

Curriculum Vitae for Glenn Shafer

Glenn Shafer is University Professor at Rutgers University.

Glenn spent his youth on a farm near Caney, Kansas. He earned two degrees from Princeton University: an A.B. in mathematics in 1968 and a Ph.D. in mathematical statistics in 1973. After teaching in Statistics at Princeton, he returned to Kansas in 1976 to teach in Mathematics at the University of Kansas. In 1984, he moved from Mathematics to Business at Kansas. He joined the Rutgers Business School in 1992 and served as its dean from 2011 to 2014.

In 1976 Glenn published *A Mathematical Theory of Evidence*, launching a widely used methodology for handling uncertainty in expert systems, the Dempster-Shafer theory of belief functions. An international organization, the [Belief Functions and Applications Society](#), is devoted to the continued development and use of this theory.

Glenn's most recent book is *Game-Theoretic Foundations for Probability and Finance*, co-authored by [Volodya Vovk](#) and published by Wiley in 2019. Glenn believes that the game-theoretic foundation for probability will reshape the interpretation and use of probability in many fields. It leads to new methods of statistical testing and forecasting, clarifies how speculation can lead to the apparent random behavior of market prices, and deepens the analysis of causality in Glenn's 1996 book, *The Art of Causal Conjecture*. Further research on game-theoretic probability is posted at www.probabilityandfinance.com.

Glenn has published in journals in statistics, philosophy, history, psychology, computer science, economics, engineering, accounting, and law. He has won teaching awards in both mathematics and business. He was a Guggenheim fellow in 1983-84, a fellow at the Center for Advanced Study in the Behavioral Sciences in 1988-89, and a Fulbright fellow at the Free University of Berlin in Spring 2001. He is a fellow of both the Institute of Mathematical Statistics and the American Association for Artificial Intelligence.

For more information on Glenn's career and research, see the interview of Glenn in the June 2016 issue of www.thereasoner.org, a blog for philosophers, or the [intellectual autobiography](#) that appeared in 2016 in *International Journal of Approximate Reasoning*.

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Personal Web Site

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Personal Information

Citizen of the United States. Born November 21, 1946, in Caney, Kansas.
Children: Richard, born March 3, 1978. Dennis, born April 28, 1981.
Married to [Nell Irvin Painter](#) on October 14, 1989.

Education

A.B., 1968, Mathematics, Princeton University
Ph.D., 1973, Statistics, Princeton University. Dissertation: *Allocations of Probability: A Theory of Partial Belief*.

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Employment

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1968-69	Peace Corps, Afghanistan High school geometry teacher
1973-76	Department of Statistics, Princeton University Assistant Professor
1976-84	Department of Mathematics, University of Kansas Assistant Professor, 1976-78 Associate Professor, 1978-83 Professor, 1983-84
1984-92	School of Business, University of Kansas Professor, 1984-87 Ronald G. Harper Distinguished Professor, 1988-92
1992-Present	Department of Accounting and Information Systems, Rutgers Business School Distinguished Professor, 1992-Present Board of Governors Professor since 2004
1996-Present	Visiting Professor, Computer Learning Research Centre, Department of Computer Science, Royal Holloway College, University of London
2015-Present	University Professor, Rutgers University

Service at Rutgers University

- Appointments and Promotions Committee, Rutgers Business School. Member 1994-96, 1997-99, and 2009-2010. Chair 1995-96 and 1998-99.
- MBA Curriculum Task Force, Rutgers Business School, 1995-96. Organized the first major revision of the school's MBA curriculum in over ten years.
- Director, Rutgers Ph.D. in Management Program, 1997-2000 and 2003-2010. Reorganized the program's curriculum and its advising, admission, and funding policies.
- Promotion Review Committee, Rutgers University. Member 2001-2006.
- Dean, Rutgers Business School – Newark and New Brunswick, January 2011 to December 2014.

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Academic Honors

- National Merit Scholar, 1964-68
- NSF Doctoral Fellow, 1970-73
- NSF Postdoctoral Fellow, 1978-79
- Guggenheim Fellow, 1983-84
- Fellow, Center for Advanced Study in the Behavioral Sciences, 1988-89
- Fellow, Institute of Mathematical Statistics, 1990
- Fellow, American Association for Artificial Intelligence, 1992
- Fulbright Fellow, Berlin, Germany, Spring 2001
- [Gorenstein Award](#) for Research and Service at Rutgers University, 2004
- [Honorary doctorate in economics](#), University of Economics, Prague, 2009
- Kampé de Fériet Award, International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems, Cádiz, Spain, June 2018
- Sarton Medal, University of Ghent. December 2018
- Volume 141 of *International Journal of Approximate Reasoning*: "Probability and Statistics: Foundations and History. In honor of Glenn Shafer," February 2022

Editorial Service

- Advisory Board, *International Journal of Approximate Reasoning*, 1986-
- Editorial Board, *International Journal of Intelligent Systems*, 1986-2022
- Editorial Board, *Electronic Journal for History of Probability and Statistics*, 2005-2013
- Associate Editor, *Statistical Science*, 2008-
- Associate Editor, *Journal of the American Statistical Association*, 1980-82
- Associate Editor, *Knowledge Engineering Review*, 1994-1998
- Reviewer for *Mathematical Reviews*, 1979-81
- Referee for journals in accounting, artificial intelligence, engineering, information science, management science, mathematical psychology, physics, probability and statistics, and philosophy of science

