd ed. vol. 7. John Wiley & Sons. doi: 10.1002/0470011815.b2a15141

201. (2005) Adapting mathematics education to an evolving environment. In *Revisiting Mathematics Education in Hong Kong for the New Millennium* (N.Y. Wong, ed.), Hong Kong Association of Mathematics Education Monograph Series, 661–671 (with S.P. Yung).

202. (2006) Structural change as an alternative to long memory in financial time series. In *Adv. Econom.*, Volume 20 Part B (T.B. Fomby, R.C. Hill and D. Terrell, eds.) Emerald/JAI, Bingley, 205–224 (with H. Xing).

203. (2006) Sequential generalized likelihood ratios and adaptive treatment allocation for optimal sequential selection. *Sequential Anal.* **25**, 179–201 (with H.P. Chan).

204. (2006) Flexible modeling via a hybrid estimation scheme in generalized mixed models for longitudinal data. *Biometrics* **62**, 159–167 (with M. Shih and S.P. Wong). doi: 10.1111/j.1541-0420.2005.00391.x

205. (2006) Maxima of asymptotically Gaussian random fields and moderate deviation approximations to boundary crossing probabilities of sums of random variables with multidimensional indices. *Ann. Probab.* **34**, 80–121 (with H.P. Chan). doi: 10.1214/009117905000000378

206. (2006) Modified Haybittle-Peto group sequential tests for superiority and non-inferiority hypotheses in clinical trials. *Stat. Med.* **25**, 1149–1167 (with M.C. Shih and G. Zhu).

207. (2006) Approximate policy optimization and adaptive control in regression models. *Comput. Economics* **27**, 433–452 (with J. Han and V. Spivakovsky). doi: 10.1007/s10614-005-9007-1

208. (2006) A new approach to modeling covariate effects and individualization in population pharmacokinetics-pharmacodynamics. *J. Pharmacok. Pharmacodynam.* **33**, 49–74 (with M.C. Shih and S.P. Wong). doi: 10.1007/s10928-005-9000-2

209. (2006) Efficient recursive estimation and adaptive control in stochastic regression and ARMAX models. *Statistica Sinica* **16**, 741–772 (with Z. Ying).

210. (2006) Confidence intervals in group sequential trials with random group sizes and applications to survival analysis. *Biometrika* **93**, 641–654 (with W. Li). doi: 10.1093/biomet/93.3.641

211. (2006) Bias correction and confidence intervals following sequential tests. In *Recent Developments in Nonparametric Inference and Probability* (J. Sun, ed.), IMS Lecture Notes–Monograph Series **50**, 44–57 (with Z. Su and C.S. Chuang).

212. (2006) Combining domain knowledge and statistical models in time series analysis. In *Time Series and Related Topics. In Memory of Ching-Zong Wei* (H.C. Ho, C.K. Ing and T.L. Lai, eds.), IMS Lecture Notes–Monograph Series **52**, 193–209 (with S.P. Wong).

213. (2006) The optimal stopping problem for S_n/n and its ramifications. In *Random Walks, Sequential Analysis and Related Topics* (A.C. Hsiung, Z. Ying and C.H. Zhang, eds.), 131–149. World Scientific, New Jersey (with Y.C. Yao).

214. (2006) Confidence intervals for survival quantiles in the Cox regression model. *Lifetime Data Analysis* **12**, 407–419 (with Z. Su).

215. (2007) Marginal regression analysis of longitudinal data with time-dependent covariates: A generalized method-of-moments approach. *J. Roy. Soc. Ser. B* **69**, 79–99 (with D. Small).

216. (2007) Nonparametric functionals of spectral distributions and their applications to time series analysis. *J. Statist. Plan. Infer.* **137**, 1066–1075 (with H. Xing).

217. (2007) Identification and adaptive control of change-point ARX models via Rao-Blackwellized particle filters. *IEEE Trans. Automat. Contr.* **52**, 67–72 (with Y. Chen).

