Michael Nussbaum

Curriculum Vitae – October 2011

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Personal

Year of birth: 1951
Place of birth: Berlin, Germany
Citizenship: German

Education

- Dr. Scientiae in Mathematics, Academy of Sciences Berlin, 1990, Thesis "Contributions to Asymptotic Estimation Theory in Regression Models with Large Parameter Space"
- Ph. D. in Mathematics, Academy of Sciences Berlin, 1979, Thesis "Estimation of Linear Functional Relationships"
- M. Sc. in Mathematics, Humboldt University Berlin, 1973, Thesis "Maximum Likelihood and Least Squares Estimation of Linear Functional Relationships"

Occupations

- 8/99-present: Professor of Mathematics, Cornell University
- 1/92-8/99: Research Group Leader, Weierstrass Institute for Applied Analysis and Stochastics, Berlin
- 7/85-12/91: Senior Researcher, Karl Weierstrass Mathematical Institute, Berlin
- 8/73-6/85 Researcher, Academy of Sciences Berlin, Mathematical Institute

Visiting positions

- 6/01 : Institut Henri Poincaré, Paris, France
- 6-7/00 : National Research Center for Quantification and Simulation of Economic Processes (SFB 373), Berlin, Germany
- 5/98: Université Paul Sabatier, Toulouse, France
- 5/96: University of Leiden, Netherlands
- 11/95-12/95 University of British Columbia, Vancouver, Canada
- 3/95-4/95 Australian National University, School of Mathematical Sciences, Canberra, Australia
- 9/94 Institut National de Recherche Agronomique (INRA), Montpellier, France

- 3/90-4/90 Université Catholique de Louvain, Center for Operations Research and Econometrics (CORE)
- 10/89-12/89 University of California at Berkeley, Dept. of Statistics
- 3/89-4/89 University of Bonn, Dept. of Economics
- 9/80-11/81, 2/83-7/83, 9/84-6/85 Institute of Problems of Information Transmission, Academy of Sciences of the U.S.S.R., Moscow

Current Research Focus

The research program focuses on asymptotic methods in quantum statistics, in particular on hypothesis testing and discrimination between states of quantum systems. Further topics are the equivalence theory of statistical experiments, asymptotic inference in locally stationary time series and nonparametric hypothesis testing.

Awards and Memberships

Fellow of the Institute of Mathematical Statistics (elected 1998)

Editing of Scientific Journals

- Associate Editor, *Annales de l'Institut Henri Poincaré , Probabilités et Statistiques,* Institute of Mathematical Statistics, Cleveland, OH, since 1995
- Associate Editor, *Statistics & Decisions,* Oldenbourg Wissenschaftsverlag, Munich, since 2003
- Associate Editor, *The Annals of Statistics,* Institute of Mathematical Statistics, Hayward, California , 1995-2000.
- Associate Editor, *European Series of Industrial and Applied Mathematics (ESAIM), Probability & Statistics*, (Electronic Journal), Société de Mathématiques Appliquées et Industrielles, Paris, 1996-2000.

Publications

(see http://www.math.cornell.edu/~nussbaum/papers.html for papers available in electronic format)

- (with A. Szkoła) An asymptotic error bound for testing multiple quantum hypotheses. To appear, *The Annals of Statistics*
- (with A. Szkoła) Asymptotically optimal discrimination between multiple pure quantum states. In: *Theory of Quantum Computation, Communication and Cryptography. 5th Conference, TQC 2010, Leeds, UK. Revised Selected Papers. Lecture Notes in Computer Science*, Vol 6519, *van Dam, Wim; Kendon, Vivien M.; Severini, Simone (Eds.), pp. 1-8, Springer (2011)*
- (with A. Szkoła) Exponential error rates in multiple state discrimination on a quantum spin chain, *J. Math. Phys.* 51 072203 (2010), *arXiv:1001.2651v1 [quant-ph] (2010)*
- (with G. K. Golubev and H. H. Zhou) Asymptotic equivalence of spectral density estimation and Gaussian white noise, *The Annals of Statistics* 38 (1) 181-214 (2010)
- (with A. Szkoła) The Chernoff lower bound for symmetric quantum hypothesis testing. *The Annals of Statistics* **37** (2) 1040-1057 (2009)