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Memberships

- American Statistical Association
- Institute of Mathematical Statistics

Principal Investigator for Grants

- National Science Foundation, GP43248 (1974-76), "The assessment of statistical evidence," \$13,200
- National Science Foundation, MCS7801887 (1978-79), "Studies in probable and statistical inference," \$7,705
- National Science Foundation, MCS8002213 (1980-83), "Studies in probable and statistical inference," \$34,344
- National Science Foundation, MCS8301282 (1983-86), "Studies in probable and statistical inference," \$30,000
- National Endowment for the Humanities, HL2067384 (1984-85), "Translation of Bernoulli's *Ars Conjectandi*," \$21,000
- National Science Foundation, IST8405210 (1984-86), "Belief functions and fuzzy sets," \$82,375
- Subcontract under Office of Naval Research, NOO01485K0492 (1985-87), "Theory and applications of belief functions," \$72,276
- Peat, Marwick, Mitchell Research Opportunities in Auditing (1986-87), "An interactive tool for managing uncertainty in expert systems for auditing," \$109,320. With Prakash Shenoy and Rajendra Srivastava
- United Telecommunications and Kansas Advanced Technology Commission (1986-88), "Expert system research and development," \$120,540. With Kenneth O. Cogger
- National Science Foundation, IST8610293 (1986-89), "Belief functions in artificial intelligence," \$255,197
- National Science Foundation, IRI8902444 (1989-91), "Belief functions in artificial intelligence," \$181,715. With Prakash Shenoy
- National Science Foundation, SBE9213674 (1992-95), "The unity and diversity of probability." \$80,000
- National Science Foundation, (1999-2002), "The representation of causality for auditing." \$338,114

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Consulting

SRI International, Decision Sciences Consortium, BMD Corporation, Exxon Production Research, Allied Bendix, General Motors, Educational Testing Service, BDO Seidman

Teaching Awards

- Nominee, Hope Undergraduate Teaching Award, University of Kansas, 1979 and 1983
- G. Bailey Price Award for Outstanding Teaching of Graduate Mathematics, Department of Mathematics, University of Kansas, 1983
- Mentor Award from the University of Kansas Business School Doctoral Students Association, 1987, 1992

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Publications

Books

1. *A Mathematical Theory of Evidence*. Princeton University Press, 1976.
2. *Readings in Uncertain Reasoning* (with Judea Pearl). Morgan Kaufmann, 1990.
3. *Probabilistic Expert Systems*. SIAM, 1996.
4. *The Art of Causal Conjecture*. MIT Press, 1996.
5. *Probability and Finance: It's Only a Game!* (with Vladimir Vovk) Wiley, 2001. A Japanese translation, by Kei Takeuchi and Masayuki Kumon, was published by Iwanami Shoten in 2006.
6. *Algorithmic Learning in a Random World*, by Vladimir Vovk, Alex Gammerman, and Glenn Shafer. Springer, 2005. Second edition, 2022.
7. *Game-Theoretic Foundations for Probability and Finance* (with Vladimir Vovk). Wiley, May 2019.
8. *The Splendors and Miseries of Martingales: Their History from the Casino to Mathematics*. (with Laurent Mazliak) Birkhäuser, September 2022.

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Articles

1. *A theory of statistical evidence*. *Foundations of Probability Theory, Statistical Inference, and Statistical Theories of Science*, Vol. II, pp. 365-436. W. L. Harper and C. A. Hooker, eds., Reidel. 1976.
2. Non-additive probabilities in the work of Bernoulli and Lambert. *Archive for History of Exact Sciences* **19** 309-370. 1978. Reprinted as Chapter 6 of *Classic Works of the Dempster-Shafer Theory of Belief Function*, edited by Ronald Yager and Liping Liu, Springer, 2008.
3. Allocations of probability. *Annals of Probability* **7** 827-839. 1979. Reprinted as Chapter 7 of *Classic Works of the Dempster-Shafer Theory of Belief Functions*, edited by Ronald Yager and Liping Liu, Springer, 2008.
4. Reliability described by belief functions (with A. M. Breipohl). *Proceedings 1979 Annual Reliability and*

