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Research Interests

Trustworthy AI, trustworthy computing, privacy, security, software specification and verification, distributed and concurrent systems, programming languages, programming methodology, software engineering.

Education

June 1983

Massachusetts Institute of Technology   Cambridge, MA
Ph.D. in Computer Science
Thesis: *A Two-Tiered Approach to Specifying Programs*.
Advisor: John Guttag.
Minor in logic and number theory.

June 1979

Massachusetts Institute of Technology   Cambridge, MA
S.M. in Electrical Engineering and Computer Science.
Thesis: *Partial-Match Retrieval Using Tries, Hashing, and Superimposed Codes*.
Advisors: Ronald Rivest (MIT) and John Reiser (Bell Labs).
VI-A co-operative student in Computer Science with AT&T Bell Laboratories.

June 1979

Massachusetts Institute of Technology   Cambridge, MA
S.B. in Computer Science and Engineering.
VI-A co-operative student in Computer Science with AT&T Bell Laboratories.

Employment History

2017–

Columbia University   New York, NY
Executive Vice President for Research, 2021–.
Avanessians Director of the Data Science Institute, 2017–2021.
Professor of Computer Science, 2017–.
Zuckerman Mind, Brain, and Behavior Institute, Affiliate Member, 2018–.

2013–2017

Microsoft Research   Redmond, WA
Corporate Vice President, Microsoft Research, July 2013–June 2017; Head of MSR Labs, September 2014–June 2017
Vice President, Head of Microsoft Research International, January–July 2013.

1985–

Carnegie Mellon University   Pittsburgh, PA
Adjunct Professor of Computer Science, 2019–.

Consulting Professor of Computer Science, 2015–2018. On leave, 2013–2015.
President's Professor of Computer Science, 2004–2013.
Head, Computer Science Department, 2004–2007, 2010–2012.
Director of Microsoft-Carnegie Mellon Center for Computational Thinking, 2007-2012.
Professor of Electrical and Computer Engineering, courtesy, 2005–.
Associate Dean for Academic Affairs, School of Computer Science, 1999–2004.
Associate Dean for Doctoral Programs, School of Computer Science, 1998.
Associate Department Head for the Ph.D. Program, Computer Science Department, 1996–2004.
Director of Specification and Verification Center, 2001–2012.

2007–2010
National Science Foundation   Arlington, VA
Assistant Director for the Computer and Information Science and Engineering (CISE) Directorate.

2002–2003
Microsoft Research   Redmond, WA
Visiting Researcher.

1992
Massachusetts Institute of Technology   Cambridge, MA
Visiting Associate Professor of Computer Science.

1983-1985
University of Southern California (USC)   Los Angeles, CA
Assistant Professor, Computer Science Department.

1979-1983
Massachusetts Institute of Technology   Cambridge, MA
Research Assistant, Systematic Programming Development Group, Laboratory for Computer Science.
Research Assistant, Programming Methodology Group, Laboratory for Computer Science.
Teaching Assistant, Department of Electrical Engineering and Computer Science.

1982, 1981
Xerox Palo Alto Research Centers   Palo Alto, CA
Summer Research Intern, Computer Science Laboratory.

1980
USC/Information Sciences Institute   Marina del Rey, CA
Summer Research Assistant, Program Verification Group.

1976-1978
AT&T Bell Laboratories   Murray Hill and Holmdel, NJ
Research Staff/Co-op Student, Interactive Computer Systems Research Department.
Research Staff/Co-op Student, Computing Techniques Research Department.
Research Staff/Co-op Student, Operator Service Department.

Research Activities

Books, Edited Volumes

1. *Realizing the Promise and Minimizing the Perils of Artificial Intelligence for the Scientific Community*, Penn Press, to appear November 2024.

2. A. Spector, P. Norvig, C. Wiggins, and J.M. Wing, *Data Science in Context: Foundations, Challenges, Opportunities*, (on-line version at `https://datascienceincontext.com`), Cambridge University Press, 2022. Winner of Professional and Scholarly Excellence (PROSE) Award for Computing and Information Sciences CAtegory 2024.

3. D. Kroening, D. Garlan, and J.M. Wing, *The Practice of Formal Methods*, in progress.

4. J.M. Wing, J.P.C. Woodcock, and J. Davies (editors), *Proceedings of FM'99: First World Congress on Formal Methods in the Development of Computing Systems*, Toulouse, France, Springer-Verlag, LNCS 1708 (Volume I) and 1709 (Volume II), 1999.

5. U. Martin and J. Wing (eds.), *Proceedings of the First International Workshop on Larch*, Springer-Verlag, Workshops in Computing Series, 1993.

6. J.V. Guttag and J.J. Horning (eds.) with S.J. Garland, K.D. Jones, A. Modet, and J.M. Wing, *Larch: Languages and Tools for Formal Specification*, Springer-Verlag, 1993.

Book Chapters (Refereed)

1. J.M. Wing "A Conversation About Computational Thinking," Chapter 8, in *Future Frontiers: Education for an AI World*, L. Loble, T. Creenaune, and J. Hayes, editors, Melbourne University Press, 2017, pp. 127-140.

2. P.K. Manadhata and J.M. Wing, "A Formal Model for a System's Attack Surface," Chapter 1, in *Moving Target Defense: Creating Asymmetric Uncertainty for Cyber Threats*, S. Jajodia, A. Ghosh, V. Swarup, C. Wang, and X.S. Wang, editors, Springer, 2011, pp. 1–28.

