

CURRICULUM VITAE OF KA-SING LAU

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EDUCATION

1969–1972	Ph.D.	University of Washington (Seattle)
1964–1968	B. Sc.	The Chinese University of Hong Kong (Magna Cum Laude)

PRESENT POSITION

1996 – Professor & Chairman, The Chinese University of Hong Kong

OTHER PROFESSIONAL EXPERIENCE

1986 – 1999	Professor, University of Pittsburgh
1997 Summer	Visiting Professor, Université de Paris-Nord
1995 Winter	Visiting Professor, National Sun Yat-Sen Univ.
1994 Summer	Visiting Professor, Cornell University
1991 Summer	Visiting Professor, Goldsmiths' College, London University
1991 Winter	Visiting Professor, Elec. Eng., University of Pittsburgh
1989 Winter	Fulbright Fellow, Indian Statistical Inst., New Delhi, India
1982 – 1983	Visiting Member, Institute for Adv. Study, Princeton
1981 Summer	Research Fellow, Bulgaria Acad. of Sci., Bulgaria
1980 – 1986	Associate Professor, University of Pittsburgh
1976 – 1977	Exchange Assistant Professor, Kansas State University
1974 – 1980	Assistant Professor, University of Pittsburgh
1972 – 1974	Instructor, University of Chicago
1969 – 1972	Research / teaching assistant, Univ. of Washington
1968 – 1969	Demonstrator, The Chinese Univ. of H.K.

RESEARCH AREAS

Functional analysis, Harmonic analysis, Fractal geometry, Wavelet theory, Applied probability

PH.D. STUDENTS: 18

PUBLICATIONS (in refereed journals)

- (1) Infinite dimensional polytopes, *Math. Scand.*, 32 (1973), 193–213.
- (2) The dual ball of a Lindenstrauss space, *Math. Scand.*, 33 (1973), 75–97.
- (3) Extreme operators in Choquet simplexes, *Pacific J. Math.*, 52 (1974), 119–124.
- (4) A representation theorem of isometries of $C(X, E)$ *Pacific J. Math.*, 22 (1975), 229–233.

- (5) Farthest points in weakly compact sets, *Israel J. Math.*, 22 (1975), 168–174.
- (6) On strongly exposing functionals, *J. Aust. Math. Soc.*, 21 (1976), 362–367.
- (7) A note on lower semicontinuous set-valued functions, *Bull. Pol. Acad. Sci.*, 24 (1976), 271–273.
- (8) A remark on strongly exposing functionals, *Proc. Amer. Math. Soc.*, 59 (1976) 242–244.
- (9) On almost Chebyshev subspaces, *J. Approx., Th.* 21 (1977), 319–327.
- (10) Best approximations by closed sets in Banach spaces, *J. Approx., Th.* 23 (1978), 29–36.
- (11) Differentiability via directional derivatives, *Proc. Amer. Math. Soc.*, 70 (1978), 11–17 (with C. Weil).
- (12) Almost Chebyshev subsets in reflexive Banach spaces, *Indiana Univ. Math. J.*, 24 (1978), 791–795.
- (13) On a sufficient condition for proximity, *Tran. Amer. Math. Soc.*, 251 (1979), 343–356.
- (14) Approximation by continuous vector valued functions, *Studia Math.*, (1980), 291–298.
- (15) On generalized harmonic analysis, *Tran. Amer. Math. Soc.*, 259 (1980), 75–97 (with J. Lee).
- (16) Banach spaces of functions with bounded upper means, *Pacific J. Math.*, 91 (1980), 153–172.
- (17) A class of convolution operators on the Marcinkiewicz spaces, *Ann. Inst. Fourier, Grenoble* 31 (1981), 225–243.
- (18) Extension of Wiener’s Tauberian theorem and multipliers on the Marcinkiewicz Spaces, *Tran. Amer. Math. Soc.*, 277 (1983), 489–506.
- (19) Integrated Cauchy functional equations and characterization of the exponential law, *Sankhya A*, 44 (1983), 72–90, (with C.R. Rao).
- (20) Solution to the integrated Cauchy functional equation on the whole line, *Sankhya A*, 46 (1984), 311–318, (with C.R. Rao).
- (21) Integrated Cauchy functional equation with an error term, *Sankhya A*, 46 (1984), 339–354 (with H.M. Gu).
- (22) Characterization of the Rao’s quadratic entropies, *Sankhya A*, 47 (1985), 295–309.
- (23) On the nonlinear diffusion equation of Kolmogorov, Petrovskii and Piskounov, *J. Differential Eq.*, 59 (1985), 44–70.
- (24) Solutions of Deny convolution equation restricted to half line via a random walk, *J. Multi. Anal.*, 24 (1988), 309–329 (with A. Alzaid, C.R. Rao and D.N. Shanbhag).
- (25) On characteristic functions satisfying a functional equation, and related classes of simultaneous integral equations, *Sankhya A*, 50 (1988), 190–198 (with B. Ramachandran and H.M. Gu).
- (26) On some new classes of Hardy spaces, *J. Funct. Anal.*, 84 (1989), 255–278 (with Y.Z. Chen).
- (27) On an equivalent class of norms for BMO, *Bull. Aust. Math. Soc.*, 46 (1989), 289–295 (with Y.Z. Chen).
- (28) Wiener transformation and functions with bounded averages, *Proc. Amer. Math. Soc.*, 108, (1990), 411–421 (with Y.Z. Chen).

