TZE LEUNG LAI

Curriculum Vitae

Born: June 28, 1945, Hong Kong
Marital Status: Married, 2 children
Citizenship: U.S. Citizen

Education

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

Professional Experience

Demonstrator of Mathematics, University of Hong Kong, 1967–1968
Assistant Professor of Mathematical Statistics, Columbia University, 1971–1974
Associate Professor of Mathematical Statistics, Columbia University, 1974–1977
Visiting Associate Professor of Mathematics, University of Illinois, 1975–1976
Professor of Mathematical Statistics, Columbia University, 1977–1986
Visiting Professor, Sonderforschungsbereich, Universität Heidelberg, 1979
Research Collaborator, Brookhaven National Laboratory, 1977–1981
Visiting Professor, Mathematical Sciences Research Institute, University of California at Berkeley, 1983
Visiting Professor, Nankai Mathematics Institute, Nankai University, 1985, 1989
Statistical Consultant, Pediatric Pulmonary Division, Columbia Presbyterian Medical Center, 1977-1987
Higgins Professor of Mathematical Statistics, Columbia University, 1986–1987
Professor of Statistics, Stanford University, 1987–present
External Examiner, National University of Singapore, 1989-1993
Advisory Committee Member, National Health Research Institute (Taipei), 1996–1997, 2003–present
Advisory Committee Member, Institute of Statistical Science, Academia Sinica, 1992–present
External Assessor, Chinese University of Hong Kong, 1991–present
External Examiner, Risk Management Science Program, Chinese University of Hong Kong, 2005–2008.
Chair, Advisory Committee, School of Statistics, Morningside Center of Mathematics, Chinese Academy of Sciences, 2003–present.
Steering Committee Member, 1999–present, and Director, 2005–present, Interdisciplinary Program in Financial Mathematics, Stanford University
Chair, Department of Statistics, Stanford University, 2001–2004
Co-director, Biostatistics Core, Stanford University Medical School Cancer Center, 2004–present
Steering Committee Member, Stanford University Methods of Analysis Program in the Social Sciences, 2005–present
Professor, by courtesy, of Health Research and Policy, Stanford University School of Medicine, 2007–present
Professor, by courtesy, of the Institute of Computational and Mathematical Engineering, Stanford University, 2009–present

Memberships

Fellow, Institute of Mathematical Statistics
Fellow, American Statistical Association
International Statistical Institute
Biometric Society
Drug Information Association
Econometric Society
Society of Financial Studies

Professional Activities

Editorial Board, Journal of Statistical Planning and Inference
Editorial Board, Sequential Analysis
Associate Editor, Journal of American Statistical Association, 1986–1989
Editorial Board, Zeitschrift Wahrscheinlichkeitstheorie verw. Gebiete, 1979–1986
Editorial Board, Probability Theory and Related Fields, 1987–1991
Editorial Board, Journal of Multivariate Analysis, 1977–1995
Editorial Board, Statistica Sinica, 1991–1999

Honors and Awards

Chan Kai Ming Prize and Walter Brown Mathematics Prize, University of Hong Kong, 1967