3. J.M. Wing, "Scenario Graphs Applied to Network Security," Chapter 9, in *Information Assurance: Survivability and Security in Networked Systems*, Yi Qian, James Joshi, David Tipper, and Prashant Krishnamurthy, editors, Morgan Kaufmann Publishers, Elsevier, Inc., 2008, pp. 247–277.

4. M. Howard, J. Pincus, and J.M. Wing, "Measuring Relative Attack Surfaces," Chapter 8, in *Computer Security in the 21st Century*, D.T. Lee, S.P. Shieh, and J.D. Tygar, editors, Springer, March 2005, pp. 109–137.

5. B.H. Liskov and J.M. Wing, "Behavioral Subtyping Using Invariants and Constraints," in *Formal Methods for Distributed Processing, an Object Oriented Approach*, Howard Bowman and John Derrick, editors, Cambridge University Press, 2001, pp. 254–280. Also available as CMU-CS-99-156, July 1999.

6. J.M. Wing and J. Ockerbloom, "Respectful Type Converters for Mutable Types," in *Foundations of Component Based Systems*, Gary Leavens and Murali Sitaraman, editors, Cambridge University Press, 2000, pages 161–186. Also available as CMU-CS-99-142, June 1999.

7. J.M. Wing, "A Symbiotic Relationship Between Formal Methods and Security," in the *Proceedings of the Workshops on Computer Security, Dependability, and Assurance: From Needs to Solution*, pp. 26-38. Also available as CMU-CS-98-188, December 1998.

8. J.M. Wing, "Hints to Specifiers," Chapter 5 in *Educational Issues of Formal Methods*, edited by M. Hinchey and N. Dean, Academic Press, London, 1996, pp. 57–77. Preliminary version available as CMU-CS-95-118R, May 1995, which supersedes "Teaching Mathematics to Software Engineers," CMU-CS-95-118, February 1995.

9. D.L. Detlefs, M.P. Herlihy and J.M. Wing, "Avalon/C++," in *Advanced Language Implementation: Recent Research at Carnegie Mellon University*, P. Lee, editor, MIT Press, 1991.

10. J.M. Wing et al., "The Avalon Language," Part IV, Chapters 19–22, in *Camelot and Avalon: A Distributed Transaction Facility*, J. Eppinger, L. Mummert and A. Spector, editors, Morgan Kaufmann Publishers, Inc., 1991.

11. M.W. Maimone, J.D. Tygar and J.M. Wing, "Formal Semantics for Visual Specification of Security," in *Visual Languages and Visual Programming*, S.-K. Chang, editor, Plenum, 1990, pp. 97–116. Also CMU-CS-88-173r.

Journal Publications

1. Blau et al., "Protecting Integrity in the Age of Generative AI," *Proceedings of the National Academy of Sciences*, edittorial, vol. 121, no. 22, May 2024.

2. A.Z. Spector, P. Norvig, C. Wiggins, J.M. Wing, B. Fried, M. Tingley, "Data Science: More Than Just Algorithms," *ACM Queue*, vol. 21, no. 1, January–February 2023, pp. 102–129. Also *Communications of the ACM*, vol. 66, no. 8, August 2023, pp. 53–61.

3. J.M. Wing, "Trustworthy AI," *Communications of the ACM*, vol. 64, no. 10, October 2021, pp. 64-71.

4. Jeff Goldsmith, Yifei Sun, Linda Fried, Jeannette Wing, Gary Miller, Kiros Berhane, "The Emergence and Future of Public Health Data Science," *Public Health Reviews*, April 2021.

5. J.M. Wing, "Toward a Research Agenda for Data Science: The Discussion Begins," *Harvard Data Science Review*, rejoinder, September 2020.

6. J.M. Wing, "Ten Research Challenge Areas in Data Science," *Harvard Data Science Review*, July 2020. arXiv:2002.05658.

7. J.M. Wing and D. Banks, "Highlights of the Inaugural Data Science Leadership Summit," *Harvard Data Science Review*, November 2019.

8. J.M. Wing, "The Data Life Cycle," *Harvard Data Science Review*, June 2019.

9. T. Zheng, J.M. Wing, C. Stein, and D. Hsu, "New Master's or Doctoral Data Science/Analtyics Programs: Columbia," *AMSTAT News*, December 2018, pp. 6–11.

10. J.M. Wing, "Computational Thinking's Influence on Research and Education for All," *Italian Journal on Educational Technology* (formerly *TD Tecnologie Didattiche*), 25(2), 7-14. doi: 10.17471/2499-4324/922, 2017.

11. Y. Gurevich, E. Hudis, and J.M. Wing, "Inverse Privacy," *Communications of the ACM*, Vol. 59, No. 7, July 2016, pp. 38–42. Also Microsoft Research Technical Report MSR-TR-2014-100, July 2014, revised version MSR-TR-2015-37, May 2015.

12. P.K. Manadhata and J.M. Wing "An Attack Surface Metric," *IEEE Transactions on Software Engineering*, June 2010.

13. J.M. Wing, "Computational Thinking and Thinking about Computing," *Philosophical Transactions of the Royal Society*, vol. 366, July 2008, pp. 3717–3725.

14. J.M. Wing, "Five Deep Questions in Computing," *Communications of the ACM*, essay, vol. 51, no. 1, January 2008, pp. 58–60.