218. (2007) A combined superiority and non-inferiority approach to multiple endpoints in clinical trials. *Stat. Med.* **26**, 1193–1207 (with D.A. Bloch, Z. Su and P. Tubert-Bitter). doi: 10.1002/sim.2611

219. (2007) Efficient importance sampling for Monte Carlo evaluation of exceedance probabilities. *Ann. Appl. Probab.* **17**, 440–473 (with H.P. Chan). doi: 10.1214/105051606000000664

220. (2007) Self-normalized limit theorems in probability and statistics. In *Asymptotic Theory in Probability and Statistics with Applications* (T.L. Lai, L. Qian and Q.M. Shao, eds.), 3–43. Higher Education Press and International Press, Beijing and Cambridge, MA (with Q.M. Shao).

221. (2007) Corrected random walk approximations to free boundary problems in optimal stopping. *Adv. Appl. Probab.* **39**, 753–775 (with Y.C. Yao and F. AitSahlia). doi: 10.1239/aap/1189518637

222. (2007) Pseudo-maximization and self-normalized processes. *Probability Surveys* **4**, 172–192 (with V. de la Peña and M.J. Klass).

223. (2008) Saddlepoint approximations and boundary crossing probabilities of random fields and their applications. In *Third International Congress of Chinese Mathematicians: Proceedings, Part 1* (K.S. Lau, Z.P. Xin and S.T. Yau, eds.), AMS/IP Studies in Advanced Mathematics Series **42**, 29–40. American Mathematical Society and International Press, Cambridge, MA.

224. (2008) Sequential nonparametrics and semiparametrics: Theory, implementation and applications to clinical trials. In *Beyond Parameters in Interdisciplinary Research* (N. Balakrishnam, E. Pena and M. Silvapulle, eds.), IMS Lecture Notes–Monograph Series **57**, 332–349 (with Z. Su).

225. (2008) Stochastic segmentation models for array-based comparative genomic hybridization data analysis. *Biostatistics* **9**, 290–307 (with H. Xing and N. Zhang). doi: 10.1093/biostatistics/kxm031

226. (2008) Efficient adaptive designs with mid-course sample size adjustment in clinical trials. *Stat. Med.* **27**, 1593–1611 (with J. Bartroff). doi: 10.1002/sim.3201

227. (2008) Statistical inference in dynamic panel data models. *J. Statist. Plan. Infer.*, Special Issue in Honor of Theodore Wilbur Anderson, Jr. on the Occasion of his 90th Birthday **138**, 2763–2776 (with D. Small and J. Liu). doi: 10.1016/j.jspi.2008.03.011

228. (2008) Generalized likelihood ratio statistics and uncertainty adjustments in efficient adaptive design of clinical trials. *Sequential Anal.* **27**, 254–276 (with J. Bartroff). doi: 10.1080/07474940802241009

229. (2008) Modern sequential analysis and its applications to computerized adaptive testing. *Psychometrika* **73**, 473–486 (with J. Bartroff and M. Finkelman). doi: 10.1007/s11336-007-9053-9

230. (2008) Discussion on "Is average run length to false alarm always an informative criterion?" by Yajun Mei. *Sequential Anal.* **27**, 385–388.

231. (2008) Statistical models for the Basel II internal ratings-based approach to measuring credit risk of retail products. *Statistics and Its Interface* **1**, 229–241 (with S.P. Wong).

232. (2008) Fast particle filters and their applications to adaptive control in change-point ARX models and robotics. In *Frontiers in Adaptive Control* (S. Cong, ed.), 51–70. InTech, Vienna, Austria (with Y. Chen and B. Wu).

233. (2008) A hidden Markov filtering approach to multiple change-point models. In *Proc. 47th IEEE Conf. on Decision and Control*, 1914–1919, Taylor and Francis, London (with H. Xing).