- Maintainability Symposium, IEEE*, pp. 23-27. 1981.
5. [Constructive probability](#). *Synthese* **48** 1-60. 1981. Reprinted as Chapter 9 of *Classic Works of the Dempster-Shafer Theory of Belief Functions*, edited by Ronald Yager and Liping Liu, Springer, 2008.
 6. Jeffrey's rule of conditioning. *Philosophy of Science* **48** 337-363. 1981.
 7. [Two theories of probability](#), *PSA 1978*, Vol. 2, pp. 441-464. Peter D. Asquith and Ian Hacking, eds. Philosophy of Science Association, East Lansing, Michigan. 1981.
 8. Lindley's paradox (with discussion). *Journal of the American Statistical Association* **77** 325-351. 1982.
 9. [Belief functions and parametric models \(with discussion\)](#). *Journal of the Royal Statistical Society, Series B* **44** 322-352. 1982. Reprinted as Chapter 10 of *Classic Works of the Dempster-Shafer Theory of Belief Functions*, edited by Ronald Yager and Liping Liu, Springer, 2008.
 10. [Bayes's two arguments for the rule of conditioning](#). *Annals of Statistics* **10** 1075-1089. 1982.
 11. Belief functions. *Encyclopedia of Statistical Sciences* **1** 209. S. Kotz and N. L. Johnson, eds., Wiley. 1982.
 12. The Bernoullis. *Encyclopedia of Statistical Sciences* **1** 214-219. S. Kotz and N. L. Johnson, eds., Wiley. 1982.
 13. Adjusting P-values to account for selection over dichotomies (with Ingram Olkin). *Journal of the American Statistical Association* **78** 674-678. 1983.
 14. [A subjective interpretation of conditional probability](#). *Journal of Philosophical Logic* **12** 453-466. 1983.
 15. Johann Heinrich Lambert. *Encyclopedia of Statistical Sciences* **4** 466-468. S. Kotz and N.L. Johnson, eds., Wiley. 1985.
 16. Miller's paradox. *Encyclopedia of Statistical Sciences* **5** 502-503. S. Kotz and N. L. Johnson, eds., Wiley. 1985.
 17. Moral certainty. *Encyclopedia of Statistical Sciences* **5** 623-624. S. Kotz and N. L. Johnson, eds., Wiley. 1985.
 18. Nonadditive probability. *Encyclopedia of Statistical Sciences* **6** 271-276. S. Kotz and N. L. Johnson, eds., Wiley. 1985.
 19. [Languages and designs for probability judgment](#) (with Amos Tversky). *Cognitive Science* **9** 309-339. 1985. Reprinted in *Decision Making*, edited by David Bell, Howard Raiffa, and Amos Tversky, Cambridge University Press, 1988, pp. 237-265. Reprinted as Chapter 13 of *Classic Works of the Dempster-Shafer Theory of Belief Functions*, edited by Ronald Yager and Liping Liu, Springer, 2008.
 20. [Hierarchical evidence](#). *Proceedings of the Second Conference on Artificial Intelligence Applications, Miami Beach, December 11-13, 1985*, pp. 16-21. IEEE Computer Society Press.
 21. [Conditional probability \(with discussion\)](#). *International Statistical Review* **53** 261-277. 1985.
 22. [Propagating belief functions with local computations](#) (with Prakash Shenoy). *IEEE Expert* **1:3** 43-52. 1986.
 23. [The combination of evidence](#). *International Journal of Intelligent Systems* **1** 155-179. 1986.
 24. [Probability judgment in artificial intelligence](#). *Uncertainty in Artificial Intelligence*, pp. 127-135. J. F. Lemmer and L. N. Kanal, eds., North-Holland. 1986.
 25. [Savage revisited \(with discussion\)](#). *Statistical Science* **1** 463-501. 1986. Reprinted in *Decision Making*, edited by David Bell, Howard Raiffa, and Amos Tversky, Cambridge University Press, 1988, pp. 193-234.
 26. [The construction of probability arguments \(with discussion\)](#). *Boston University Law Review* **66** 799-823. 1986. Reprinted in *Probability and Inference in the Law of Evidence*, edited by Peter Tillers, Kluwer, 1988, pp. 185-204.
 27. [Probability judgment in artificial intelligence and expert systems \(with discussion\)](#). *Statistical Science* **2** 3-44. 1987.
 28. [Belief functions and possibility measures](#). *The Analysis of Fuzzy Information, Vol. 1: Mathematics and Logic*, pp. 51-84. James C. Bezdek, ed., CRC Press. 1987.
 29. [Implementing Dempster's rule for hierarchical evidence](#) (with Roger Logan). *Artificial Intelligence* **33** 272-298. 1987. Reprinted as Chapter 18 of *Classic Works of the Dempster-Shafer Theory of Belief Functions*, edited by Ronald Yager and Liping Liu, Springer, 2008.
 30. [Propagating belief functions in qualitative Markov trees](#) (with Prakash Shenoy and Khaled Mellouli). *International Journal of Approximate Reasoning* **1** 349-400. 1987.
 31. [Modifiable combining functions](#) (with Paul Cohen and Prakash Shenoy). *AI EDAM (Artificial Intelligence for Engineering Design, Analysis, and Manufacturing)* **1** 47-57. 1987.
 32. [Qualitative Markov networks](#) (with Khaled Mellouli and Prakash Shenoy). *Uncertainty in Knowledge-Based Systems*, B. Bouchon and R. R. Yager, eds, pp. 69-74. Springer-Verlag. 1987.
 33. Saint Petersburg paradox. *Encyclopedia of Statistical Sciences* **8** 865-870. S. Kotz and N. L. Johnson, eds., Wiley. 1988.
 34. Sharp null hypotheses. *Encyclopedia of Statistical Sciences* **8** 433-436. S. Kotz and N. L. Johnson, eds., Wiley. 1988.
 35. [Propagation of belief functions: A distributed approach](#) (with Prakash Shenoy and Khaled Mellouli). *Uncertainty in Artificial Intelligence* **2** 325-335. J. F. Lemmer and L. N. Kanal, eds. North-Holland. 1988.
 36. [Evidential reasoning using DELIEF](#) (with Debra Zarley and Yen-Teh Hsia). *AAAI-88; Proceedings of the Seventh National Conference on Artificial Intelligence*, pp. 205-209. 1988.
 37. [Auditor's Assistant: A knowledge-engineering tool for audit decisions](#) (with Prakash Shenoy and Rajendra Srivastava). *Proceedings of the 1988 Touche-Ross/ University of Kansas Symposium*, pp. 61-84. 1988.
 38. [An axiomatic framework for Bayesian and belief-function propagation](#) (with Prakash Shenoy). *Proceedings of the Fourth Workshop on Uncertainty in Artificial Intelligence*, pp. 307-314, Minneapolis, MN, 1988.
 39. [The unity of probability](#). Pp. 95-126 of *Acting Under Uncertainty: Multidisciplinary Conceptions*, edited by

