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Education

Ph.D. (1988) Statistics. University of Maryland, Thesis: “Conditional Least Squares for Semi-martingales” Advisor: Grace Yang.

M.S. (1984) Computer Science. Rutgers University.

M.A. (1982) Statistics. University of Maryland.

B.S. (1980) Biochemistry. University of Maryland.

Academic Appointments

University of Pennsylvania (1992 - present) Associate, Full, The William H. Lawrence Professor of Statistics, and now the Marie and Joseph Melone Professor, The Wharton School.

Hebrew University (1996, 2006 - 2007, 2012) Winston Fellow, Institute for Advanced Studies (visitor).

Northwestern University (Winter quarter 1997) Visiting Research Professor, Center for Mathematical Studies.

University of Chicago (1988 - 1992) Assistant then Associate Professor of Statistics, Graduate School of Business.

Students/Honors

Students: Choong Tze Chua (2003), Liang Wang (2004), Abhishek Gupta (2008), Dongyu Lin (2009), Jordan Rodu (expected 2014), Parmaveer Dhillion (expected 2014), Yichao Lu (expected 2015), Peichao Peng (expected 2016).

Personel Committee: (2008-2010), Wharton Personel Committee.

Elected: Game Theory Society Council. 2005-2011.

Editor: (2005-2007) for *Statistical Science*.

Associate Editor: (1997-2005) for *Mathematical Social Sciences*.

IMS Fellow (2000). Elected to fellowship in the Institute of Mathematical Statistics.

NSF Grants Statistics (2011-1013) *Martingale Control of mFDR in Variable Selection*, with Robert Stine. Statistics (1998 - 2000) *Information Theory and Statistical Model Selection*, with Robert Stine. Economics (1993) *Measuring Risk in Financial Asset Markets*, with Dan Nelson. Economics (1991,1992) *Estimating Conditional Variances and Covariances: Measurement Accuracy and Implications for Asset Pricing and Portfolio Choice*, with Dan Nelson.

BIBLIOGRAPHY

Work in Progress

- “Combining Multiple Probability Predictions Using a Simple Logit Model” with Ville Satopaa, Jonathan Baron, Barbara Mellers, Phil Tetlock, and Lyle Ungar, submitted to *International Journal of Forecasting*.
- “A Level-Set Hit-and-Run Sampler for Quasi-Concave Distributions Dean Foster,” Shane T. Jensen, under submission to *Bayesian Statistics*.
- “Testing for excess returns in financial markets: A martingale Approach” with Robert Stine and H. Peyton Young.
- “Multi View Learning of State in Language via Canonical Correlation Analysis” with Lyle Ungar and Paramveer Dhillon.
- “Spectral Dimension Reduction for HMMs,” with Jordan Rodu and Lyle Ungar.
- “Estimating factorial HMM,” with Jordan Rodu.

Web publications

- “On the lower limits of entropy estimation,” with A. Wyner, under submission to *Entropy* (19 cites).
- “Multi-View Dimensionality Reduction via Canonical Correlation Analysis” with Sham M. Kakade, & Tong Zhang. TTI-C Tech Report, TTI-TR-2008-4, 2008, (13 cites).
- “Adaptive Variable Selection Competes with Bayes Experts,” with R. Stine, (4 cites).

Refereed Papers

- “New Subsampling Algorithms for Fast Least Squares Regression,” with Y. Lu, P. Dhillon, and L. Ungar, *NIPS*, 2013, 25% acceptance.