Special Invited Paper, Institute of Mathematical Statistics, 1980

John Simon Guggenheim Fellowship, 1983–1984

Committee of Presidents of Statistical Societies (COPSS) Award, 1983

Y. C. Wong Lectures in Mathematical Sciences, University of Hong Kong, 1989

Election to Academia Sinica, 1994

Richard Anderson Lecture in Statistics, University of Kentucky, 1999

Matsushita Lectures in Mathematical Finance, Fudan University, 1999

Center for Advanced Study in the Behavioral Sciences Fellowship, 1999–2000

C. V. Starr Lecture in Financial Mathematics, University of Hong Kong, 2001

Distinguished Lecture Series in Statistical Science, Academia Sinica, 2001

Abraham Wald Prize in Sequential Analysis, 2005

Publications by Tze Leung Lai

1. Space-time processes, parabolic functions and one-dimensional diffusions (1973). *Trans. Amer. Math. Soc.* **175**, 409–438.
2. Optimal stopping and sequential tests which minimize the maximum expected sample size (1973). *Ann. Statist.* **1**, 659–673.
3. Limiting behavior of weighted sums of independent random variables (1973). *Ann. Probab.* **1**, 810–824 (with Y. S. Chow).
4. Gaussian processes, moving averages and quick detection problems (1973). *Ann. Probab.* **1**, 825–837.
5. On Strassen-type laws of the iterated logarithm for delayed averages of the Wiener process (1973). *Bull. Inst. Math., Academia Sinica* **1**, 29–39.
6. Control charts based on weighted sums (1974). *Ann. Statist.* **2**, 134–147.
7. Limit theorems for delayed sums (1974). *Ann. Probab.* **2**, 432–440.
8. Martingales and boundary crossing probabilities for Markov processes (1974). *Ann. Probab.* **2**, 1152–1167.
9. Reproducing kernel Hilbert spaces and the law of the iterated logarithm for Gaussian processes (1974). *Z. Wahrscheinlichkeitstheorie verw. Gebiete* **29**, 7–19.
10. Summability methods for independent, identically distributed random variables (1974). *Proc. Amer. Math. Soc.* **45**, 253–261.
11. Convergence rates in the strong law of large numbers for random variables taking values in Banach spaces (1974). *Bull. Inst. Math., Academia Sinica* **2**, 67–85.
12. One-sided theorems on the tail distribution of sample sums with applications to the last time and largest excess of boundary crossings (1975). *Trans. Amer. Math. Soc.* **208**, 51–72 (with Y. S. Chow).
13. Termination, moments and exponential boundedness of the stopping rule for certain invariant sequential probability ratio tests (1975). *Ann. Statist.* **3**, 581–598.
14. Chernoff-Savage statistics and sequential rank tests (1975). *Ann. Statist.* **3**, 825–845.
15. A note on first exit times with applications to sequential analysis (1975). *Ann. Statist.* **3**, 999–1005.
16. Uniform integrability in renewal theory (1975). *Bull. Inst. Math., Academia Sinica* **3**, 99–105.
17. Asymptotic moments of random walks with applications to ladder variables and renewal theory (1976). *Ann. Probab.* **4**, 51–66.
18. Maximally dependent random variables (1976). *PNAS USA* **73**, 286–288 (with H. Robbins).
19. On confidence sequences (1976). *Ann. Statist.* **4**, 265–280.
20. Boundary crossing probabilities for sample sums and confidence sequences (1976). *Ann. Probab.* **4**, 299–312.
21. 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 (1976). *Z. Wahrscheinlichkeitstheorie verw. Gebiete* **34**, 59–71 (with K. K. Lan).
22. On r-quick convergence and a conjecture of Strassen (1976). *Ann. Probab.* **4**, 612–627.
23. Uniform Tauberian theorems and their applications to renewal theory and first passage problems (1976). *Ann. Probab.* **4**, 612–627.

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

25. Sequential decision about a normal mean (1977). 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. Power-one tests based on sample sums (1977). *Ann. Statist.* **5**, 866–880.

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

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

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

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

31. Adaptive design in regression and control (1978). *PNAS USA* **75**, 586–587 (with H. Robbins).

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

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

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

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

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

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

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

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

40. 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 (1979). *Ann. Probab.* **7**, 672–692 (with R. A. Wijsman).

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

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

43. Adaptive design and stochastic approximation (1979). *Ann. Statist.* **7**, 1196–1221 (with H. Robbins).

44. Strong consistency of least squares estimates in multiple regression II (1979). *J. Multivariate Analysis* **9**, 343–361 (with H. Robbins and C. Z. Wei).