234. (2009) Discussion on "Optimal sequential surveillance for finance, public health, and other areas" by Marianne Frisén. *Sequential Anal.* **28**, 360–364 (with H. Xing). doi: 10.1080/07474940903041688

235. (2009) Martingales in sequential analysis and time series, 1945–1985. *J. Électron. Hist. Probab. Stat.* **5**, no. 1, 31 pp.

236. (2009) Tests and confidence intervals for secondary endpoints in sequential clinical trials. *Biometrika* **96**, 903–915 (with M.C. Shih and Z. Su). doi: 10.1093/biomet/asp063

237. (2009) A Bayesian approach to sequential surveillance in exponential families. *Commun. Statist.–Theor. Method.*, Special Issue in honor of S. Zacks **38**, 2958–2968 (with H. Xing). doi: 10.1080/03610920902947253

238. (2009) Option hedging theory under transaction costs. *J. Econ. Dyn. Control* **33**, 1945–1961 (with T.W. Lim). doi: 10.1016/j.jedc.2009.04.007

239. (2009) Theory and applications of multivariate self-normalized processes. *Stoch. Proc. Appl.* **119**, 4210–4227 (with V. de la Peña and M. Klass). doi: 10.1016/j.spa.2009.10.003

240. (2010) Sequential change-point detection when the pre- and post-change parameters are unknown. *Sequential Anal.* **29**, 162–175 (with H. Xing). doi: 10.1080/07474941003741078

241. (2010) Stepwise regression. In *The Encyclopedia of Research Design* (N. Salkind, B. Frey and D. Dougherty, eds.), 1450–1452. Sage Publications, Thousand Oaks, CA (with C.K. Ing). doi: 10.4135/9781412961288.n444

242. (2010) Multistage tests of multiple hypotheses. *Commun. Statist.–Theor. Method.* **39**, Recent Advances in Statistical Inference — In Honor of M. Akahira, 1597–1607 (with J. Bartroff).

243. (2010) Time series modeling and forecasting of the volatilities of asset returns. In *The Handbook of Quantitative Finance and Risk Management* (C.F. Lee, A.C. Lee and J. Lee, eds.), 1417–1426. Springer, New York. doi: 10.1007/978-0-387-77117-5_96

244. (2010) Information sets and excess zeros in random effects modeling of longitudinal data. *Statistics in Biosciences* **2**, 81–94 (with K.H. Sun and S.P. Wong). doi: 10.1007/s12561-010-9022-1

245. (2010) Sequential generalized likelihood ratio tests for vaccine safety evaluation. *Stat. Med.* **29**, 2698–2708 (with M.C. Shih, J.F. Heyse and J. Chen). doi: 10.1002/sim.4036

246. (2010) Black-necked swans and active risk management. In *Surveillance Technologies and Early Warning Systems: Data Mining Applications for Risk Detection* (A.S. Koyuncugil and N. Ozgulbas. eds.), 64–74. IGI Global, Hershey, PA (with B. Shen).

247. (2010) Cramér-type moderate deviations for studentized U-statistics. *ESAIM: Prob. & Stat.* **15**, 168–179 (with Q.M. Shao and Q. Wang). doi: 10.1051/ps/2009014

248. (2010) Approximate dynamic programming and its applications to the design of Phase I cancer trials. *Statist. Sci.* **25**, 245–257 (with J. Bartroff). doi: 10.1214/10-STS317

249. (2011) Incorporating individual and collective ethics into Phase I cancer trial designs. *Biometrics* **67**, 596–603 (with J. Bartroff). doi: 10.1111/j.1541-0420.2010.01471.x

250. (2011) Mean-variance portfolio optimization when means and covariances are unknown. *Ann. Appl. Statist.* **5**, Number 2A, 798–823 (with Z. Chen and H. Xing). doi: 10.1214/10-AOAS422SUPP

251. (2011) A simple Bayesian approach to multiple change-points. *Statistica Sinica* **21**, 539–569 (with H. Xing). doi: 10.5705/ss.2011.025a