- “Faster Ridge Regression via Subsampled Randomized Hadamard Transform,” with P. Dhillon, Y. Lu, and L. Ungar, *NIPS*, 2013, 25% acceptance.
- “One-shot learning and big data with $n=2$,” with Lee Dicker, *NIPS*, 2013, 25% acceptance.
- “How to retire early,” with Phillip Ernst and Larry Shepp, to appear in *Journal of Advances in Applied Probability*, 2013.
- “Estimating reading growth attributable to Accelerated Reader in one Caribbean international school,” with David Foster, to appear *Reading Psychology*, 2013.
- “Stochastic convex optimization with bandit feedback,” with Alekh Agarwal, Alexander Rakhlin, Daniel Hsu, Sham Kakade accepted at *SIAM Journal on Optimization*, forthcoming.
- “A Wealth-Requirement Axiomatization of Riskiness,” with Sergiu Hart, forthcoming in *Theoretical Economics*.
- “Using Regression for Spectral Estimation of HMMs,” with Jordan Rodu, Lyle Ungar and Weichen Wu, *Statistical Language and Speech Processing (SLSP 2013)*, 216-227, 27 out of 61 accepted.
- “Experiments with Spectral Learning of Latent-Variable PCFGs,” with S. Cohen, K. Stratos, M. Collins, and Lyle Ungar, *NAACL-HLT 2013*.
- “Two Step CCA: A new spectral method for estimating vector models of words,” with Paramveer Dhillon, Jordan Rodu and Lyle Ungar. *ICML 2012*, Acceptance Rate: 27%.
- “New Insights from Coarse Word Sense Disambiguation in the Crowd,” with Adam Kapelner, Krishna Kaliannan, Andy Schwartz, Lyle Ungar, *COLING 2012*, 30% acceptance rate.
- “A Spectral Algorithm for Latent Dirichlet Allocation,” with Daniel Hsu, Sham Kakade, Yi-Kai Liu, and Anandkumar Anima, *NIPS 2012* (72 out of 1400 submissions selected for oral presentations).

- “Spectral Dependency Parsing with Latent Variables” with Paramveer Dhillon, Jordan Rodu, Michael Collins, and Lyle Ungar, *EMNLP 2012*, (about 25% acceptance rate).
- “Spectral Learning of Latent-Variable PCFGs,” with Shay Cohen, Michael Collins, Karl Stratos, Lyle ungar, *ACL 2012*, about 25% acceptance rate.
- “A strategy-proof test of portfolio returns,” with Peyton Young, *Quantitative Finance*, 2012, **12**:5, 671-683.
- “Minimum Description Length Penalization for Group and Multi-Task Sparse Learning,” with Paramveer S. Dhillon, Lyle H. Ungar, *JMLR*, **12**, 525564, 2011.
- “Domain adaption; Overfitting; and Small Sample Statistics,” with Sham Kakade and Ruslan Salakhutdinov, *AI-STATS 2011* (134 out of 400 accepted).
- “No Internal Regret via Neighborhood Watch,” with Alexander Rakhlin, *AI-STATS 2011*, (134 out of 400 accepted).
- “Stochastic convex optimization with bandit feedback.” with Alekh Agarwal, Daniel Hsu, Sham M. Kakade, and Alexander Rakhlin. *NIPS 2011* (305 out of 1400 accepted)
- “Multi View Learning of Word Embeddings via Canonical Correlation Analysis,” with Parmaveer Dhillon, and Lyle Ungar. *NIPS 2011*. (305 out of 1400 accepted)
- “Complexity-Based Approach to Calibration with Checking Rules,” with Alexander Rakhlin, Karthik Sridharan and Ambuj Tewari, *COLT 2011*. (36 out of 117 accepted)
- “Domain Adaptation with Coupled Subspaces,” with S. Kakade, J. Blitzer, *Statistics and AI*, 2011 (77 out of 272 accepted)
- “VIF Regression: A Fast Regression Algorithm for Large Data” with Dongyu Lin, and Lyle Ungar, *JASA*, 2011.