- (29) On the geometry of spheres in normed linear spaces, *J. Aust. Math. Soc.*, 48 (1990), 101–112 (with J. Gao).
- (30) Characterization of exponential law by relevated transform, *J. Applied Prob.*, 27 (1990), 726–729 (with B.L.S. Prakasa Rao).
- (31) On the convolution equation of Choquet and Deny on semigroups, *Studia Math.*, 97 (1990), 115–135 (with W. Zeng).
- (32) The sum of Rademacher functions and Hausdorff dimension, *Math. Proc. Camb. Phil. Soc.*, 108 (1990), 97–103 (with T.Y. Hu).
- (33) On two classes of Banach spaces with uniform normal structure, *Studia Math.*, 99 (1991), 41–56 (with J. Gao).
- (34) Fractal measures and mean p -variations, *J. Funct. Anal.*, 108 (1992), 427–457.
- (35) Fractal dimensions and singularities of the Weierstrass functions, *Tran. Amer. Math. Soc.*, 335 (1993), 649–665, (with T.Y. Hu).
- (36) Mean quadratic variations and Fourier asymptotics of self-similar measures, *Monatsch Math.*, 115 (1993), 99–132, (with J. Wang).
- (37) Dimension of a family of singular infinite Bernoulli convolutions, *J. Funct. Anal.*, 116 (1993), 335–358.
- (38) Hausdorff dimension of the level sets of Rademacher series, *Bull. Polish Acad. Sci.*, 41 (1993), 11–18 (with T.Y. Hu).
- (39) On the Hausdorff dimension of the graph of the perturbed Rademacher series, *Real Anal. Exchange*, 19 (1994), 457–464, (with T.Y. Hu).
- (40) Solution of the operator-valued integrated Cauchy functional equation, *J. Operator Theory*, 32 (1994), 157–183 (with C.H. Chu).
- (41) Characterization of the L^p -solutions for the two-scale dilation equations, *SIAM Math. Anal.*, 26 (1995), 1018–1046 (with J. Wang).
- (42) Vector-valued Choquet-Deny theorem, renewal equation and self-similar measures, *Studia Math.*, 117 (1995), 1–28, (with J. Wang and C.H. Chu).
- (43) On some regularity estimates of L^2 -scaling functions, *SIAM J. Math. Anal.*, 27 (1996), 835–864, (with M. Ma and J. Wang).
- (44) A weighted Tauberian theorem, *J. Fourier Anal. and Appl.*, 2 (1996), 397–406.
- (45) On the discount sum of Bernoulli random variables, *Stat. J. of Inference and Planning*, 63 (1997), 231–246 (with A. Ho).
- (46) On the regularity of the L^p -scaling functions, *J. Asian Math.*, (1997), 272–292 (with M.F. Ma).
- (47) Asymptotic behavior of multiperiodic functions, *J. Fourier Anal. and Appl.*, 4 (1998), 129–150 (with A. Fan).
- (48) The L^q -spectrum of the Bernoulli convolution associated with the golden number, *Studia Math.*, 131 (1998), 225–251 (with S.M. Ngai).
- (49) Embedding locally compact semi-group into groups, *Semi-group Forum*, 57 (1998), 151–156 (with J. Lawton, W.B. Zeng).
- (50) Multifractal measures and a weak separation condition, *Advances in Math.*, 141 (1999), 45–96 (with S.M. Ngai).
- (51) Iterated function systems and Ruelle operators, *J. Math. Anal. Appl.*, 231 (1999), 319–344 (with A. Fan).