252. (2011) A stepwise regression method and consistent model selection for high-dimensional sparse linear models. *Statistica Sinica* **21**, 1473–1513 (with C.K. Ing). doi: 10.5705/ss.2010.081

253. (2011) A sequential Monte Carlo approach to computing tail probabilities in stochastic models. *Ann. Appl. Probab.* **21**, 2315–2342 (with H.P. Chan). doi: 10.1214/10-AAP758

254. (2011) Innovative clinical trial designs: Toward a 21st-century health care system. *Stat. Biosci.* **3**, 145–168 (with P.W. Lavori). doi: 10.1007/s12561-011-9042-5

255. (2011) Evaluating probability forecasts. *Ann. Statist.* **39**, 2356–2382 (with D.B. Shen and S. Gross). doi: 10.1214/11-AOS902

256. (2011) Option prices and pricing theory: Combining financial mathematics with statistical modeling. *Wiley Interdisciplinary Reviews: Computational Statistics* **3**, 566–576 (with L. Chen and T.W. Lim). doi: 10.1002/wics.186

257. (2011) Discussion on "Two-stage procedures for high-dimensional data" by Makoto Aoshima and Kazuyoshi Yata. *Sequential Anal.* **30**, 404–411 (with C.K. Ing). doi: 10.1080/07474946.2011.619092

258. (2012) Adaptive trial designs. *Annu. Rev. Pharmacol. Toxicol.* **52**, 101–110 (with P.W. Lavori and M.C. Shih). doi: 10.1146/annurev-pharmtox-010611-134504

259. (2012) Sequential design of Phase II-III cancer trials. *Stat. Med.* **31**, 1944–1960 (with P.W. Lavori and M.C. Shih). doi: 10.1002/sim.5346

260. (2012) Sequential importance sampling and resampling for dynamic portfolio credit risk. *Oper. Res.* **60**, 78–91 (with S. Deng and K. Giesecke).

261. (2012) Clinical trial designs for testing biomarker-based personalized therapies. *Clin. Trials J.* **9**, 141–154 (with P.W. Lavori, M.C. Shih and B. Sikic). doi: 10.1177/1740774512437252

262. (2012) Futility stopping in clinical trials. *Statistics and Its Interface* **5**, 415–424 (with P. He and O.Y. Liao).

263. (2012) Adaptation in clinical development plans and adaptive clinical trial designs. *Statistics and Its Interface* **5**, 431–442 (with O.Y. Liao and G.R. Zhu). WOS: 000312365700007

264. (2012) Sequential planning for robotic navigation and exploration under uncertainty. In *Introduction to Modern Robotics II* (Daisuke Chugo and Sho Yokota, eds.), pp. 47–68. iConcept Press, Queensland, Australia (with Y. Chen and K.B. Wu).

265. (2012) Rare-event simulation of heavy-tailed random walks by sequential importance sampling and resampling. *Advan. Appl. Probab.* **44**, 1173–1196 (with H.P. Chan and S. Deng). doi: 10.1239/aap/1354716593

266. (2012) Efficient adaptive randomization and stopping rules in multi-arm clinical trials for testing a new treatment. *Sequential Anal.* **31**, 441–457 (with O.Y. Liao). doi: 10.1080/07474946.2012.719433

267. (2012) Evolutionary credibility theory: A generalized linear mixed modeling approach. *N. Amer. Actuarial J.* **16**, 273–284 (with K.H. Sun).

268. (2012) Singular stochastic control in option hedging with transaction costs. Chapter 6 in *Stochastic Modeling and Control* (Ivan G. Ivanov, ed.), pp. 103–118. InTech, Vienna, Austria (with T.W. Lim).