15. J.M. Wing, "Computational Thinking," *Communications of the ACM*, viewpoint, vol. 49, no. 3, March 2006, pp. 33–35. Chinese translation in *Communications of CCF*, vol. 3 no. 11, November 2007, pp. 83–85. French translation, by Pierre Lescanne, in *Bulletin of SPECIF*, December 2008.

16. K.W. Lye and J.M. Wing, "Game Strategies in Network Security," *International Journal of Information Security*, February 2005, 4(1-2), pp. 71–86.

17. J.M. Wing, "Beyond the Horizon: A Call to Arms," *IEEE Security and Privacy*, November/December 2003, pp. 62–67.

18. D. Kindred and J.M. Wing, "Theory Generation for Security Protocols", in progress.

19. J.M. Wing and J. Ockerbloom, "Respectful Type Converters," *IEEE Transactions on Software Engineering*, vol. 26, no. 7, July 2000, pp. 579–593; also CMU-CS-98-130.

20. D. Jackson, Y. Ng, and J.M. Wing, "A Nitpick Analysis of Mobile IPv6," *Formal Aspects of Computing*, vol. 11, no. 6, 1999, pp. 591–615; also CMU-CS-98-113, March 1998.

21. H.S. Chadha, J.W. Baugh Jr., and J.M. Wing, "Formal Specification of Concurrent Systems," *Advances in Engineering Software* (read by civil and mechanical engineers), vol 30, no. 3, March 1999, pp. 211–224.

22. G. Leavens and J.M. Wing, "Protective Interface Specifications," *Formal Aspects of Computing*, vol. 10, March 1998, pp. 59–75.

23. A.M. Zaremski and J.M. Wing, "Specification Matching of Software Components," *ACM Trans. on Software Engineering and Methodology*, vol. 6, no. 4, October 1997, pp. 333-369. Shorter version published in *Proceedings of SIGSOFT Foundations of Software Engineering*, October 1995, pp. 6–17; recommended by program committee for submission to *TOSEM*; also CMU-CS-95-127, March 1995. **2012 SIGSOFT Retrospective Paper Award** (for FSE paper).

24. J.M. Wing and M. Vaziri-Farahani, "A Case Study in Model Checking Software Systems," *Science of Computer Programming*, vol. 28, 1997, pp. 273–299; also CMU-CS-96-124. Shorter version published as "Model Checking Software Systems: A Case Study," *Proceedings of SIGSOFT Foundations of Software Engineering*, October 1995, pp. 128–139; also CMU-CS-95-128, March 1995.

25. E.M. Clarke and J.M. Wing, "Formal Methods: State of the Art and Future Directions," *ACM Computing Surveys*, vol. 28, no. 4, December 1996, pp. 626–643. Available as CMU-CS-96-178.

26. L. Mummert, J.M. Wing and M. Satyanarayanan, "Using Belief to Reason about Cache Coherence in Distributed File Systems," submitted to *The Chicago Journal of Theoretical Computer Science*, December 1994. Shorter version published as "Using Belief to Reason about Cache Coherence," in *Proceedings of the Symposium on Principles of Distributed Computing*, August 1994, pp. 71–80. Recommended by program committee for submission to *CJTCS*; also CMU-CS-94-151R, December 1994.

27. D. Jackson and J. Wing, "Lightweight Formal Methods," *IEEE Computer*, April 1996, pp. 21–22.

28. A.M. Zaremski and J.M. Wing, "Signature Matching, a Tool for Software Libraries," *ACM Trans. on Software Engineering and Methodology*, vol. 4, no. 2, April 1995, pp. 146–170. Shorter version published as "Signature Matching: A Key to Reuse," in *Proceedings of SIGSOFT Foundations of Software Engineering*, December 1993. Recommended by program committee for submission to *TOSEM*; also CMU-CS-93-151, May 1993.

29. B.H. Liskov and J.M. Wing, "A Behavioral Notion of Subtyping," *ACM Trans. on Prog. Lang. and Systems*, vol. 16, no. 6, November 1994, pp. 1811–1841.

30. N. Haines, D. Kindred, J.G. Morrisett, S.M. Nettles and J.M. Wing, "Composing First-Class Transactions," *ACM Trans. on Prog. Lang. and Systems*, Short Communications, vol. 16, no. 6, November 1994, pp. 1719–1736.

31. J.M. Wing and C. Gong, "Testing and Verifying Concurrent Objects," *Journal of Parallel and Distributed Computing*, vol. 17, 1993, pp. 164–182.

32. M.P. Herlihy and J.M. Wing, "Specifying Graceful Degradation," *IEEE Trans. on Parallel and Distributed Computing*, vol. 2, no. 1, January 1991, pp. 93–104; preliminary version in CMU-CS-87-120 March 1988. Shorter version published as "Specifying Graceful Degradation in Distributed Systems," in *Proceedings of the 6th Symposium on Principles on Distributed Computing*, Vancouver, Canada, August 1987, pp. 167–177; also CMU-CS-87-120, May 1987.

33. A. Heydon, M. Maimone, D. Tygar, J.M. Wing and A.M. Zaremski, "Miro: Visual Specifications of Security," *IEEE Trans. on Software Engineering*, vol. 16, no. 10, October 1990, pp. 1185–1197. Also CMU-CS-89-199, November 1989.