- (52) Asymptotic regularity of Daubechies scaling function, Proc. AMS, 128 (1999), 1087–1095 (with Q. Sun).
- (53) The L^q -spectrum of the Bernoulli convolution associated with the P.V. number, Osaka J. Math., 36 (4) (1999), 993–1010 (with S.M. Ngai).
- (54) On the boundary of attractors with non-void interior, Proc. AMS, 128 (2000), 1761–1768 (with Y. Xu).
- (55) On the connectedness of self-affine tiles, J. London Math. Soc., (2) 62 (2000), 291–304 (with I. Kirat).
- (56) Iterated function systems with overlaps, Asian J. Math., 4 (2000), 527–552 (with A. Fan and S.M. Ngai).
- (57) Second order self-similar identities and multifractal decomposition, Indiana U. Math. J., 49 (2000), 925–972 (with S.M. Ngai).
- (58) Iterated function system with overlaps and self-similar measures, J. London Math. Soc., 63 (2001), 99–116 (with S.M. Ngai and H. Rao).
- (59) L^p -solution of refinement equations, J. Fourier Anal. and Appl., 7 (2001), 143–167 (with R. Jia and D.X. Zhou).
- (60) On the multifractal structure of convolution of Cantor measure, Adv. in Appl. Math., 27 (2001), 1–16 (with T. Hu).
- (61) Measure representation and multifractal analysis of complete genomes, Phy. Rev. E, 64, (2001), 031903-1 to 031903-9 (with Z. Yu and V. Anh).
- (62) Ruelle operator with nonexpansive maps, Studia Math., 148 (2001), 143–169 (with Y.L. Ye).
- (63) Corrigendum to: iterated function systems and Ruelle operator, J. Math. Anal. Appl., 262 (2001), 446-451 (with H. Rao and Y. Ye).
- (64) Multifractal characterization of complete genomes, Journal of Physics A: Mathematical and General, 34 (2001), 7127–7139 (with Vo Anh and Zu-Guo Yu).
- (65) Multifractal characterisation of length sequences of coding and noncoding segments in a complete genome, Physica A, 301 (2001) 351–361 (with Zu-Guo Yu and Vo Anh).
- (66) On the absolute continuity of a class of invariant measures, Proc AMS, 130 (2002), 759–767 (with T.Y. Hu and X.Y. Wang).
- (67) Relationship between different dimension of a measure, Monatsch. Math., 135 (2002), 191–201 (with A.H. Fan and H. Rao).
- (68) Classification of integral expanding matrices and self-affine tiles, Discrete and Comp. Geometry, 28 (2002), 49–73 (with I. Kirat)
- (69) The pressure function of product of nonnegative matrices, Math. Research Letters, 9 (2002), 363–378 (with D.J. Feng).
- (70) Hausdorff dimension of random fractals with overlaps, Bull. Austr. Math. Soc., 65 (2002), 315–328.
- (71) The Fourier asymptotics of the Cantor type measures at infinity, Proc AMS, 130 (2002), 2711–2717 (with T.Y. Hu).
- (72) Ergodic limits on the conformal repellers, Advances in Math., 169 (2002), 58–91 (with D. Feng and J. Wu).
- (73) Recognition of an organism from fragments of its complete genome, Phy. Rev. E., 66 (2002), 031910, 1–9 (with V. Anh and Y.G. Yu).