269. (2012) Credit portfolios, credibility theory, and dynamic empirical Bayes. *ISRN: Probability and Statistics*, Volume 2012, Article ID 832175, 42 pages. doi: 10.5402/2012/832175

270. (2013) Discussion of "Change-points: From sequential detection to biology and back" by David Siegmund. *Sequential Anal.* **32**, 22–27 (with H. Chan). doi: 10.1080/07474946.2013.751840

271. (2013) Stochastic change-point ARX-GARCH models and their applications to econometric time series. *Statistica Sinica* **23** (A Special Issue in Honor of Professor David Siegmund's 70th Birthday), 1573–1594 (with H. Xing). doi: 10.5705/ss.2012.224s

272. (2013) Adaptive filtering, nonlinear state-space models, and applications to finance and econometrics. In *State-Space Models: Applications in Economics and Finance* (S. Wu and Y. Zeng, eds.), Statistics and Econometrics for Finance, Vol. 1, 3–22. Springer, New York (with V. Bukkapatanam).

273. (2013) Group sequential designs for developing and testing biomarker-guided personalized therapies in comparative effectiveness research. *Contemp. Clin. Trials* **36**, 651–663 (with O.Y-W. Liao and D.W. Kim). doi: 10.1016/j.cct.2013.08.007

274. (2013) Data science, statistical modeling, and financial and health care reforms. *Notices of the International Congress of Chinese Mathematicians (ICCM)* **1**, 47–57. doi: 10.4310/ICCM.2013.v1.n2.a6

275. (2013) A general theory of particle filters in hidden Markov models and some applications. *Ann. Statist.* **42**, 2877–2904 (with H.P. Chan). doi: 10.1214/13-AOS1172

276. (2014) A new approach to designing phase I-II cancer trials for cytotoxic chemotherapies. *Stat. Med.* **33**, 2718–2735 (with J. Bartroff and B. Narasimhan). doi: 10.1002/sim.6124

277. (2014) Statistics in a new era for finance and health care. In *Past, Present and Future of Statistical Science* (X. Lin et al, eds.), 369–379. Chapman & Hall/CRC, Baton Rouge.

278. (2014) Discussion on "Sequential estimation in time series models" by T.N. Sriram and R. Iaci. *Sequential Anal.* **33**, 169–173. doi: 10.1080/07474946.2014.896688

279. (2014) Dynamic empirical Bayes models and their applications to longitudinal data analysis and prediction. *Statistica Sinica* **24**, 1505–1528 (with Y. Su and K.H. Sun). doi: 10.5705/ss.2012.048

280. (2014) Stochastic change-point models of asset returns and their volatilities. In *Handbook of Financial Econometrics and Statistics* (C.F. Lee, J.C. Lee, eds.), 2317–2335. Springer, New York.

281. (2014) Adaptive choice of patient subgroup for comparing two treatments. *Contemp. Clin. Trials* **39**, 191–200 (with P.W. Lavori and O.Y.W. Liao). doi: 10.1016/j.cct.2014.09.001

282. (2015) Asymptotically efficient parameter estimation in hidden Markov spatio-temporal random fields. *Statistica Sinica* **25**, 403–421 (with J. Lim). doi: 10.5705/ss.2013.281w

283. (2015) ABO mismatch is associated with increased nonrelapse mortality after allogeneic hematopoietic cell transplantation. *Biol. Blood Marrow Transplant.* **21**, 746–754 (with A.C. Logan, Z. Wang, K. Alimoghaddam, et al.). doi: 10.1016/j.bbmt.2014.12.036

284. (2015) Design of clinical trials with failure-time endpoints and interim analyses: An update after fifteen years. *Contemp. Clin. Trials* 10th Anniversary Special Issue, **45** Part A, 103–112 (with P. He and Z. Su). doi: 10.1016/j.cct.2015.05.018

285. (2015) Adaptive design of confirmatory trials: Advances and challenges. *Contemp. Clin. Trials* 10th Anniversary Special Issue, **45** Part A, 93–102 (with P.W. Lavori and K.W. Tsang). doi: 10.1016/j.cct.2015.06.007