34. J.M. Wing, "Using Larch to Specify Avalon/C++ Objects," *IEEE Trans. on Software Engineering*, vol. 16, no. 9, September 1990, pp. 1076–1088.

35. J.M. Wing, "A Specifier's Introduction to Formal Methods," *IEEE Computer*, vol. 23, no. 9, September 1990, pp. 8–24. Also CMU-CS-90-136, May 1990, superseding CMU-CS-89-200, "What is a Formal Method?," November 1989.

36. M.P. Herlihy and J.M. Wing, "Linearizability: A Correctness Condition for Concurrent Objects," *ACM Trans. on Prog. Lang. and Systems*, vol. 12, no. 3, July 1990, pp. 463–492; also CMU-CS-88-120, November 1987. Shorter version published as "Axioms for Concurrent Objects," in *Proceedings of the 14th Symposium on Principles of Programming Languages*, Munich, W. Germany, January 21-23, 1987, pp. 13–26; also CMU-CS-86-154, October 1986.

37. J.M. Wing, "Verifying Atomic Data Types," *International Journal of Parallel Programming*, vol. 18, no. 5, 1989, pp. 315–357.

38. M.R. Barbacci, D.L. Doubleday, C.B. Weinstock and J.M. Wing, "Developing Applications for Heterogeneous Machine Networks: The Durra Environment," *Computing Systems*, vol. 2, no. 1, March 1989, pp. 7–35.

39. J.M. Wing and M. Nixon, "Extending Ina Jo with Temporal Logic," *IEEE Trans. on Software Engineering*, vol. 15, no. 2, February 1989, pp. 181–197. Shorter version in *1986 IEEE Symposium on Security and Privacy*, Oakland, California, April 1986, pp. 2–13.

40. D.L. Detlefs, M.P. Herlihy and J.M. Wing, "Inheritance of Synchronization and Recovery Properties in Avalon/C++," *IEEE Computer*, vol. 21, no. 12, December 1988, pp. 57–69. Also CMU-CS-87-133, June 1987.

41. J.M. Wing, "A Study of Twelve Specifications of the Library Problem," *IEEE Software*, vol. 5, no. 4, July 1988, pp. 66–76. Runner-up for 1988 *IEEE Software* Best Paper Award. Also CMU-CS-87-142, July 1987.

42. J.M. Wing, "Writing Larch Interface Language Specifications," *ACM Trans. on Prog. Lang. and Systems*, vol. 9, no. 1, January 1987, pp. 1–24.

43. J.V. Guttag, J.J. Horning and J.M. Wing, "The Larch Family of Specification Languages," *IEEE Software*, vol. 2, no. 5, September 1985, pp. 24–36.

44. J.V. Guttag, and J.J. Horning and J.M. Wing, "Some Remarks on Putting Formal Specifications to Productive Use," *Science of Computer Programming*, vol. 2, no. 1, October 1982, pp. 53–68.

Refereed Conference and Workshop Papers

1. D. Mandal, S. Deng, D. Hsu, S. Jana, and J.M. Wing, "Ensuring Fairness Beyond the Training Data," in *Proceedings of the 34th Conference on Neural Information Processing Systems* (NeurIPS), December 2020. arXiv:2007.06029, July 2020.

2. R. Bernstein, M. Vakar, and J.M. Wing, "Transforming Probabilistic Programs for Model Checking," in *Proceedings of ACM-IMS Foundations of Data Science*, virtual meeting, October 18-20, 2020.

3. Y. Gurevich, E. Hudis, and J.M. Wing, "Inverse Privacy: A Position Paper," *MyData 2016 Workshop: Making Sense of the Value of Personal Data*, Helsinki, Finland, August 31, 2016.

4. M.C. Tschantz, A. Datta, A. Datta, and J.M. Wing, "A Methodology for Information Flow Experiments," *IEEE Computer Security Foundations Symposium*, Verona, Italy, July 13–17, 2015.

5. S. Sen, S. Guha, A. Datta, S. Rajamani, J. Tsai, and J.M. Wing, "Bootstrapping Privacy Compliance in Big Data Systems," in *35th IEEE Symposium on Security and Privacy ("Oakland")*, San Francisco, CA, May 18–21, 2014. **Best Student Paper Award.** Selected for inclusion in the Science of Security Index of Significant Research in Cyber Security 2015. Also Microsoft Research Technical Report MSR-TR-2014-36, March 2014.

6. M.C. Tschantz, A. Datta, and J.M. Wing, "Purpose Restrictions on Information Use," in *Proceedings of the 18th European Symposium on Research in Computer Security (ESORICS)*, Egham, UK, September 9–11, 2013. Also CMU-CS-13-116 and CMU-CyLab-13-005, June 2013.

7. M.C. Tschantz, A. Datta, and J.M. Wing, "Formalizing and Enforcing Purpose Restrictions of Privacy Policies," in *Proceedings of IEEE Symposium on Security and Privacy*, San Francisco, CA, May 20–23, 2012. Also CMU-CS-12-106 (full version), March 2012.

8. V. Gligor and J.M. Wing, "Towards a Theory of Trust in Networks of Humans and Computers," in *Proceedings of Nineteenth International Workshop on Security Protocols*, Cambridge, England, March 28–30, 2011, Lecture Notes in Computer Science, Springer-Verlag, **Invited Paper**.