- “The effect of winning an Oscar Award on survival: Correcting for healthy performer survivor bias with a rank preserving structural accelerated failure time model,” with Xu Han, Dylan Small, and Vishal Patel *Annals of Applied Statistics*, 2011, 746-772.
- “A New Approach to Lexical Disambiguation of Arabic Text,” EMNLP 2010, with Rushin Shah, Paramveer S. Dhillon, Mark Liberman, Mohamed Maamouri and Lyle Ungar (27% acceptance rate).
- “Feature Selection using Multiple Streams,” with Paramveer Dhillon and Lyle Ungar. *AISTATS 2010*, (Acceptance Rate: 41%).
- “Gaming Performance Fees by Portfolio Managers” with H. Peyton Young, *Quarterly Journal of Economics*, 2010, 1435-1458. (A lighter version was published in *The Economists’ Voice* (MS #1311) 2010 which was then republished as the lead article in their special issue on *Financial Regulation, Financial crisis, and Bailouts*.)
- “An operational measure of riskiness,” with S. Hart, *Journal of Political Economy*, 2009. (lead article)
- “Brain imaging and brain privacy: a realistic concern?” with Martha J Farah, M Elizabeth Smith, Cyrena Gawuga, Dennis Lindsell 2009, *Journal of Cognitive Neuroscience*, **21**, 119-127.
- “Transfer Learning, Feature Selection and Word Sense Disambiguation,” with Paramveer Dhillon and Lyle Ungar. *Association of Computational Linguistics (ACL-IJCNLP 2009)*, (Acceptance Rate: 25%).
- “Multi-Task Feature Selection using the Multiple Inclusion Criterion (MIC),” with P. S. Dhillon, B. Tomasik, and L. Ungar, *ECML*, 2009. (105 accepted out of 422.)
- “Efficient Feature Selection in the Presence of Multiple Feature Classes,” with Paramveer Dhillon, Dean Foster and Lyle Ungar. IEEE- International Conference on Data Mining (ICDM 2008), (20% acceptance rate).
- “Information Consistency of Nonparametric Gaussian Process Methods” with Seeger, M. W., Kakade, S. M.; *IEEE Transactions on Information Theory*, **54**, 2008, 2376 - 2382 .

- “Deterministic Calibration and Nash Equilibrium” with Sham M. Kakade, 2008, *Journal of Computer and System Sciences* (learning theory special issue) **74** 2008, Pages 115-130.
- “ α -investing: A procedure for Sequential Control of Expected False Discoveries” with R. Stine, *JRSS-B*, **70**, 2008, pages 429-444.
- “A dynamic model for the Forward Curve,” with C. Chua, K. Ramaswamy, R. Stine, *Review of Financial Studies*, 21, 265-310 (2007).
- “Streamwise Feature Selection” with Jing Zhou, Robert A. Stine and Lyle H. Ungar *JMLR* **7**, 2006, 1861-1885.
- “Multi-View Regression via Canonical Correlation Analysis,” with S Kakade, *COLT*, 2006. (about 40% acceptance rate)
- “Worst-Case Bounds for Gaussian Process Models,” with Sham Kakade, and Matthias Seeger, *NIPS*, 2006.
- “Honest confidence intervals for the error variance in stepwise regression,” with R. Stine, *Journal of Economic and Social Measurement*, 89 - 102, (2006).
- “Regret Testing: A simple payoff-based procedure for learning Nash equilibrium,” with H. Young, *Economic Theory*, **1**, (2006) Theoretical economics, 341-367.
- “Being Warren Buffett: A Classroom Simulation of Risk and Wealth When Investing in the Stock Market,” with Robert A. Stine, *The American Statistician*, **60**, 2006, 53-60.
- “Streaming Feature Selection,” L. Ungar and R. Stine, *AI and statistics*, 2005.
- “Streaming Feature Selection using alpha investing,” with J. Zhou, L. Ungar and R. Stine, in *KDD* 2005.
- “Deterministic Calibration and Nash Equilibrium” S. Kakade, *COLT*, 2004. (25% acceptance rate)
- “Streaming Feature Selection,” with L. Ungar and R. Stine, in *AI and Stat* 2004.