- George von Furstenberg, Kluwer (Boston), 1990.
40. Perspectives on the theory and practice of belief functions. *International Journal of Approximate Reasoning* **4** 323-362. 1990. [PREPUBLICATION VERSION](#)
 41. The Bayesian and belief-function formalisms: A general perspective for auditing (with Rajendra Srivastava and with discussion). *Auditing: A Journal of Practice and Theory*, Volume 9 Supplement, 110-148, 1990.
 42. Probability propagation (with Prakash Shenoy). *Annals of Mathematics and Artificial Intelligence* **2** 327-352. 1990. [PREPUBLICATION VERSION](#)
 43. Axioms for probability and belief-function propagation (with Prakash Shenoy). *Uncertainty in Artificial Intelligence* **4**, pp. 169-198. R. D. Shachter, T. S. Levitt, L. N. Kanal, and J. F. Lemmer, eds. North-Holland, 1990. [PREPUBLICATION VERSION](#). Reprinted as Chapter 20 of *Classic Works of the Dempster-Shafer Theory of Belief Functions*, edited by Ronald Yager and Liping Liu, Springer, 2008.
 44. The unity and diversity of probability (with discussion). *Statistical Science* **5** 435-462. 1990. [PREPUBLICATION VERSION](#)
 45. Why should statisticians be interested in artificial intelligence? Pp. 16-58 of *Proceedings of the Fifth Annual Conference on Making Statistics More Effective in Schools of Business*, University of Kansas, June 1-2, 1990, edited by Steven Hillmer and Lawrence A. Sherr. [PREPUBLICATION VERSION](#)
 46. What is probability? In *Perspectives on Contemporary Statistics*, edited by David C. Hoaglin and David S. Moore. Mathematical Association of America, MAA Notes Number 21, pp. 93-105. 1992. [PREPUBLICATION VERSION](#)
 47. Belief-function formulas for audit risk (with Rajendra P. Srivastava). *The Accounting Review* **67** 249-283. 1992. [PREPUBLICATION VERSION](#). Reprinted as Chapter 23 of *Classic Works of the Dempster-Shafer Theory of Belief Functions*, edited by Ronald Yager and Liping Liu, Springer, 2008.
 48. The Dempster-Shafer theory. Pp. 330-331 of *Encyclopedia of Artificial Intelligence*, Second Edition, Stuart C. Shapiro, editor. Wiley. 1992. [PREPUBLICATION VERSION](#)
 49. Can the various meanings of probability be reconciled? Pp. 165-196 of *A Handbook for Data Analysis in the Behavioral Sciences: Methodological Issues*, edited by Gideon Keren and Charles Lewis. Lawrence Erlbaum, Hillsdale, New Jersey, 1993. [PREPUBLICATION VERSION](#)
 50. The early development of mathematical probability. Pp. 1293-1302 of *Companion Encyclopedia of the History and Philosophy of the Mathematical Sciences*, edited by I. Grattan-Guinness. Routledge, London, 1993. [PREPUBLICATION VERSION](#)
 51. Integrating statistical and non-statistical audit evidence using belief functions: A case of variable sampling (with Rajendra P. Srivastava). *International Journal of Intelligent Systems* **9** 519-539. 1994. [PREPUBLICATION VERSION](#)
 52. The subjective aspect of probability. Pp. 53-73 of *Subjective Probability*, edited by George Wright and Peter Ayton. Wiley, 1994. [PREPUBLICATION VERSION](#)
 53. Propagating beliefs in AND-trees (with Rajendra P. Srivastava and Prakash P. Shenoy). *International Journal of Intelligent Systems* **10** 647-664. 1995. [PREPUBLICATION VERSION](#)
 54. Philosophical foundations for causal networks. Pp. 3-12 of *Advances in Intelligent Computing*, edited by Bernadette Bouchon-Meunier, Ronald R. Yager, and Lotfi A. Zadeh. Springer Verlag, Lecture Notes in Computer Science 945. 1995. [PREPUBLICATION VERSION](#)
 55. The significance of Jacob Bernoulli's *Ars Conjectandi* for the philosophy of probability today. *Journal of Econometrics*. **75** 15-32. 1996. [PREPUBLICATION VERSION](#)
 56. Causal relevance. Pp. 187-208 of *Reasoning with Uncertainty in Robotics*, edited by Leo Dorst, Michiel van Lambalgen, and Frans Voorbraak. Springer Verlag, Lecture Notes in Artificial Intelligence 1093. 1996. [PREPUBLICATION VERSION](#)
 57. Vanishing tetrad differences and model structure (with Alexander Kogan and Peter Spirtes). *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems* **4** 209-224. 1996. [PREPUBLICATION VERSION](#). [RUTCOR RESEARCH REPORT](#)
 58. The situation of causality. *Foundations of Science* **1** 543-563. 1996. [PREPUBLICATION VERSION](#)
 59. Lindley's paradox. *Encyclopedia of Biostatistics*, P. Armitage and T. Colton, eds., Wiley. 1997. [PREPUBLICATION VERSION](#)
 60. A logic of action, causality, and the temporal relations of events (with Richard Scherl). Pp. 89-96 of the *Proceedings of the Fifth International Workshop on Temporal Representation and Reasoning (Time-98)*, edited by Lina Khatib and Robert Morris. Los Alamitos, Calif.: IEEE Computer Society. 1998. [PREPUBLICATION VERSION](#)
 61. Mathematical foundations for probability and causality. Pp. 207-270 of *Mathematical Aspects of Artificial Intelligence*, edited by Frederick Hoffman. American Mathematical Society, Symposia in Applied Mathematics, Volume 55. 1998. [PREPUBLICATION VERSION](#)
 62. Causal logic. Pp. 711-719 of *Proceedings of the 13th European Conference on Artificial Intelligence (ECAI-98)*, edited by Henri Prade. Chichester: Wiley. 1998. [PREPUBLICATION VERSION](#)
 63. Causal conjecture. Pp. 17-32 of *Causal Models and Intelligent Data Management*, edited by Alex Gammerman. Springer. 1999. [PREPUBLICATION VERSION](#)
 64. The logic of events (with Peter R. Gillett and Richard Scherl). *Annals of Mathematics and Artificial Intelligence* **28** 315-389. 2000. [PREPUBLICATION VERSION](#)
 65. Causality and responsibility. *Cardozo Law Review* **22** 101-123. 2001. [PREPUBLICATION VERSION](#)
 66. Nature's possibilities and expectations. Pp. 147-166 of *Probability Theory : Philosophy, Recent History and*