286. (2015) Innovative designs of point-of-care comparative effectiveness trials. *Contemp. Clin. Trials* 10th Anniversary Special Issue, **45** Part A, 61–68 (with M.C. Shih and M. Turakhia). doi: 10.1016/j.cct.2015.06.014

287. (2015) Fixed-size confidence regions in high-dimensional sparse linear regression models. *Sequential Anal.* **34**, 324–335 (with C.K. Ing). doi: 10.1080/07474946.2015.1063258

288. (2015) State price density estimation and nonparametric pricing of basket options. *J. Mathemat. Finance* **5**, 448–456 (with Y. Kuang). doi: 10.4236/jmf.2015.55038

289. (2016) Discussion on "Perils and potentials of self-selected entry to epidemiological studies and surveys" by N. Keiding and T.A. Louis. *J. Roy. Statist. Soc. Ser. A* **179**, 355 (with A.L. Choi). doi: 10.1111/rssa.12136

290. (2016) Conversations with Tze Leung Lai by Milan Shen, Ka Wai Tsang and Samuel Po-Shing Wong. *ICSA Bulletin* **28**, 29–40.

291. (2016) Health analytics, economics and medicine toward a 21st-century health care system. *Health* **8**, 428–443 (with A.L. Choi and D.A. Lai). doi: 10.4236/health.2016.85046

292. (2016) Multivariate stochastic regression in time series modeling. *Statistica Sinica* **26**, 1411–1426 (with K.W. Tsang). doi: 10.5705/ss.2014.211t

293. (2016) Discussion on "Sequential detection/isolation of abrupt changes" by Igor V. Nikiforov. *Sequential Anal.* **35**, 305–310 (with K.W. Tsang). doi: 10.1080/07474946.2016.1206372

294. (2016) Sequential multiple hypothesis testing and applications to on-line detection and diagnosis in multi-component systems. In *Proc. 54th Annual Allerton Conference on Communication, Control, and Computing* (September 27–30, Monticello, IL), IEEE Xplore (with M. Shen and K.W. Tsang).

295. (2016) Multiple testing in regression models with applications to fault diagnosis in the big data era. *Technometrics*, 1–10 (with C.K. Ing, M. Shen, K.W. Tsang and S.H. Yu). Published online 19 September. doi: 10.1080/00401706.2016.1236755

296. (2016) A new approach to regression analysis of censored competing-risks data. *Lifetime Data Analysis*, 1–21 (with Y. Jin). doi: 10.1007/s10985-016-9378-8

297. (2016) Adaptive designs. In *Oncology Clinical Trials: Successful Design, Conduct and Analysis*, 2nd ed. (W.K. Kelly and S. Halabi, eds.) Demos Medical Publishing, New York (with Y. Lu and K.W. Tsang).

298. (2016) Power of an adaptive trial design for endovascular stroke studies simulations using IMS (Interventional Management of Stroke) III data. *Stroke* **47**, 2931–2937 (with M.G. Lansberg, N.S. Bhat, S.D. Yeatts, Y.Y. Palesch, J.P. Broderick, G.W. Albers and P.W. Lavori). doi: 10.1161/STROKEAHA.116.015436

299. (2017) Model and moment selection in moment restriction models. To appear *Economet. Theory* (with D. Small and Y. Su).

300. (2017) Sensitivity versus specificity in the evaluation of adverse event data from clinical trials. To appear *Medical Safety and Global Health* (with J. Chen, J.F. Heyse and J. Miao).

Doctoral Students and Their Ph.D. Dissertations

At Columbia University

1. GIAN-CARLO MANGANO (1974). On Strassen-type laws of the iterated logarithm for Gaussian random variables with values in abstract spaces.