- “Variable selection in data mining: Building a predictive model for bankruptcy,” with R. Stine, *JASA*, 2004, **99**, 303-313.
- “Learning, Hypothesis Testing and Nash Equilibrium,” with H. P. Young, *Games and Economic Behavior*, 2003, 73 - 96.
- “Universal Codes for Finite Sequences of Integers Drawn from a Monotone Distribution,” with R. Stine, and Adi Wyner, *IEEE Transactions on Information Theory*, 2002, **48**, 1713 - 1720.
- “On the Impossibility of Predicting the Behavior of Rational Agents,” with H. Peyton Young, *Proceedings of the National Academy of Sciences*, 2001, 12848-12853.
- “Empirical Bayes Variable Selection,” with E. George, *Biometrika*, 2000, **87**, 731 - 747.
- “Introduction to the Special Issue,” (in honor of David Blackwell) with R. Vohra, D. Levine, *Games and Economic Behavior*, (1999), **29**, 1 - 7.
- “Regret in the On-line Decision Problem,” with R. Vohra, *Games and Economic Behavior* (1999), **29**, 7 - 36.
- “A proof of Calibration via Blackwell’s Approachability Theorem,” *Games and Economic Behavior*, (1999), **29**, 73 - 79.
- “Local Asymptotic Coding and the MDL,” with R. Stine, *IEEE Transaction on Information Theory*, (1999) **45**, 1289 - 1293.
- “Competitive Algorithms for Layered Graph Traversal,” with A. Fiat, H. Karloff, Y. Rabani, Y. Ravid, and S. Vishwanathan, *SIAM Journal on Computing* (1999) **28** 448 - 463.
- “Cost and trust issues in online auctions,” with L. Ungar and D. Parkes, AMET-98.
- “A formal statistical approach to collaborative filtering.” with L.H. Ungar *CONALD98*, 1998.
- “On the Non-convergence of Fictitious Play in Coordination Games,” with H. P. Young, *Games and Economic Behavior*. 1998, 79 - 96.

- “An Axiomatic Characterization of a Class of Location in Tree Networks,” with R. Vohra *Operations Research* (1998) **46**, 347 - 354.
- “Asymptotic Calibration,” with R. Vohra, *Biometrika*, **85**, (1998) 379 - 390.
- “Characterizing the generalization performance of model selection strategies,” with D. Schuurmans and L. Ungar, ICML proceedings (1997).
- “Calibrated Learning and Correlated Equilibrium,” with R. Vohra *Games and Economic Behavior*, (1997) **21**, 40-55.
- “Precision and Accuracy of Judgmental Estimation,” with I. Yaniv, *Journal of Behavioral Decision Making* **10**, (1997), 21 - 32.
- “Continuous Record Asymptotics for Rolling Sample Variance Estimators,” with D. Nelson, *Econometrica*, **64**, (1996), 139 - 174. Reprinted in *Modeling Stock Market Volatility: Bridging the Gap to Continuous Time*, Editor P. Rossi, Academic Press (1996), 291 - 329.
- “A Simple Ancillarity Paradox,” with E. George, *Scandinavian Journal of Statistics*, **23**, (1996), 233 - 242.
- “Filtering and Forecasting with Misspecified ARCH Models: Making the Right Forecast with the Wrong Model,” with D. Nelson, *Journal of Econometrics*, **67**, (1995), 303 - 335. Reprinted in *Modeling Stock Market Volatility: Bridging the Gap to Continuous Time*, Editor P. Rossi, Academic Press (1996), 157 - 191.
- “Graininess of Judgment Under Uncertainty: An Accuracy - informativeness Tradeoff,” with I. Yaniv, *Journal of Experimental Psychology: General*, **124**, (1995), 424 - 432.
- “Asymptotic Filtering Theory for Univariate ARCH Models,” with D. Nelson, *Econometrica*, **62**, (1994), 1 - 41. Reprinted in *Modeling Stock Market Volatility: Bridging the Gap to Continuous Time*, Editor P. Rossi, Academic Press, (1996), 193 - 240.
- “The Risk Inflation Criterion for Multiple Regression,” with E. George, *The Annals of Statistics*, **22**, (1994), 1947 - 1975.
- “A Randomization Rule for Selecting Forecasts,” with R. Vohra, *Operations Research*, **41**, (1993), 704 - 709, with discussion by R. Clemen.