9. M.C. Tschantz and J.M. Wing, "Formal Methods for Privacy," in *Proceedings of Formal Methods 2009*, Eindhoven, The Netherlands, Lecture Notes in Computer Science, Springer-Verlag, November 2009, pp. 1–15. **Invited Paper**. Also CMU-CS-TR-09-154, August 2009.

10. P.K. Manadhata, Y. Karabulut, and J.M. Wing, "Measuring the Attack Surface of SAP Platforms and Business Applications," in *Proceedings of the International Symposium Symposium on Engineering Secure Software and Systems*, Industry Track Leuven, Belgium, February 4–6, 2009, pp. 91–100..

11. P.K. Manadhata, Y. Karabulut, and J.M. Wing, "Measuring the Attack Surfaces of SAP Software Systems," in *Proceedings of the 19th IEEE International Symposium on Software Reliability Engineering*, Industry Track (only abstract and presentation published), Redmond, WA, November 11–14, 2008.

12. M.C. Tschantz and J.M. Wing, "Extracting Conditional Confidentiality Policies," in *Proceedings of the 6th IEEE International Conference on Software Engineering and Formal Methods*, Cape Town, South Africa, November 10–14, 2008, pp. 107–116. **Best Paper Award.** Preliminary version available as CMU-CS-08-127 Technical Report, May 2008.

13. P.K. Manadhata, J.M. Wing, M.A. Flynn, and M.A. McQueen, "Measuring the Attack Surfaces of Two FTP Daemons," in *Proceedings of Quality of Protection Workshop*, Alexandria, VA, October 30, 2006, pp. 3–10.

14. V. Mehta, C. Bartzis, H. Zhu, E.M. Clarke, and J.M. Wing, "Ranking Attack Graphs," in *Proceedings of Recent Advances in Intrusion Detection 2006*, Hamburg Germany, Sept. 20–22, 2006, pp. 127–144.

15. P.K. Manadhata and J.M. Wing, "An Attack Surface Metric," *First Workshop on Security Metrics*, Vancouver, BC, August 1, 2006, position paper.

16. J.M. Wing, "Scenario Graphs Applied to Security," in *Proceedings of Verification of Infinite State Systems with Applications to Security (VISSAS) 2005*, Timisoara, Romania, March 2005, extended abstract, pp. 229–234.

17. J. Pincus and J.M. Wing, "Towards an Algebra for Security Policies," *Proceedings of 26th International Conference on Applications and Theory of Petri Nets*, Miami, FL, June 2005, extended abstract, pp. 17–25.

18. O. Sheyner and J.M. Wing, "Tools for Generating and Analyzing Attack Graphs," *Proceedings of Workshop on Formal Methods for Components and Objects*, 2004, pp. 344–371.

19. M. Howard, J. Pincus, and J.M. Wing, "Measuring Relative Attack Surfaces," *Proceedings of Workshop on Advanced Developments in Software and Systems Security*, Taipei, December 2003. Also CMU-CS-03-169 Technical Report, August 2003.

20. T.M. Wong, C. Wang, and J.M. Wing, "Verifiable Secret Redistribution for Archive Systems," *Proceedings of the First International Security in Storage Workshop*, Maryland, December 2002.

21. K.W. Lye and J.M. Wing, "Game Strategies in Network Security," in the *Proceedings of the Foundations of Computer Security Workshop 2002*, July 26, 2002, Copenhagen, Denmark. Longer version available as CMU-CS-02-136, May 2002.

22. S. Jha, O. Sheyner, and J.M. Wing, "Two Formal Analyses of Attack Graphs," *Proceedings of the 15th IEEE Computer Security Foundations Workshop*, Nova Scotia, Canada, June 2002, pp. 49–63.

23. O. Sheyner, J. Haines, S. Jha, R. Lippmann, and J.M. Wing, "Automated Generation and Analysis of Attack Graphs," *Proceedings of the IEEE Symposium on Security and Privacy*, Oakland, CA, May 2002.

24. S. Jha and J. Wing, "Survivability Analysis of Networked Systems," *Proceedings of the International Conference on Software Engineering*, Toronto, Canada, May 2001. Preliminary version available as CMU-CS-00-168, October 2000.

25. J. Wing, "Towards a Science of Survivability: A Research Agenda and a Specific Method," *Proceedings of the Third Information Survivability Workshop (ISW-2000),*" Boston, MA, October 24-26, 2000. Position paper.

26. O. Sheyner and J. Wing, "Composing Proofs of Security Protocols Using Isabelle/IOA," *Proceedings of the Theorem Proving for Higher Order Logics (TPHOLs) Workshop*, short paper, August 2000. Longer version available as CMU-CS-00-106.

27. N. Hopper, S. Seshia, and J. Wing, "A Comparison and Combination of Theory Generation and Model Checking for Security Protocol Analysis," *Proceedings of the Workshop on Formal Methods and Security*, July 2000; earlier version available as CMU-CS-00-107.

28. S. Jha, J.M. Wing, R. Linger, and T. Longstaff, "Analyzing Survivability Properties of Specifications of Networks," *Proceedings of the International Conference on Dependable Systems and Networks*, Workshop on Dependability Despite Malicious Faults, New York City, NY, June 25-28, 2000, pp. 613-622.

29. M. Vaziri, N. Lynch, and J.M. Wing, "Proving the Correctness of a Controller Algorithm for the RAID Level 5 System," *Proceedings of the International Symposium on Fault-Tolerant Computing*, June 1998; also CMU-CS-98-117, March 1998.