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

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

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

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

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

50. Heart rate and heart rate variability during sleep in aborted sudden infant death syndrome (1980). *J. Pediatrics* **97**, 51–55 (with R. A. Epstein, M. A. F. Epstein, G. G. Haddad, H. L. Leistner and R. B. Mellins).

51. Ventilation and ventilatory patterns during sleep in aborted SIDS infants (1981). *Pediatric Research* **15**, 879–883 (with G. G. Haddad, H. L. Leistner and R. B. Mellins).

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

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

54. Convergence systems and strong consistency of least squares estimates in regression models (1981). *J. Multivariate Analysis* **11**, 319–333 (with G. C. Chen and C. Z. Wei).

55. A law of the iterated logarithm for double arrays with applications to regression and time series models (1982). *Ann. Probab.* **10**, 320–335 (with C. Z. Wei).

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

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

58. Breath-to-breath variations in rate and depth of ventilation in sleeping infants (1982). *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).

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

60. Asymptotic properties of projections with application to stochastic regression problems (1982). *J. Multivariate Anal.* **12**, 346–370 (with C. Z. Wei).

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

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

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

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

65. Some asymptotic properties of general autoregressive models and strong consistency of least squares estimates of their parameters (1983). *J. Multivariate Anal.* **13**, 1–23 (with C. Z. Wei).

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

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

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

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

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

71. Heart rate pattern during sleep in congenital prolongation of the QT interval (Romano-Ward Syndrome) (1983). *Chest* **84**, 191–194 (with G. G. Haddad, H. L. Leistner and R. B. Mellins).

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

73. Optimal sequential sampling from two populations (1984). *PNAS USA* **81**, 1284–1286 (with H. Robbins).

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

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

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

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

79. Asymptotically efficient adaptive allocation rules (1985). *Adv. Appl. Math.* **6**, 4–22 (with H. Robbins).

80. Stochastic approximation and sequential search for optimum (1985). 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. Orthonormal Banach systems with applications to linear processes (1985). *Z. Wahrscheinlichkeitstheorie verw. Gebiete* **70**, 381–394 (with C. Z. Wei).

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

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

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

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

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

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

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

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

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

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

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

93. Heart rate variability during respiratory pauses in puppies and dogs (1987). *Pediatric Research* **22**, 306–331 (with G. G. Haddad and H. J. Jeng).

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

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

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

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

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

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

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

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

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

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

104. Asymptotic optimality of generalized sequential likelihood ratio tests in some classical sequential testing problems (1991). 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. Adaptive prediction in non-linear autoregressive models and control systems (1991). *Statist. Sinica* **1**, 309–334 (with G. Zhu).
106. Estimating a distribution function with truncated and censored data (1991). *Ann. Statist.* **19**, 160–189 (with Z. Ying).
107. Rank regression methods for left truncated and right censored data (1991). *Ann. Statist.* **19**, 531–556 (with Z. Ying).
108. Large sample theory of a modified Buckley-James estimator for regression analysis with censored data (1991). *Ann. Statist.* **19**, 1370–1402 (with Z. Ying).
109. Weak convergence of time-sequential censored rank statistics with applications to sequential testing in clinical trials (1991). *Ann. Statist.* **19**, 1403–1433 (with M. G. Gu).
110. Recursive identification and adaptive prediction in linear stochastic systems (1991). *SIAM J. Contr. Optimizat.* **29**, 1061–1090 (with Z. Ying).
111. Parallel recursive algorithms in asymptotically efficient adaptive control of linear stochastic systems (1991). *SIAM J. Contr. Optimizat.* **29**, 1091–1127 (with Z. Ying).
112. Some almost sure convergence properties of weighted sums of martingale difference sequences (1991). 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. Information bounds, certainty equivalence and learning in asymptotically efficient adaptive control of time-invariant stochastic systems (1991). In *Stochastic Systems, Modelling, Estimation and Adaptive Control* (L. Gerenesér and P. E. Caines, Eds.), 335–368. Springer-Verlag, Berlin.
114. Rank tests based on censored data and their sequential analogues (1991). *Amer. J. Math. Manag. Sci.* **11**, 147–176 (with M. G. Gu and K. K. G. Lan).
115. Linear rank statistics in regression analysis with censored or truncated data (1992). *J. Multivariate Anal.* **40**, 13–45 (with Z. Ying).
116. Recursive solutions of estimating equations and adaptive spectral factorization (1992). *IEEE Trans. Automat. Contr.* **37**, 240–243 (with Z. Ying).
117. Asymptotically efficient estimation in censored and truncated regression models (1992). *Statist. Sinica* **2**, 17–46 (with Z. Ying).
118. Recursive estimation in ARMAX models (1992). 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. Bootstrap confidence bounds for spectra and cross-spectra (1992). *IEEE Trans. Acoust. Speech Sign.* **40**, 1206–1215 (with D. Politis and J. Romano).
120. Asymptotic theory of a bias-corrected least squares estimator in truncated regression (1992). *Statist. Sinica* **2**, 519–539 (with Z. Ying).
121. Certainty equivalence with uncertainty adjustments in stochastic adaptive control (1992). In *Stochastic Theory and Adaptive Control* (T. Duncan and B. Pasik-Duncan, Eds.), 270–284. Springer-Verlag, Berlin.
122. An empirical Bayes approach to modeling and control of stochastic systems with time-varying parameters (1992). In *Proc. 31st IEEE Conf. Decision and Control*, 1072–1076. IEEE Publications.