- (with K. M. R. Audenaert, A. Szkoła and F. Verstraete) Asymptotic error rates in quantum hypothesis testing. *Communications in Mathematical Physics* **279** (1) 251-283 (2008)
- (with M. Jähnisch) A functional Hungarian construction for the sequential empirical process, *C.R. Acad. Sci. Paris, Ser*. I **341** 761-763 (2005)
- Equivalence asymptotique des expériences statistiques (Conférence Lucien Le Cam, 2003). *Journal de la Société française de Statistique* **145** (1) 31-45 (2004)
- (with M. Jähnisch) Asymptotic equivalence for a model of independent non identically distributed observations. *Statistics & Decisions* **21** 197-218 (2003)
- (with I. Grama) A functional Hungarian construction for sums of independent random variables. *Annales de l'Institut Henri Poincaré, Probabilités et Statistiques*, **38** (6) pp. 923-957 (2002)
- (with I. Grama) Asymptotic equivalence for nonparametric regression. *Mathematical Methods of Statistics* **11** (1) 1-36 (2002)
- (with V. Genon-Catalot and C. Larédo) Asymptotic equivalence of estimating a Poisson intensity and a positive diffusion drift. *The Annals of Statistics* **30** 731-753 (2002)
- (with G. Milstein) Maximum likelihood estimation of a nonparametric signal in white noise by optimal control. *Statistics and Probability Letters*, **55** (2) 193-203 (2001)
- (with A. P. Korostelev) The asymptotic minimax constant for sup-norm loss in nonparametric density estimation, *Bernoulli* **5** (6) 1099-1118 (1999)
- Minimax risk: Pinsker bound. In: *Encyclopedia of Statistical Sciences, Update Volume* 3, 451-460 (S. Kotz, Ed.), John Wiley, New York (1999)
- (with G. Milstein) Diffusion limits for nonparametric autoregression. *Probability Theory and Related Fields* **112** 535-543 (1998)
- (with I. Grama) Asymptotic equivalence for nonparametric generalized linear models. *Probability Theory and Related Fields* **111** 167-214 (1998)
- (with P. Hall and S. E. Stern) On the estimation of a support curve of indeterminate sharpness. *Journal of Multivariate Analysis* **62** (2) 204-232 (1997)
- Asymptotic equivalence of density estimation and Gaussian white noise , *The Annals of Statistics* **24** 2399-2430 (1996)
- Discussion on: "Wavelet smoothing- Asymptopia ?" by D. Donoho, I. Johnstone, G. Kerkyacharian, D. Picard, *Journal of the Royal Statistical Society*, *Series* B, **57** (1995), 348-349
- (with W. Härdle) Kernel estimation: the equivalent spline smoothing method. *Publications de l'Institut de Statistique de l'Université de Paris* , XXXVIII, fasc. 3, 61-86 (1994)
- (with G. Golubev) An adaptive spline estimator in the nonparametric regression model. *Theory of Probability and Applications* **37** (3) 554-561 (1992)
- (with W. Härdle) Bootstrap confidence bands. In*: Bootstrapping and Related Techniques*, Proceedings of an International Conference held in Trier, Germany, June 1990 (K. H. Jöckel, G. Rothe, W. Sendler, Eds., Springer Verlag, Berlin, 1992
- (with G. Golubev) A risk bound in Sobolev class regression. *The Annals of Statistics* **18** 758-778 (1990)
- (with D. Donoho) Minimax quadratic estimation of a quadratic functional. *Journal of Complexity* **6** 290-323 (1990)
- (with G. Golubev) Nonparametric estimation of a regression function in L_2 (in Russian). *Problems of Information Transmission* **26** (3) 38-49 (1990)
- Some topics in nonparametric regression. In*: Regression, Functional Relations and Robust Methods* (H. Bunke, O. Bunke, Eds.), John Wiley, Chichester, 1989, pp. 105-125