- (74) On one-dimensional self-affine tilings and the pq -tiles, *Tran AMS*, 355 (2002), 1401–1414 (with H. Rao).
- (75) Self-affine sets and graph-directed systems, *Constr. Appr.*, 19 (2003), 373–397 (with X.G. He and H. Rao).
- (76) Cauchy-transform of self-similar measures: Laurent coefficients, *J. Functional Anal.*, 202 (2003), 67–97 (with X.H. Dong).
- (77) Heat kernels on metric measure spaces and an application to semilinear elliptic equations, *Tran. AMS*, 355 (2003), 2065–2093 (with A. Grigoryan and J. Hu).
- (78) Dimensions of the boundaries of self-similar sets, *Experimental Math.*, 12 (2003), 13–26 (with S. Ngai).
- (79) The genomic tree of living organism based on a fractal model, *Physics Letter A*, 317 (2003), 293–302 (with Zu-Guo Yu, V. Anh and K.H. Chu).
- (80) Multifractal and correlation analysis of protein sequences from complete genome, *Phy. Rev. E.*, 68 (2003), 021903 (with Z.G. Yu and V. Anh).
- (81) Iterated function system and multifractal analysis of biological sequences, *International Journal of Modern Physics B*, 17 (2003), 4367–4375 (with Z.G. Yu and V. Anh).
- (82) Expanding polynomials and connectedness of self-affine tiles, *Discrete & Comp. Geom.*, 31 (2004), 275–286 (with I. Kirat and H. Rao).
- (83) Iterated function systems with a weak separation condition, *Studia Math.*, 161 (2004), 249–261 (with X.Y. Wang).
- (84) Characterization of tile digit sets with prime determinants, *Applied and Computational Harmonic Analysis*, 16 (2004), 159–173 (with X.G. He).
- (85) Fractal analysis of measure representation of large portions based on the detailed HP model, *Phy. A: Stat and Theor. Phy.*, 337 (2004), 171–184 (with Z.G. Yu and V. Anh).
- (86) Chaos game representation of protein sequences based on the detailed HP model and their multifractal and correlation analysis, *J. Th. Biology*, 226 (2004), 341–348.
- (87) An integral related to the Cauchy transform on the Sierpinski gaskets, *Experimental Math*, 13 (2004), 415–419 (with X.H. Dong).
- (88) Wavelet decomposition of Calderón-zygmound operators on function spaces, *J. Aust. Math. Soc.*, 77 (2004), 29–46 (with L. Yan).
- (89) Some exceptional phenomena in multifractal formalization: Part I, *Asian J. Math.*, 9 (2005), 275–294 (with X.Y. Wang).
- (90) Some exceptional phenomena in multifractal formalization: Part II, *Asian J. Math.*, 9 (2005), 473–488 (with D.J. Feng and X.Y. Wang).
- (91) Disk-likeness of planar self-affine tiles, *Tran Amer. Math. Soc.* (to appear) (with K.S. Leung).
- (92) A generalized finite type condition for iterated function systems, *Adv. Math.* (to appear) (with S.M. Ngai).
- (93) Equivalent conditions for on-diagonal upper bounds of heat kernels on self-similar spaces, *J. Functional Anal.*, (to appear) (with A. Grigorian and J.X. Hu).
- (94) Laplace operators related to self-similar measures on \mathbb{R}^d , *J. Functional Anal.*, (to appear), (with J.X. Hu and S.M. Ngai).

- (95) Self-affine measures and vector-valued representations, submitted (with Q.R. Deng and X.G. He).
- (96) Cauchy transform of self-similar measures: starlikenes, preprint (with X.H. Dong).

PUBLICATIONS (in refereed conference proceedings)

- (1) On some classes of Banach spaces and generalized harmonic analysis, Contemporary Math., 2 (1980), 213–226.
- (2) Harmonic analysis of functions with bounded means, 1987 summer conference on harmonic analysis, Contemporary Math., 91 (1989), 165–175 (with Y.Z. Chen).
- (3) On a convolution equation and its applications to a characterization problem, Proc. Bose conf. on Prob. Stat. and Design of Experiment, Wiley Eastern, (1990), 75–85 (with B. Zeng).
- (4) Integrated Cauchy functional equation with an error term on $[0, \infty)$, Proc. Bose conf. on Prob. Stat. and Design of Experiment, Wiley Eastern (1990), (with B. Ramachandran).
- (5) On the L^p -Lipschitz exponents of the scaling functions, Proceeding conference on spline functions and wavelets, CRM Proceedings and Lecture Notes, 17 (1998), 67–78 (with M.F. Ma).
- (6) On the classification and connectedness of self-affine tiles, International Conference on Wavelets, Analysis and Applications, AMS/IP Studies in Adv. Math., 25 (2002), 193–206.
- (7) On the self-affine sets and scaling functions, Wavelet Analysis twenty years of developments, ed. D.X. Zhou, World Scientific (2002), 179–195 (with X.G. He and H. Rao).
- (8) Differentiability of pressure functions for product of non-negative matrices, Complex Dym. and Related Topics, ed. by Y. Jiang and Y.F. Wang (2004), 129–146 (with D.J. Feng).
- (9) On Some problems of self-affine tiles, Proceeding of ICCM 2001, (2004) 483–493, International Press (with I. Kirat and H. Rao).

SPECIAL INVITED SURVEY ARTICLES

- (1) Self-similarity, L^p -spectrum and multifractal formalism, Progress in Prob., 37 (1995), 55–90.
- (2) Iterated function systems with overlaps and multifractal structure, Trends in prob. and related analysis, World Scientific, (1998), 35–76.
- (3) Multifractal structure and product of matrices, Analysis Th. and Appli., 19:4 (2003), 289–311.

PAPER IN BOOK CHAPTER

Comments on “Harmonic analysis and group theory”, Nobert Weiner: Collected work Vol. II, Edited by P. Masani (1980).

MONOGRAPH

Functional equations in probability theory, Academic Press (1991) (with B. Ramachandran).

CONFERENCE PROCEEDINGS (Editor)

Advances in Wavelets, Springer Verlag, (1999).