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

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

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

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

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

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

129. Nearly optimal generalized sequential likelihood ratio tests in multivariate exponential families (1994). 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. Asymptotic properties of nonlinear least squares estimates in stochastic regression models (1994). *Ann. Statist.* **22**, 1917–1930.

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

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

133. Computer-based screening of patients with HIV/AIDS for clinical-trial eligibility (1995). *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. Sequential change-point detection in quality control and dynamical systems (with discussion) (1995). *J. Roy. Soc. Ser. B* **57**, 613–658.

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

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

137. Change of measures, likelihood ratio martingales and some applications (1995). 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. The nonparametric bandit approach to machine learning (1995). In *Proc. 34th IEEE Conf. Decision and Control*, 568–572. IEEE Publications (with S. Yakowitz).

139. Convergence rate in the strong law of large numbers for Markov chains (1996). 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. Bootstrap methods for truncated and censored data (1996). *Statist. Sinica* **6**, 509–530 (with S. Gross).

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

142. Nonparametric estimation and regression analysis with left truncated and right censored data (1996). *JASA* **91**, 1166–1181 (with S. Gross).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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240. Stepwise regression (2009). To appear *Encyclopedia of Research Design* (N. Salkind, B. Frey and D. Dougherty, eds.), Sage Publications (with C. Ing)

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Books

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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.

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. ZHILIANG YING (1987). Recursive estimation and adaptive control in dynamic systems and time series models.
13. MINGGAO GU (1987). Nonparametric analysis of survival data in staggered entry clinical trials.

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 (1994). 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 (1995). Nonparametric function estimation with left truncated and right censored data.
25. SAMUEL PO-SHING WONG (1996). 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 (1998). 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
33. WENZHI LI (2001). 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 (2002). Autoregressive models with time-varying
36. JOHAN LIM (2003). Hidden variable models and their applications.
37. SERGIY TERENTYEV (2004). Asymptotic counterparty relations in default modeling.
38. QINGFENG ZHANG (2004). A basis function approach to interest rate derivative valuation.
39. MATTHEW FINKELMAN (2004). 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. JIARUI HAN (2005). Dynamic portfolio management: An approximate linear programming approach.
43. JINGYANG LI (2005). A Bayesian approach to efficient estimation with censored survival data.
44. WEI JIN (2006). A Bayesian approach for additive-multiplicative hazard models.
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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 (2009). Econometric analysis of policy effects and corporate defaults.

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.