30. J.M. Wing, "Subtyping for Distributed Object Stores," *Proceedings of the Second IFIP International Workshop on Formal Methods for Open Object-based Distributed Systems (FMOODS)*, July 1997, pp. 305-318. **Invited Paper**. Also CMU-CS-97-121, April 1997.

31. Gary T. Leavens and J.M. Wing, "Protective Interface Specifications," *Proceedings of TAPSOFT '97 Theory and Practice of Software Development, 7th International Joint Conference CAAP/FASE*, Lecture Notes in Computer Science 1214, April 1997, pp. 520-534. Also CMU-CS-96-129R, October 1996. Earlier version appeared as "Protection from the Underspecified," CMU-CS-96-129 and Iowa State University Dept. of Computer Science TR96-04, April 1996.

32. D. Kindred and J.M. Wing, "Fast, Automatic Checking of Security Protocols," *Proc. of the USENIX 1996 Workshop on Electronic Commerce*, Oakland, CA, November 1996, pp. 41–52. Also CMU-CS-96-173, September 1996.

33. N. Heintze, J.D. Tygar, J.M. Wing, and H.-C. Wong, "Model Checking Electronic Commerce Protocols," *Proc. of the USENIX 1996 Workshop on Electronic Commerce*, Oakland, CA, November 1996, pp. 147–164.

34. J.M. Wing, "Teaching Mathematics to Software Engineers," *Proceedings of the Fourth International Conference on Algebraic Methodology and Software Technology (AMAST '95)*, Montreal, Canada, July 3, 1995, pp. 18-40. **Invited Paper**. Also CMU-CS-95-118, March 1995; superseded by CMU-CS-95-118R, May 1995.

35. J.M. Wing and D.C. Steere, "Specifying Weak Sets," *Proceedings of the 15th International Conference on Distributed Computing Systems*, Vancouver, May 30-June 2, 1995. Also CMU-CS-94-194, October 1994.

36. D. Garlan, G. Abowd, D. Jackson, J. Tomayko, and J.M. Wing, "The CMU Master of Software Engineering Core Curriculum," *Proceedings of the Eighth SEI Conference on Software Engineering Education (CSEE)*, New Orleans, Lecture Notes in Computer Science 895, Springer-Verlag, March-April 1995, pp. 65–86.

37. Harpreet S. Chadha, John W. Baugh Jr., and J.M. Wing, "Formal Specification of AEC Product Models," *Computing in Civil Engineering: Proceedings of the First Congress*, K. Khozeimeh, ed., American Society of Civil Engineers (ASCE), Washington, D.C., June pp. 571–578, 1994.

38. J.M. Wing, "Decomposing and Recomposing Transactional Concepts," *Proceedings of the Workshop on Object-based Distributed Programming*, Lecture Notes in Computer Science 791, R. Guerraoui, O. Nierstrasz, and M. Riveill (editors), Springer-Verlag, pp. 111–121, 1994.

39. B. Liskov and J.M. Wing, "Specifications and Their Use in Defining Subtypes," *Proceedings of OOP-SLA '93*, September 1993, pp. 16–28. Also reprinted by permission from ACM in *Proceedings of ZUM '95*, Lecture Notes in Computer Science, Springer-Verlag, September 1995, pp. 245–263.

40. B. Liskov and J.M. Wing, "A New Definition of the Subtype Relation," *Proceedings of ECOOP '93*, Lecture Notes in Computer Science 707, Springer-Verlag, July 1993, pp. 118–141. Also CMU-CS-93-149, April 1993; MIT LCS Programming Methodology Group Memo 76, May 1993.

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Patents Filed

1. Privacy Preserving Sensor Apparatus, MS#339904.02, filed on January 18, 2014.

2. Enhanced Spatial Impression For Home Audio, MS#339903.01, filed on January 18, 2014.

3. Dynamic Calibration Of An Audio System, MS#339902.01, filed on January 18, 2014.

4. Structural Element For Sound Field Estimation And Production, MS#339901.01, filed on January 9, 2014.

5. Adapting Audio Based Upon Detected Environmental Acoustics, MS#339900.01, filed December 20, 2013.

University, Industry, and Government Talks

1. "Trustworthy AI," Cray Colloquium Series, University of Minnesota, Twin Cities, MN, scheduled for November 25, 2024. **Distinguished Speaker**.

2. TBD, Academic and Government Leadership Team, Elsevier, New York, NY, scheduled for November 5, 2024.

3. "Research Security at Columbia," School of Nursing, Columbia University, April 24, 2024.

4. "Trustworthy AI," Center for Neurosymbolic Learning Systems, MIT, February 23, 2024, virtual.

5. "Ten Research Challenges in Data Science," Institute for Foundations of Data Science, Yale University, New Haven, CT, Septermber 22, 2023. **Invited Speaker**.

6. "Ten Research Challenges in Data Science," STAT-S115, Harvard University, August 2, 2023, virtual. **Guest Lecturer**

7. "Trustworthy AI," Tissue Talks, Columbia University, NY, NY, May 10, 2023, virtual.

8. "Trustworthy AI," Research Day at Fordham University, Fordham University, NY, NY, March 22, 2023. **Keynote Speaker**.

9. "Research at Columbia," Provost Leadership Fellows, Columbia University, March 10, 2023.