- Relations to Science*, edited by Vincent F. Hendriks, Stig Andur Pedersen, and Kaus Froyin Jørgensen. Kluwer (Synthese Library, Vol. 297). 2001. [PREPUBLICATION VERSION](#)
67. A new understanding of subjective probability and its generalization to lower and upper prevision (with Peter R. Gillett and Richard Scherl). *International Journal of Approximate Reasoning*. **33** 1-49. 2003. [PREPUBLICATION VERSION](#)
 68. Kolmogorov's contributions to the foundations of probability (with Vladimir Vovk). *Problems of Information Transmission*. **39** 21-31. 2003. [PREPUBLICATION VERSION](#)
 69. Subjective Probability and Lower and Upper Prevision: A New Understanding (with Peter R. Gillett and Richard Scherl). Pp. 511-525 of *ISIPTA '03: Proceedings of the Third International Symposium on Imprecise Probabilities and Their Applications*, Lugano, Switzerland, edited by Jean-Marc Bernard, Teddy Seidenfeld, and Marco Zaffalon. Carleton Scientific 2003. [PREPUBLICATION VERSION](#)
 70. [Self-calibrating Probability Forecasting](#) (with Vladimir Vovk and Ilia Nourtdinov). Pp. 1133-1140 of *NIPS 2003: Advances in Neural Information Processing Systems 16 - Proceedings of the 2003 Conference* (v. 16), edited by Sebastian Thrun, Lawrence K. Saul, Bernhard Schölkopf. MIT Press June 2004.
 71. [Defensive forecasting](#) (with Vladimir Vovk and Akimichi Takemura). In *AISTATS 2005: Proceedings of the 10th International Workshop on Artificial Intelligence and Statistics, Barbados, January 6-8, 2005*, edited by Robert Cowell and Zoubin Ghahramani, pp. 365-372. 2005.
 72. [Defensive forecasting for linear protocols](#) (with Vladimir Vovk, Ilia Nourtdinov, and Akimichi Takemura). In *Algorithmic Learning Theory: Proceedings of the 16th International Conference, ALT 2005, Singapore, October 8-11, 2005*, edited by Sanjay Jain, Hans Ulrich Simon, Etsuji Tomita. Lecture Notes in Computer Science, Volume 3734. Springer-Verlag. 2005. [RELATED WORKING PAPER](#).
 73. Good randomized sequential probability forecasting is always possible (with Vladimir Vovk). *Journal of the Royal Statistical Society, Series B*. 67 747-764. 2005. [RELATED WORKING PAPER](#)
 74. [The sources of Kolmogorov's Grundbegriffe](#) (with Vladimir Vovk). *Statistical Science* Vol. 21, No. 1, pp. 70-98, 2006. [RELATED WORKING PAPER](#).
 75. The Game-Theoretic Framework for Probability. In *IPMU 2006: Proceedings of the 11th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems, Paris, July 2-7, 2006*, pp. 3-10. 2006. [PREPUBLICATION VERSION](#).
 76. A probabilistic logic based on the acceptability of gambles (with Peter R. Gillett and Richard B. Scherl). *International Journal of Approximate Reasoning*. **44**(3) 281-300. 2007. [PREPUBLICATION VERSION](#).
 77. From Cournot's principle to market efficiency. Pp. 55-95 of *Augustin Cournot: Modelling Economics*, edited by Jean-Philippe Touffut and published by Edward Elgar, 2007. The article also appeared in French, as "Du principe de Cournot au marché éfficient," pp. 83-132 of *La Société du probable: Les mathématiques sociales après Augustin Cournot*, edited by Jean-Philippe Touffut and published by Albin Michel, 2007. [PREPUBLICATION VERSION](#).
 78. The Game-Theoretic Capital Asset Pricing Model (with Vladimir Vovk). *International Journal of Approximate Reasoning* **49**(1) 175-197. September 2008. [Related Working Paper](#).
 79. Game-Theoretic Probability and Defensive Forecasting. *Proceedings of the 2007 Winter Simulation Conference*, edited by S. G. Henderson, B. Biller, M.-H. Hsieh, J. Shortle, J. D. Tew, and R. R. Barton. [PREPUBLICATION VERSION](#)
 80. Defensive forecasting: How to use similarity to make forecasts that pass statistical tests. Pp. 215-147 of *Preferences and Similarities*, edited by Giacomo Della Riccia, Didier Dubois, Rudolf Kruse, and Hans-Joachim Lenz, CISM Series, SpringerWienNewYork, 2008. [RELATED WORKING PAPER](#)
 81. [A Tutorial on Conformal Prediction](#) (with Vladimir Vovk), *Journal of Machine Learning Research*. 9 (March) 371-421. 2008.
 82. Portfolio Selection and Online Learning (with Tatsiana Levin). *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems* **16**(4) 437-473. August 2008.
 83. [The education of Jean André Ville](#), www.jehps.net (*Electronic Journal for History of Probability and Statistics*) **5**(2), June 2009.
 84. [On the history of martingales in the study of randomness](#) (with Laurent Bienvenu and Alexander Shen) www.jehps.net (*Electronic Journal for History of Probability and Statistics*) **5**(2), June 2009.
 85. How to base probability theory on perfect-information games (with Vladimir Vovk and Roman Chychyła), *Bulletin of the European Association for Theoretical Computer Science*, **Number 100**, pp. 115-148, February 2010.
 86. Predicting bond yields using defensive forecasting (with Sam Ring). Pp. 1257-1272 of *Handbook of Quantitative Finance and Risk Management*, edited by C. F. Lee, Alice C. Lee, and John Lee, Springer, 2010.
 87. [A betting interpretation for probabilities and Dempster-Shafer degrees of belief](#). *International Journal of Approximate Reasoning* **52** 127-136. 2011.
 88. [The generality of the zero-one laws](#) (with Akimichi Takemura, Vladimir Vovk). *Annals of the Institute of Statistical Mathematics* **63** 873-885. 2011.
 89. What does the arrest and release of Emile Borel and his colleagues in 1941 tell us about the German Occupation of France? (with Laurent Mazliak). *Science in Context* **24** 587-623. 2011. [PREPUBLICATION VERSION](#). [RELATED DOCUMENTS](#)
 90. [Test martingales, Bayes factors, and p-values](#) (with Alexander Shen, Nikolai Vereshchagin, and Vladimir Vovk). *Statistical Science* **26** 84-101. 2011.
 91. [Insuring against loss of evidence in game-theoretic probability](#) (with A. Philip Dawid, Steven de Rooij,