2. YUNG KUNG MENG (1975). Treatment allocation problems and sequential tests in clinical trials.

3. KUANG HSIEN LIN (1976). Large deviation probabilities for U-statistics with applications to sequential analysis.

4. JOHN GEBBED KASHAH (1979). Fixed size confidence regions for certain time series parameters.

5. CHING ZONG WEI (1980). Limit theorems for weighted sums with applications to regression and time series models.

6. LANCELOT WU (1982). On recursive estimation, adaptive filtering, and stochastic approximation.

7. FU CHANG (1983). Contributions to the multi-armed bandit problem.

8. ZUKANG ZHENG (1984). Regression analysis with censored data.

9. HUAJING JENG (1985). Contributions to spectral analysis with applications to electromyographic data.

10. CHUN JIAN TIAN (1986). Statistical analysis of periodically correlated time series.

11. WEI-QIU WU (1986). Stochastic approximation and sequential minimization under constraints.

12. MING GAO GU (1987). Nonparametric analysis of survival data in staggered entry clinical trials.

13. ZHILIANG YING (1987). Recursive estimation and adaptive control in dynamic systems and time series models.

At State University of New York at Stony Brook

14. ZUEI-CHUAN LIN (1981). Sequential hypothesis testing in a normal population with unknown variance.

At University of Padova, Italy

15. MONICA BREZZI (1998). Sequential learning and nearly optimal rules in dynamic allocation.

At Stanford University

16. QIZHI WANG (1991). Edgeworth expansions and bootstrap methods in survival analysis.
17. GUANGRUI ZHU (1992). Least squares estimation and adaptive prediction in non-linear stochastic regression models with applications to time series and stochastic systems.
18. LIMIN ZHANG (1993). Asymptotically optimal sequential tests of linear hypotheses in exponential families.
19. CHUL-KI KIM (1995). Nonparametric regression for censored and truncated data.
20. FARID AITSAHLIA (1995). Optimal stopping and weak convergence methods for some problems in financial economics.
21. ZHAOLIN SHAN (1995). Sequential detection of parameter changes in linear dynamic systems and regression models.
22. CHIN-SHAN CHUANG (1995). Estimation with resampling after sequential tests.
23. TODD LAWRENCE GRAVES (1995). Comparison of treatments under adaptive treatment allocation in clinical trials and stochastic adaptive control.
24. JINHO PARK (1996). Nonparametric function estimation with left truncated and right censored data.
25. SAMUEL PO-SHING WONG (1997). Stochastic neural networks and their applications to regression analysis and time series forecasting.
26. HOCK PENG CHAN (1998). Boundary crossing theory in change-point detection and its applications.
27. TIONG-WEE LIM (1999). Recursive integration and optimal stopping: Applications to option pricing.
28. MEI-CHIUNG SHIH (1999). Estimation in nonlinear mixed effects models: Parametric and nonparametric approaches.
29. VIKTOR SPIVAKOVSKY (2000). Multiperiod control in stochastic regression models.
30. JULIA TUNG (2000). Parameter estimation in stochastic volatility models and hidden Markov chains.
31. TONGWEI LIU (2000). Segmentation and estimation in stochastic systems with occasional parameter changes.
32. YUGUO CHEN (2001). Sequential importance sampling with resampling: Theory and applications.
33. WENZHI LI (2002). Confidence intervals following group sequential trials with random group sizes and applications to survival analysis.
34. DYLAN SMALL (2002). Inference and model selection for instrumental variables regression.
35. HAIYAN LIU (2003). Autoregressive models with time-varying parameters and applications to financial time series.
36. JOHAN LIM (2003). Hidden variable models and their applications.
37. SERGIY TERENTYEV (2004). Asymptotic counterparty relations in default modeling.
38. QING-FENG ZHANG (2005). A basis function approach to interest rate derivative valuation.