- (with S. Zwanzig) A minimax result in a model with infinitely many nuisance parameters. *Transactions of the 10th Prague Conference on Information Theory, Statistical Decision Functions, Random processes* , Academia, Prague 1988
- On the nonparametric estimation of regression functions that are smooth in a domain of R^k. Theory of Probability and Applications **31** (1) 118-125 (1986)
- Spline smoothing in regression models and asymptotic efficiency in L_2. *The Annals of Statistics* **13** 984-997 (1985)
- (with R. Z. Hasminski) An asymptotic minimax bound in a regression model with an increasing number of nuisance parameters. In: *Asymptotic Statistics 2* (Kutna Hora, 1983), Elsevier, Amsterdam, New York 275-283 (1984)
- An asymptotic minimax risk bound for estimation of a linear functional relationship. *Journal of Multivariate Analysis* **14** (3) 300-314 (1984)
- Optimal filtering of a function of many variables in Gaussian white noise (in Russian) *Problems of Information Transmission* **19** (2) 23-29 (1983)
- (with H. P. Höschel) Models with errors-in-variables, in*: Regression, Functional Relations and Robust Methods* (H. Bunke, O. Bunke, Eds.), John Wiley, Chichester, 1989, pp. 214-415
- Capacity in the case of transmission by smooth surfaces in multiparametric Gaussian white noise (in Russian). *Problems of Information Transmission* **18** (4) 235-244 (1982)
- Asymptotic efficiency of estimators of a multivariate linear functional relation. *Mathematische Operationsforschung und Statistik* , Series Statistics **10** 505-527 (1979)
- (with H. Bunke) The structural distribution of parameters in linear functional models. In: *Statistical Inference in Linear Models* (H. Bunke, O. Bunke, Eds.), John Wiley, Chichester 1986, pp. 499-503
- Asymptotic optimality of estimators of a linear functional relation if the ratio of the error variances is known. *Mathematische Operationsforschung und Statistik* **8** 173-198 (1977)
- Asymptotic efficiency of estimators in the multivariate linear model. *Mathematische Operationsforschung und Statistik* **8** 439-445 (1977)
- Maximum likelihood and least squares estimation of linear functional relationships. *Mathematische Operationsforschung und Statistik* **7** 23-49 (1976)

Unpublished reports

- (with C. Butucea) Asymptotic equivalence of discretely observed geometric Brownian motion to a Gaussian shift. Discussion paper No. 59/1999, Sonderforschungsbereich 373, Humboldt University, Berlin 1999
- (with S. Pereverzev) The degrees of ill-posedness in stochastic and deterministic noise models. Preprint No. 509, Weierstrass Institute, Berlin 1999.
- (with J. Klemelä) Constructive asymptotic equivalence of density estimation and Gaussian white noise. Discussion paper No. 53, Sonderforschungsbereich 373, Humboldt University, Berlin 1998.

Organisation of professional meetings

- Member of Scientific Committee, Stochastics Days 2000, Hamburg (German Open Conference on Probability and Statistics), March 2000

- Workshop on "Empirical Processes in Non- and Semiparametric Statistics", Berlin, September 1998 (Satellite Meeting of the International Congress of Mathematicians, Berlin, August 1998) (jointly with E. Mammen, Heidelberg)
- Member of Local Scientific Committee, International Congress of Mathematicians, Berlin, August 1998
- Organizer of an invited paper session on Asymptotic Statistics, Stochastics Days 1998, Munich, March 1998 (German Open Conference on Probability and Statistics)
- Workshop on "Asymptotic Methods in Stochastic Dynamics and Nonparametric Statistics", Berlin, September 1996 (Satellite Meeeting of the 4th World Congress of the Bernoulli Society, Vienna), (jointly with E. Mammen)
- Organizer of an invited paper session on "Convergence of Experiments", Annual Meeting of the Institute of Mathematical Statistics, Chicago, Illinois, August 1996
- Seminar on Mathematical Statistics Paris-Berlin "Complex Models in Nonparametrics", Berlin, September 1995 (jointly with E. Mammen, Heidelberg))
- Organizer of an invited paper session on Inverse Problems, 21st European Meeting of Statisticians, Aarhus, Denmark, August 1995
- Workshop on Stochastics and Finance, Berlin, September 1994 (jointly with U. Küchler et al.)
- Seminar on Mathematical Stochastics, Oberwolfach, March 1994 (jointly with A. Wakolbinger)

Presentations

- Statistics and Modeling for Complex Data, Marne-la-Vallée, France: An asymptotic error bound for discriminating between several quantum states (June 2011)
- Princeton University, Dept. of Operations Research and Financial Engineering: Asymptotic Error Rates in Quantum Hypothesis Testing (December 2010)
- European Meeting of Statisticians, Toulouse, France: Asymptotic Error Rates in Quantum Discrimination (July 2009)
- Yale University, Dept. of Statistics: The Chernoff lower bound for symmetric quantum hypothesis testing (December 2007)
- Asymptotic Analysis in Stochastic Processes, Nonparametric Estimation and Related Problems, Wayne State University, Detroit: An asymptotic error bound for symmetric hypothesis testing in quantum statistics (September 2006)
- Technical University Berlin: On the problem of symmetric hypothesis testing in the quantum case (July 2006)
- University of Heidelberg, Germany: Asymptotic equivalence of spectral density estimation and signal recovery in Gaussian white noise (July 2006)
- ETH Zurich, Switzerland: Asymptotic equivalence of spectral density estimation and Gaussian white noise (April 2006)
- Technical University of Kaiserslautern: Asymptotic statistical equivalence for models of stochastic processes (April 2006)
- University of Uppsala, Sweden: Asymptotic statistical equivalence for models of stochastic processes (January 2006).
- Dynstoch Workshop 2004 ("Statistical Methods for Dynamic Stochastic Models"), Copenhagen: Asymptotic equivalence of spectral density estimation and Gaussian white noise (June 2004)
- AMS Fall Eastern Sectional Meeting, Binghamton, NY: Asymptotic equivalence of spectral density estimation and Gaussian white noise (October 2003)
- Lucien Le Cam lecture, 35èmes Journées de Statistique, Lyon, France: Equivalence asymptotique des expériences statistiques (June 2003)