- Alexander Shen, Nikolai Vereshchagin, and Vladimir Vovk). *Statistics and Probability Letters* **81** 157-162. 2011.
92. [Lévy's zero-one law in game-theoretic probability](#) (with Vladimir Vovk and Akimichi Takemura). *Journal of Theoretical Probability* 25(1):1-24. DOI: 10.1007/s10959-011-0390-3. 2012.
 93. The historian as unifier of probability's diversity. www.jehps.net (*Electronic Journal for History of Probability and Statistics*) **9**(1), December 2013.
 94. Game-theoretic probability (with Vladimir Vovk). Pp. 113-134 of *Introduction to Imprecise Probabilities*, edited by Thomas Augustin, Frank P. A. Coolen, Gert de Cooman, and Matthias C. M. Troffaes, Wiley, 2014.
 95. Dempster's rule of combination. *International Journal of Approximate Reasoning* **79** 26-40. December 2016. [PREPUBLICATION VERSION](#).
 96. Constructive decision theory. *International Journal of Approximate Reasoning* **79** 45-62. December 2016. [PREPUBLICATION VERSION](#).
 97. The problem of dependent evidence. *International Journal of Approximate Reasoning* **79** 41-44. December 2016. [PREPUBLICATION VERSION](#).
 98. *A Mathematical Theory of Evidence* turns 40. *International Journal of Approximate Reasoning* **79** 7-25. December 2016. [PREPUBLICATION VERSION](#).
 99. Marie-France Bru and Bernard Bru on dice games and contracts. *Statistical Science* **33** 277-284. 2018. [PREPUBLICATION VERSION](#).
 100. [Reconciling betting and measure](#). *Prisme* 36. Centre Cournot, October 2018.
 101. [Pascal's and Huygens's game-theoretic foundations for probability](#). *Sartoniana* **32** 117-145. 2019
 102. Comment: Illusions, Then and Now. *Statistical Science* **35**(2):173-174, 2020.
 103. [Comment: On the history and limitations of probability updating](#). *Statistical Science* **36**(2):191-195, 2021.
 104. [Testing by betting: a strategy for statistical and scientific communication, with discussion and response](#). *Journal of the Royal Statistical Society, Series A* **184**(2):407-478, 2021.
 105. [Causal interpretation of graphical models](#). *International Journal of Approximate Reasoning* **141** 179-182. 2022.
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2. [Uncertainty in Expert Systems](#). Ten lectures as the principal lecturer at an NSF-CBMS Regional Research Conference. University of North Dakota. June 1-5, 1992.
3. [The Handling of Uncertainty in Expert Systems](#). Keynote address at the 1992 Conference on Artificial Intelligence in Petroleum Exploration and Production. Houston. July 22, 1992.
4. [Axioms for Computation in Join Trees](#). Department of Statistics, Temple University. October 13, 1992.
5. [Decision Making with Generalizations of Probability](#). Presentation for the panel (with Kenneth Arrow and Peter Fishburn) on epistemic uncertainty in rational decision at the 34th Joint National Meeting of ORSA/TIMS. San Francisco. November 4, 1992.
6. [Probabilistic Expert Systems](#). Tutorial at the Rutgers Conference on Information Systems. Newark. November 20, 1992.
7. [The Language of Causation in Event Trees](#). Fourth International Workshop in Artificial Intelligence and Statistics. Fort Lauderdale. January 6, 1993.
8. [Probabilistic Causation](#). Department of Civil Engineering. Princeton University. February 26, 1993.
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45. *Causal Explanation of Statistical Observations*. Séminaire Risque, Incertitude, et Décision, University of Pierre and Marie Curie (Paris 6). November 4, 1996.
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72. *La Règle de Dempster*. Séminaire Intelligence Artificielle et Processus de Décision, University of Pierre and Marie Curie (Paris 6). June 19, 1997.
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74. *A Causal Action Logic*. Symposium on Prospects for a Commonsense Theory of Causation, Spring Symposium Series, American Association for Artificial Intelligence, Stanford University. March 24, 1998.
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 107. *Contributions to Machine Learning*. Department of International Studies, Meiji Gakuin University, Tokyo. May 31, 2004.
 108. *Why do Price Series Look Like Ito Processes?* Statistics Seminar, Department of Economics, University of Tokyo, Hongo Campus. June 1, 2004.
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 110. *Implications of Cournot's Principle for Machine Learning and Finance*. Department of Computer Science, Royal Holloway College. June 29, 2004.
 111. *Dynamic Hedging Without Probability*. Conference on Financial Innovation, sponsored by the Rutgers University Whitcomb Center for Research in Financial Services and held at Verizon Headquarters, New York City. November 12, 2004.
 112. *Defensive Forecasting*. 10th International Workshop on Artificial Intelligence and Statistics, Barbados. January 7, 2005.
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 134. *Dempster-Shafer judgements*. Workshop commemorating the 50th anniversary of the Harvard Statistics Department, Cambridge. October 27, 2007.
 135. *Game-Theoretic Probability and Defensive Forecasting*, Winter Simulation Conference '07, Washington, D.C. December 11, 2007. [RELATED PAPER](#)
 136. *The use of game-theoretic probability for probability judgment*. Workshop on Game-Theoretic Probability and Related Topics, Department of Mathematical Informatics, University of Tokyo. February 28, 2008.
 137. *Game-theoretic probability and defensive forecasting*. Japan Statistical Society, Tokyo. March 1, 2008.
 138. *Game-theoretic probability*. Rutgers Experimental Mathematics Seminar, New Brunswick, New Jersey. March 6, 2006.
 139. *Game-theoretic probability*. Decision Sciences Research Seminar, INSEAD, Fontainebleau, France. April 11, 2008.
 140. *Was Jean Ville a statistician?* Royal Statistical Society North Eastern Local Group, Durham, England. May 8, 2008.
 141. *Putting online prediction online*. Workshop on Principles and Methods of Statistical Inference with Interval Probability. Department of Mathematical Sciences, Durham, England. May 12, 2008.
 142. *Game-theoretic probability*. Applied Mathematics Colloquium, Columbia University. May 20, 2008.
 143. *Why was Jean Ville's work on game-theoretic probability forgotten?* NAFIPS 2008, New York. May 21, 2008.
 144. *Game-theoretic probability*. SIPTA School 08. Montpellier, France. July 8, 2008.
 145. *Game-theoretic probability and its applications*. Microsoft Research, Redmond, Washington. October 15, 2008.
 146. *Cournot's principle: A unifying interpretation of probability*. Prague International Colloquium on Foundations of Uncertainty: Probability and Its Rivals. September 2, 2009.
 147. *Three betting interpretations of probability*. Department of Statistics, University of North Carolina, Chapel Hill. October 26, 2009
 148. *The meaning of independence in Dempster-Shafer theory*. Department of Statistics, Purdue University. November 5, 2009.
 149. *Game-theoretic probability and its applications*. [Subjective Bayes Workshop](#), Center for Research in Statistical Methodology, University of Warwick. December 14, 2009.
 150. *A betting interpretation for probabilities and Dempster-Shafer degrees of belief*. [Workshop on the Theory of Belief Functions](#). Ecole Nationale Supérieure d'Ingénieurs, Brest. April 2, 2010.
 151. *Betting interpretations of probability*. [Third Workshop on Game-Theoretic Probability and Related Topics](#). Computer Learning Research Centre, Royal Holloway University of London. June 21, 2010.
 152. *Game-theoretic probability and its applications*. PIMS Distinguished Seminar Series in Bayesian Methodologies. Departments of Computer Science, University of Saskatchewan and University of Regina. September 23, 2010.
 153. *Is everything stochastic?* Cournot Centre for Economic Studies, Paris. October 13, 2010.
 154. *The implications of defensive forecasting for probability judgement*. *Probabilités juridiques et statistiques judiciaires*. Université de Franche-Comté, Besançon. October 14, 2010.
 155. *Interpreting game-theoretic probability*. Philosophy of Science Association, Montreal. November 6, 2010.
 156. *Basics and interpretation of game-theoretic probability*. Keynote to Fourth Workshop on Game-Theoretic Probability and Related Topics, University of Tokyo. November 12, 2012.
 157. *Testing with non-negative martingales, measure-theoretically and game-theoretically*. Department of Statistics, University of Michigan, February 1, 2013, and Center for Research in Mathematics, Guanajuato, Mexico, March 21, 2013.