10. "Trustworthy AI," Bell Labs Fellows Conference, Murray Hill, NJ, November 30, 2022.

11. "Ten Research Challenges in Data Science," Norrkoping, Sweden, May 23, 2022.

12. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," Linkoping University, Honorary Doctorate Symposium, May 20, 2022.

13. "Trustworthy AI," Computer Science Department, Linkoping University, Sweden, May 19, 2022.

14. "Trustworthy AI," Michelson Lecture, US Naval Academy, Annapolis, MD, March 22, 2022.

15. "Trustworthy AI," Center for Connected and Automated Transportation, University of Michigan, February 24, 2022. **Distinguished Lecture**.

16. "Trustworthy AI," Precision Medicine Initiative, Columbia University, February 11, 2022.

17. "Research at Columbia," Environmental Health and Safety Semi-Annual Staff Meeting, Columbia University, October 29, 2021.

18. "Research at Columbia," Research Administrators Forum, Columbia University, October 13, 2021.

19. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," Mastercard Cyber Product Town Hall, June 23, 2021.

20. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," VMWare RADIO event, June 14-15, 2021.

21. "Trustworthy AI," Technical Speaker Series, D.E. Shaw Group, New York, NY, May 25, 2021. **Invited Speaker**.

22. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," USC AI Future Symposium, University of Southern California, May 3, 2021. **Keynote Speaker**.

23. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," Penn Institute for Foundations of Data Science, joint with Penn Research in Machine Learning, April 9, 2021. **Keynote Speaker**.

24. "Trustworthy AI," Barnard BEARS: Better, Enhance, and Advance Research Series, Barnard College, February 15, 2021.

25. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," New Jersey Institute of Technology, February 10, 2021. **Invited Speaker**.

26. "Data for Good: Data Science at Columbia University," Columbia Biostatistics Depatment Faculty Meeting, February 10, 2021.

27. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," Massachusetts General Hospital Division of Clinical Research of the MGH Research Institute, October 1, 2020. **Keynote Speaker**.

28. "Trustworthy AI," Institute for Assured Autonomy, Johns Hopkins University, September 22, 2020. **Invited Speaker**.

29. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," Columbia at Home, Alumni (virtual) event, June 24, 2020.

30. "Data for Good: Data Science at Columbia University," Google X, Mountain View, CA, October 23, 2019.

31. "Data for Good: Data Science at Columbia," School of Computer and Communications Sciences, Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland, October 18, 2019.

32. "Data for Good: Data Science at Columbia," JP Morgan Distinguished Lecture Series on AI, New York, NY, May 31, 2019. **Distinguished Lecturer**.

33. "Data for Good: Data Science at Columbia," Lotus Club, New York, NY, May 2, 2019. **Invited Speaker**

34. "Data for Good: Data Science at Columbia," Information Systems, NYU Stern School, New York, NY, May 2, 2019. **Invited Speaker**

35. "Data for Good: Data Science at Columbia," Stavros Niarchos Foundation Brain Insight Lecture Series, Zuckerman Mind, Brain, Behavior Institute, April 9, 2019.

36. "Data for Good: Data Science at Columbia," NJIT Women in Computing Club and DIMACS, New Jersey Institute of Technology, Newark, NJ, March 13, 2019. **Keynote Speaker**.

37. "Data for Good: Data Science at Columbia," NSA, Laurel, MD, March 6, 2019.

38. "Data for Good: Data Science at Columbia," Office for Alumni Development, Columbia University, NY, NY, January 28, 2019.

39. "My Journey as a Scientist Through Academia, Government, and Industry," East and Southeast Asian Scientists and Technologists—Biz Resource Group, IBM, Yorktown Heights, NY, January 23, 2019.

40. "Data for Good: Data Science at Columbia," Columbia-IBM Center for Blockchain and Data Transparency, Distinguished Speaker Series, IBM, Yorktown Heights, NY, January 23, 2019. **Distinguished Speaker**.

41. "Data for Good: Data Science at Columbia," Georgia Institute of Technology, Atlanta, GA, December 7, 2018. **Distinguished Lecturer**.

42. "Data for Good: Scary AI and the Dangers of Big Data," Cybbersecurity, Data Privacy and Surveillance Law, Guest Lecture, Columbia University Law School, New York, NY, December 4, 2018.

43. "Data Science: The Next Big Thing," Beijing Global Development Center, Columbia University, Beijing, China, November 11, 2018.

44. "Data for Good: Data Science at Columbia," Chinese Association for Science and Technology: Greater New York Region, NYU Langone Medical Center, New York, NY, October 6, 2018.

45. "Writing in Computer Science," Undergraduate Writing Program, Columbia University, New York, NY, October 5, 2018.

46. "Data for Good: Data Science at Columbia," School of Nursing, Columbia University, New York, NY, September 18, 2018.

47. "Data for Good: Scary AI and the Dangers of Big Data," Data for Good Talk Series, Columbia University, New York, NY, September 14, 2018.

48. "Data for Good: Data Science at Columbia," Belgium Delegation, Columbia University, New York, NY, June 25, 2018.

49. "Data for Good: Data Science at Columbia," Federal University of Rio, Rio de Janeiro, Brazil, May 9, 2018.

50. "Data for Good: Scary AI and the Dangers of Big Data," 15-150 Guest Lecture, Carnegie Mellon Univerxosity, Pittsburgh, PA, May 1, 2018.