- University of Connecticut, Storrs, Dept. of Statistics: Asymptotic equivalence of spectral density estimation and Gaussian white noise (October 2002)
- University of Pennsylvania, Philadelphia, Dept. of Statistics: Asymptotic equivalence of spectral density estimation and Gaussian white noise (April 2002)
- Colloquium in Honor of Jean Bretagnolle, Didier Dacunha-Castelle and Ildar Ibragimov, Orsay, France: On smoothness conditions for asymptotic equivalence of experiments (June 2001)
- "Nonparametric function estimation, neural nets and risk asymptotics" , summer course at Math. Institute Oberwolfach , Germany (DMV-Seminar), jointly with Andrew Barron (Yale), Laszlo Gyorfi (Budapest) (June 2000)
- "Statistics and Finance", Oberwolfach, Germany: Asymptotic equivalence of statistical experiments: recent developments (March 1999)
- Cornell University, Ithaca, Dept of Mathematics: Asymptotic equivalence of experiments (February 1999)
- University of California at Berkeley, Dept. of Statistics: Minimax prediction of time varying volatility (January 1999)
- University of California at Berkeley, Dept. of Statistics: Asymptotic equivalence of experiments (January 1999)
- Yale University, Dept. of Statistics: Asymptotic equivalence of experiments I, II (January 1999)
- Workshop "Statistical Inference for Stochastic Processes II", Le Mans, France: Constructive asymptotic equivalence of density estimation and Gaussian white noise (December 1998)
- Université Paul Sabatier, Toulouse, France: Equivalence asymptotique des expériences statistiques: processus Gaussians stationnaires et aspets constructives (May 1998)
- Workshop "Statistical Inference for Stochastic Processes", Paderborn, Germany: Likelihood approximation for a nonparametric birth process (April 1998)
- ISI Satellite Meeting "Mathematical Statistics and its Applications to Biosciences", Rostock: Asymptotic equivalence of nonparametric experiments given by stochastic processes (September 1997)
- Michigan State University, East Lansing, Michigan: Asymptotic equivalence of statistical experiments (August 1997)
- IMS Annual Meeting, Park City, Utah: Gaussian white noise approximation for some nonparametric models of counting processes (July 1997)
- Workshop "Statistical Inference for Stochastic Processes", Rennes, France: Asymptotic equivalence of a nonparametric spectral density model to Gaussian white noise (April 1997)
- Workshop "The Art of Nonparametric Statistics: Methodologies and Applications", Louvain-la-Neuve, Belgium: Asymptotic equivalence of counting process experiments and Gaussian white noise (February 1997)
- Vienna University of Economics, Austria: Asymptotic equivalence of experiments: results and problems (December 1996)
- Ecole Normale Supérieure, Paris: Asymptotic equivalence for counting process experiments via Skorokhod embedding (December 1996)
- Seminar on Mathematical Statistics Paris--Berlin, Garchy, France: Asymptotic equivalence of experiments: problems and perspectives (October 1996)
- 59th IMS Annual Meeting, Chicago, USA: Nonlinear smoothing and approximation of experiments (August 1996)

- Seminar "Inverse Problems and Estimation in Function Spaces", Baarlo, Netherlands: Approximation of statistical experiments for ill-posed function estimation problems (lecture series, June 1996)
- Workshop "Statistics of Stochastic Processes", Sandbjerg Manor, Denmark: Deficiency distance approximation for nonparametric experiments of counting processes (May 1996)
- University of Leiden, Netherlands: Asymptotic equivalence of statistical experiments via martingale methods (April 1996)
- IMS Eastern Regional Meeting, Richmond, USA: Asymptotic equivalence of nonparametric experiments via Skorokhod embedding of partial sums (March 1996)
- University of Technology Berlin: Principles of Asymptotic Statistics (lecture series, January 1996)