- “Estimation up to a Change Point,” with E. George, *The Annals of Statistics*, **21**, (1993), 625 - 644.
- “An Economic Argument for Affirmative Action,” with R. Vohra, *Rationality and Society*, **4**, (1992), 176 - 188, with discussion by G. Loury, by D. Friedman, and by J. Heckman and T. Philipson.
- “A Probabilistic Analysis of the K - location Problem,” with R. Vohra, *American Journal of Mathematical and Management Sciences*, **12**, (1992), 75 - 87, winner of the 1993 Jacob Wolfowitz prize.
- “Competitive Algorithms for Layered Graph Traversal,” with A. Fiat, H. Karloff, Y. Rabani, Y. Ravid, and S. Vishwanathan, in *Proc. 32nd Symposium on Foundations of Computer Science*, Puerto Rico, (1991), 288 - 297.
- “Prediction in the Worst Case,” *The Annals of Statistics*, **19**, (1991), 1084 - 1090.
- “Cooperation in the Short and in the Long Run,” with H.P. Young, *Games and Economic Behavior*, **3**, (1991), 145 - 156.
- “Stochastic Evolutionary Games Dynamics,” with H.P. Young, *Theoretical Population Biology*, **38**, (1990), 219 - 232, with a correction in (1997), pp - pp. Also reprinted in *Complexity in Economics*, edited by J. B. Rosser, Jr, (2002).
- “Probabilistic Analysis of a Heuristic for the Dual Bin Packing Problem,” with R. Vohra, *Information Processing Letters*, **31**, (1989), 287 - 290.

Books and Patents and Products

- Business Statistics* (2010, 2012) with R. Stine.
- Business Statistics: A Casebook*, with R. Stine and R. Waterman, Springer-Verlag (1998).
- Business Analysis using Regression: A Casebook*, with R. Stine and R. Waterman, Springer-Verlag (1998).

Method and apparatus for publishing textual information to a web page, with Lyle Ungar, Patent filed 2007, denied 2010. filed under *Automatic construction of Wiki pages from emails US Application No. 11/770227 S&L File No. P 33091*.

The Wharton Course Auction, with Rakesh Vohra and Anjani Jain. This was the course auction that was used by Wharton from 1996 up to 2012.

Mortality calculator, with Lyle Ungar and Choong Tze Chua, 2001. A web calculator which models the death rate given covariates of a user.

Unrefereed Papers

“Calibration: Respice, Adspice, Prospice,” with Rakesh Vohra, *Advances in Economics and Econometrics: Theory and Applications, Tenth World Congress*, 2012.

“Spectral methods for estimating probabilistic language models,” with Lyle Ungar, Paramaveer Dhillon, Jordan Rodu and Michael Collins, *Snowbird*, 2012.

“Hedge fund wizards,” with H Peyton Young, *The Economists voice* (2009) *Washington Post on line* (2009).

“In defense of L0,” with Dongyu Lin, Emily Pitler, and Lyle H Ungar (2008), Workshop on Feature Selection, (ICML 2008).

“Maximal feature sets,” with L. Ungar, and A. Goldenberg, *Snowbird*, 2008.

“The contribution of parameters to stochastic complexity,” with R. Stine, 195 - 213, in *Advances in Minimum Description Length*, edited by P. Grünwald, I. Myung and M. Pitt, MIT Press (2005).

“The Competitive Complexity ratio,” with R. Stine, *Proceedings of the 2000 Conference on Information Sciences and Systems, Volume I*, Princeton University, WP8 1-6.

“A Proposal for Learning by Ontological Leaps,” with L. Ungar, *Snowbird* 2002.

“Discussion of Chipman, George and McCulloch,” with R. Stine, IMS monograph, (2001), 124 - 131.

“Clustering Methods For Collaborative Filtering,” with L. Ungar, Proceedings of the Workshop on Recommendation Systems. AAAI Press, Menlo Park California (1998). (400+ google cites.)

Invited Discussion on Schervish, Seidenfeld, and Kadane, *Bayesian Statistics 7*, Oxford University Press (2002), 400 - 402.

“Learning with Hazy Beliefs,” with H. P. Young, Institute Vienna Circle proceedings, (1997).

“Comment on Nick Polson’s Paper,” discussion for *Bayesian Statistics 5*, Oxford University Press (1996), 318 - 319.

“Comment on Nozer Singpurwalla’s Paper,” Invited Discussion for the *Bayesian Statistics 5*, Oxford University Press (1996), 384 - 385.

“Judgment, Graininess, and Categories,” with I. Yaniv, *Cognitive Science Proceedings*, (1990), 133 - 140, Hillsdale, NJ: Lawrence Erlbaum.