158. [Introduction to game-theoretic probability](#). Keynote to Workshop on Games and Decisions, Centro de Ricerca Matematica Ennio De Giorgi, Scuola Normale Superiore, Pisa, Italy. July 8, 2013.
159. [The eternal debate between Bernoulli and Leibniz](#). Keynote to 29th European Meeting of Statisticians, Budapest, Hungary. July 21, 2013.
160. [Introduction to the Fifth Workshop on Game-Theoretic Probability and Related Topics](#). Centro de Investigación en Matemáticas, Guanajuato, Mexico. November 13, 2014.
161. [Game-theoretic prediction without exogenous probabilities](#). Distinguished Lecture on Complex Systems. Sandia National Laboratories. Albuquerque, New Mexico. September 1, 2015.
162. [Game-theoretic prediction without exogenous probabilities](#). Department of Electrical and Computer Engineering, Temple University. September 23, 2015.
163. [Whither Kiyosi Itô's reconciliation of Lévy \(betting\) and Doob \(measure\)?](#) Keynote for the Cournot Center's Conference celebrating the centennial of the birth of Kiyosi Itô: KIYOSI ITÔ'S LEGACY FROM A FRANCO-JAPANESE PERSPECTIVE, French Embassy, Tokyo, November 26, 2015.
164. [Munich lectures on Game-Theoretic Probability](#). Ten lectures, given at the Munich Center for Mathematical Philosophy, Ludwig Maximilian University of Munich, Germany. March 15-21, 2016.
165. [The invention of random variables: concept and name](#). Workshop on History of Statistics, Department of Statistics, Ludwig Maximilian University of Munich, Germany. March 22-23, 2016.
166. [Probability Judgement. Munich-Sydney-Tilburg Conference 9: Evidence, Inference, and Risk](#). Munich Center for Mathematical Philosophy, Germany. March 31, 2016.
167. [What does "frequentist" mean? Workshop on Fusion Learning, BFF inferences and Statistical Foundations](#). Department of Statistics, Rutgers University - New Brunswick, New Jersey. April 11, 2016.
168. [How speculation can explain the equity premium](#). Department of Accounting and Information Systems. Rutgers Business School. October 14, 2016.
169. [How speculation can explain the equity premium](#). Department of Economics, Rutgers University - Newark. November 16, 2016.
170. [Dempster-Shafer is fiducial and so are you](#). Fourth Bayesian, Fiducial, and Frequentist Conference (BFF4), Department of Statistics, Harvard University. May 1, 2017.
171. [What is accomplished by successful non-stationary stochastic prediction?](#) ICERM, Brown University. June 19, 2017.
172. [Three principles for using probability](#). School of Business, University of Kansas. October 20, 2017.
173. [Hypothesis Testing as a Game](#). Second Journal of Accounting, Auditing and Finance Symposium, Indian Institute of Management Ahmedabad. January 9, 2018.
174. [Hypothesis Testing as a Game](#). Department of Biostatistics, Columbia University Mailman School of Public Health. March 8, 2018.
175. [So Much Data. Have We Been Here Before?](#) Banquet talk for the Fifth Bayesian, Fiducial, and Frequentist (BFF5) Conference: Foundations of Data Science, Ann Arbor, Michigan. May 7, 2018.
176. [Hypothesis Testing as a Game](#). Keynote, 17th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems, Cádiz (Spain), June 11, 2018
177. [When Data is a Science, Who Needs Probability?](#) Banquet talk for the International Chinese Statistics Association's 2018 Applied Statistics Symposium, New Brunswick, New Jersey. June 15, 2018.
178. [Hypothesis Testing as a Game](#). 12th International Vilnius Conference on Probability Theory and Mathematical Statistics and 2018 IMS Annual Meeting on Probability and Statistics, Vilnius, Lithuania. July 5, 2018.
179. [Pascal's and Huygens's game-theoretic foundations for probability](#). Sarton Lecture, School of Architecture and Engineering, University of Ghent. December 13, 2018.
180. [Game-theoretic statistics](#). Centrum Wiskunde & Informatica, Amsterdam. December 17, 2018.
181. [Reviving Pascal's and Huygens's game-theoretic foundations for probability](#). Department of Philosophy, University of Utrecht. December 19, 2018.
182. [The language of betting as a strategy for scientific communication](#). Rutgers Experimental Mathematics Seminar. February 14, 2019.
183. [The language of betting as a strategy for communicating statistical results](#). Rutgers Department of Statistics and Biostatistics. February 27, 2019.
184. [The language of betting as a strategy for communicating statistical and scientific results](#). Rutgers Foundations of Probability Seminar. March 4, 2019.
185. [Evidence and the language of betting](#). Computer Science Colloquium, CUNY Graduate Center. March 7, 2019.
186. [The language of betting as a strategy for scientific communication](#). LIP6, Université Pierre et Marie Curie. March 20, 2019.
187. [Pascal's and Huygens's game-theoretic foundations for probability](#). Teachers College, Columbia University. March 25, 2019.
188. [Let's replace p-values with betting outcomes!](#) 12th MuST and 3rd PSE: Statistical Reasoning and Scientific Error, Munich. July 1, 2019.
189. [Let's replace p-values with betting outcomes!](#) ISIPTA 2019, Ghent. July 4, 2019.
190. [Let's replace p-values with betting outcomes!](#) PROGIC 2019, Frankfurt. July 9, 2019.
191. [Let's replace p-values with betting scores](#). Association for Mathematics Applied to Social and Economic Sciences. Perugia, September 11, 2019.