Teaching

Cornell University:
- Math 171, F 01-04, S 03, S,F 05, F 06, S 07, S, F 08, F 10: Statistical Theory and Applications in the Real World
- Math 271, A Second Course in Statistics, S 10
- Math 471, F 99, Basic Probability
- Math 472, S 00-02, S 04, S 09, 10, 11: Statistics
- Math 674, S 00-05, S 07, 09, 11: Introduction to Mathematical Statistics
- Math 774, F 00: Asymptotic Statistics, F 05, 07, 09, 11: Statistical Learning Theory: Classification, Pattern Recognition, Machine Learning

Humboldt University Berlin:
- Stochastic Risk Theory for Insurance, Fall and Spring 99
- Principles of Asymptotic Statistics, Fall and Spring 98

Technical University Berlin:
- Mathematical Statistics, Spring 93

Ph. D. Thesis advising

- Balakanapaty Rajaratnam, *Asymptotic Equivalence for Markov Chains and Eigenvalue Estimation in the Marginal Likelihood Framework*, Ph. D. thesis in Statistics, Cornell University, 2006
- Harrison H. Zhou, *Minimax Estimation with Thresholding and Asymptotic Equivalence for Gaussian Variance Regression*, Ph. D. thesis in Mathematics, Cornell University, 2004
- Michael Jähnisch, *Asymptotic Equivalence for a Density Model with Non-Identically Distributed Observations*, Ph. D. thesis in Mathematics, Humboldt University Berlin, June 99

Refereeing

- Annals of Statistics
- Annals of Applied Probability
- Probability Theory and Related Fields

- Bernoulli
- Journal of Multivariate Analysis
- Scandinavian Journal of Statistics
- Mathematical Methods of Statistics
- Electronic Journal of Statistics
- ESAIM Probabilité & Statistique
- Statistica Neerlandica
- Journal of Statistical Planning and Inference
- Computational Statistics and Data Analysis
- Econometric Theory
- Biometrics
- Statistics and Probability Letters
- Statistics (formerly Math. Operationsforsch. Statist.)
- Metrika
- National Science Foundation
- National Science Foundation, Statistics Panel
- Engineering and Physical Sciences Research Council, UK
- Natural Sciences and Engineering Research Council, Canada
- Republic of Georgia National Science Foundation
- tenured und tenure track positions for universities in the U.S.
- tenured faculty positions for German universities

Research grants

- NSF Grant DMS-1106460 "Asymptotic Inference for Locally Stationary Processes", since 2011 (web page at http://www.math.cornell.edu/~nussbaum/research.html),
- NSF Grant DMS-0805632 "Asymptotic Methods in Quantum Statistics", 2008-2011
- NSF Grant DMS-0306497 "Asymptotic Equivalence of Statistical Experiments", 2003-2009
- NSF Grant DMS-0072162 "Asymptotic Equivalence of Statistical Experiments", 2000-2002
- Research grant "Statistics in Function Spaces" (project coordinator), 26 months of scholarships for scientists from Russia for 1998-2000, joint grant from German National Science Foundation and Russian Foundation for Fundamental Research, Code 436 RUS 113/467/0 (R)
- Research grant: 3 months scholarship for a scientist from Ukraine, German National Science Foundation, 1998, Code 436 UKR 17/4/98
- Member of National Research Center SFB 373 "Simulation and Quantification of Economic Processes", Berlin (German National Science Foundation), 1994-, subproject leader (project B1), 1997-1999
- Member of collective grant (Gaduiertenkolleg) "Stochastic Processes and Probabilistic Analysis", (German National Science Foundation), 1996-1999
- Research grant: 3 months scholarship for a scientist from Russia, German National Science Foundation, 1997, Code 436 RUS 17/123/96
- Research grant: 3 months scholarship for a scientist from Russia, German National Science Foundation, 1996, Code 436 RUS 17/186/95
- Research grant: 3 months scholarship for a scientist from Russia, German National Science Foundation, 1996, Code 436 RUS 17/48/96
- Research grant: 3 months scholarship for a scientist from Moldavia, German National Science Foundation, 1995, Code 436 MOL\ 17/1/95

- Research grant: 3 months scholarship for a scientist from Moldavia, NATO Postdoc Program for Eastern Europe / German Academic Exchange Service (DAAD), 1995, Code 317-nato2-ca
- Research grant: 3 months scholarship for a scientist from Russia, German National Science Foundation, 1995, Code 436 RUS 17/36/95

Membership in Professional Organizations
- Institute of Mathematical Statistics
- German Mathematical Society