39. MATTHEW FINKELMAN (2005). Statistical issues in computerized adaptive testing.
40. ZHENG SU (2005). Computational methods for least squares problems and survival analysis.
41. HAIPENG XING (2005). Change-point stochastic regression models with applications to econometric time series.
42. JINGYANG LI (2005). A Bayesian approach to efficient estimation with censored survival data.
43. JIARUI HAN (2005). Dynamic portfolio management: An approximate linear programming approach.
44. WEI JIN (2006). A Bayesian approach for additive-multiplicative hazard models.
45. JAEMYOUNG KIM (2007). Pricing and hedging bond options in the presence of transaction costs.
46. ZEHAO CHEN (2008). Estimation of high-dimensional covariance matrices and applications to portfolio selection.
47. ZHEN WEI (2008). Functional learning methods with applications to quantitative finance.
48. YUXUE JIN (2009). Regression modeling of competing risks with applications to bone marrow transplantation studies and mortgage prepayment and default behavior.
49. JIA LIU (2010). Econometric analysis of policy effect.
50. BO SHEN (2010). Evaluation of forecasts with applications to meteorology.
51. LING CHEN (2010). A semiparametric approach to option pricing and hedging with transaction costs.
52. SHAOJIE DENG (2010). Sequential methods for rare event simulation: Theory and applications.
53. PAUL C.K. PONG (2010). Interest rate modeling and a time series model for functional data.
54. HOWARD SHEK (2011). Statistical and algorithmic aspects of optimal portfolios.
55. KEVIN BIN WU (2011). An integrated approach to robotic navigation under uncertainty.
56. KEVIN HAOYU SUN (2011). Dynamic empirical Bayes models and their applications to longitudinal data.
57. FENG ZHANG (2011). Cross-validation and regression analysis in high-dimensional sparse linear models.
58. HONGSONG YUAN (2012). Regularization methods and algorithms for noisy output signals and high-dimensional input vectors.
59. SHILIN ZHU (2012). Probabilistic and statistical modeling of fixed income assets.
60. PEI HE (2012). Non-proportional hazards in clinical trials with failure-time endpoints.
61. OLIVIA YUEH-WEN LIAO (2013). Adaptive design of clinical trials with interim selection of treatment arm.
62. YONG SU (2013). Statistical methods for dynamic panel data and their applications.
63. LI XU (2013). Dynamic asset allocation using adaptive particle filters.
64. VIBHAV BUKKAPATANAM (2013). Statistical and computational methods for credit portfolio loss and state-space models.
65. ABHAY SUBRAMANIAN (2013). An adaptive filtering approach to problems in high-frequency trading.
66. DONG WOO KIM (2014). Multi-armed bandits with side information.
67. TONG XIA (2014). Gradient boosting machine for high-dimensional additive models.
68. KA WAI TSANG (2015). High-dimensional sparse multivariate regression models.

69. SUKWON CHUNG (2015). Adaptive particle filters for high signal-to-noise ratios with applications to robotics.

70. ANDY GEWITZ (2015). A sequential Monte Carlo approach to joint longitudinal and time-to-event modeling.

71. MILAN SHEN (2015). Contributions to fault detection and diagnosis with high-dimensional data.

72. YUMING KUANG (2016). Adaptive particle filters in hidden Markov models: A new approach and its applications.

73. ZHIYU WANG (2017). Dynamic panel data analytics and a martingale approach to evaluation of econometric forecasts and its applications.

Postdoctoral Trainees and Their Subsequent Positions

1. HUAJING JENG (1985–1986). Member of Technical Staff, AT&T Bell Laboratories.

2. FRIDRIK BAULDURSSON (1985–1987). Assistant Professor, University of Iceland.

3. MEI-CHIUNG SHIH (2000–2001). Assistant Professor, Department of Biostatistics, Harvard University.

4. WERNER BRANNATH (2002–2003). Assistant Professor, Medical University of Vienna.

5. JAY BARTROFF (2004–2006). Assistant Professor, Department of Statistics, University of California at Riverside.

6. ZHENG SU (2005–2006). Assistant Professor, Department of Applied Mathematics and Statistics, State University of New York at Stony Brook.