192. *The 19th century origins of confidence intervals, significance tests, and p-hacking*. Rutgers Foundations of Probability Seminar. March 4, 2019.
193. *The history of significance testing*. College of Education, Florida State University, Tallahassee. December 6, 2019.
194. *Using game theory to reunify subjective and objective probability*. Seminar in Logic, Games and Language, CUNY Graduate Center. December 13, 2019.
195. *Let's replace p-values with betting scores*. 4th JAAF India Symposium, IIM Bangalore. January 12, 2020.
196. *Let's replace p-values with betting scores*. Finance & Risk Engineering Lecture, NYU Tandon School of Engineering. April 2, 2020. [YouTube video](#), as recorded by NYU Tandon School of Engineering as part of the Brooklyn Quant Experience (BQE) Lecture Series.
197. *Testing by betting*. Royal Statistical Society Discussion Meeting. September 9, 2020. [Paper \(pre-print\)](#), [slides](#), [video](#).
198. *Testing by betting and the randomness of risk*. Mathematics Department, University of Kansas. October 8, 2020.
199. *Testing by betting and the randomness of risk*. Statistics Seminar, Durham University. October 19, 2020.
200. *Game-theoretic foundations for statistical testing and imprecise probabilities*. Four lectures for SIPTA school at Liverpool University, December 9 and 10, 2020.
201. *Let's replace (p-value + power) with (betting outcome + betting target)*. North Carolina State Department of Statistics. February 5, 2021.
202. *Event trees, situation spaces, chain event graphs, martingale spaces*. Conference on Reasoning with Asymmetric and Context-Specific Graphs, Baylor University. July 19, 2021.
203. *Bringing betting games back to the center of probability and statistics*. Session on testing and estimation using betting, e-values and martingales, 2021 Joint Statistical Meetings. August 9, 2021.
204. *Dempster's simplicial model and the larger Dempster-Shafer theory*. 2021 Joint Statistical Meetings. August 9, 2021.
205. *How game-theoretic probability can reform theoretical statistics*. Eurandom, Eindhoven, the Netherlands. May 31, 2022.
206. *One way testing by betting can improve data analysis: Statistical testing with optional continuation*. Department of Civil & Environmental Engineering, University of Maryland. September 13, 2023.
207. *Maurice Fréchet named Cournot's principle. What did he name?* International Conference on Maurice Fréchet: Mathematics, the abstract and the concrete. Institut Henri Poincaré, Paris. October 10 2023.
208. *Statistical testing with optional continuation*. Statistics Seminar, Department of Decision Sciences, Bocconi University. October 13, 2023.
209. *Kelly betting with imprecise probabilities*. Foundations Lab, Department of Electronics and Information Systems, Ghent University. October 16, 2023.
210. *When are probabilities predictions?* Philog (Seminar in Philosophy, Logic and Games). January 31, 2024.
211. *Modernizing Cournot's Principle*. Department of Statistics and Data Science, Carnegie Mellon University. March 25, 2024.