51. "Data for Good: Data Science at Columbia," 15-150 Guest Lecture, Carnegie Mellon University, Pittsburgh, PA, May 1, 2018.

52. "Data Science at Columbia, at Mailman," with DuBois Bowman, Mailman's School Ground Rounds Talk on Data Science and Public Health, April 25, 2018.

53. "Data for Good: Data Science at Columbia," Columbia University Precison Medicine, New York, NY, April 24, 2018. **Distinguished Lecturer**.

54. "Data Science at Columbia," UNC 2017 Triangle Computer Science Distinguished Lecture Series, Chapel Hill, NC, April 23, 2018. **Distinguished Lecturer**.

55. "Data for Good: Scary AI and the Dangers of Big Data," Department of Biomedical Informatics Retreat, New Paltz, NY, April 18, 2018.

56. "Data Science at Columbia," Distinguished Lecturer Seminar, University of Irvine, Irvine, CA, April 13, 2018. **Distinguished Lecturer**.

57. "Data for Good: Data Science at Columbia,", 2018 Birnberg Research Program, Columbia College of Dental Medicine, New York, NY, April 11, 2018.

58. "Safe Cyber-Physical Systems That You Can Bet Your Life On," AI Safety, Ethics and Policy, Columbia University, April 9, 2018

59. "Data for Good: Scary AI and the Dangers of Big Data," All Things Tech at Columbia (ADI), Columbia University, New York, NY, April 3, 2018.

60. "Future of Data Science and Societal Implications," Future of Learning Forum, Columbia University, New York, NY, March 9, 2018.

61. "The Academia-Industry-Government Innovation Cycle," Council on Governmental Relations, Washington, DC, February 23, 2018.

62. "Data for Good: Scary AI and the Dangers of Big Data," Data for Good Talk Series, Columbia University, New York, NY, February 9, 2018.

63. "Data for Good: Scary AI and the Dangers of Big Data," Data Analytics Club, Business School, Columbia University, New York, NY, February 6, 2018.

64. "Data Science at Columbia," Sustainable Development Program, Columbia University, New York, NY, February 5, 2018.

65. "Data Science at Columbia," Michigan Institute for Data Science, University of Michigan, Ann Arbor, MI, February 2, 2018.

66. "Data Science at Columbia," University of Rochester, Rochester, NY, December 8, 2017.

67. "Data Science at Columbia," MBA: Research to Revenue course, Columbia University, New York, NY, November 29, 2017.

68. "New Threats, New Targets, and New Opportunities," Data Science Symposium, Tufts University, Medford, MA, November 8, 2017. **Keynote Speaker**.

69. "Data Science at Columbia," Henan Province, Mayor Meeting, Columbia University, New York, NY, November 2, 2017.

70. "Data Science at Columbia," Town Hall, Columbia University, New York, NY, November 1, 2017.

71. "Data Science at Columbia," United Technologies, Columbia University, New York, NY, October 31, 2017.

72. "Data for Good: Scary AI and the Dangers of Big Data," The Computing Conference, Hangzhou, China, October 11, 2017.

73. "Data for Good: Scary AI and the Dangers of Big Data," Institute for Social and Economic Research and Policy, Columbia University, New York, NY, September 20, 2017.

74. "Research at Microsoft: Beyond the Horizon," New Employee Orientation, MSR Lab Interns, Redmond, WA, May 8, 2017.

75. "Formal Methods: An Industrial Perspective," 15-150 Guest Lecture, Carnegie Mellon University, Pittsburgh, PA, May 2, 2017.

76. "Research and Career," Third Annual Women's Research Day, Computer Science and Engineering, University of Washington, Seattle, April 1, 2017.

77. "A Theme and Variation: Information Technology and Policy Meet," Baker Institute for Public Policy, Rice University, February 8, 2017. **Invited Panelist**.

78. "Research at Microsoft: Beyond the Horizon," Computer Science Department, University of Illinois, Urbana-Champaign, IL, October 24, 2016. **Distinguished Lecture**.

79. "Computational Thinking," Visionaries in Technology Distinguished Lecture Series, Dartmouth College, Hannover, NH, October 21, 2016.

80. "Towards a Theory of Trust in Networks of Humans and Computers," MIT Institute for Data, Systems, and Society Launch Event, MIT, Cambridge, MA, September 22, 2016.

81. "Computational Thinking," Vienna Godel Lecture, Vienna Institute of Technology, Vienna, Austria, June 9, 2016, **Distinguished Speaker**.

82. "Research at Microsoft: Beyond the Horizon," New Employee Orientation, MSR Lab Interns, Redmond, WA, June 6, 2016.

83. "Crashing Drones and Hijacked Cameras: CyberTrust Meets CyberPhysical," Data Science Institute, Columbia University, New York, NY, May 9, 2016.

84. "Research at Microsoft: Beyond the Horizon," Computer Science and Artificial Intelligence Laboratory, MIT, Cambridge, MA, May 4, 2016.

85. "Formal Methods: An Industrial Perspective," 15-150 Guest Lecture, Carnegie Mellon University, Pittsburgh, PA, April 28, 2016.

86. "The Importance of Basic Research," Berkeley Forum, Berkeley, CA, April 25, 2016. **Invited Speaker**.

87. "Computational Thinking," Distinguished Women Series, Florida International University, Miami, FL, April 15, 2016, **Distinguished Speaker**.

88. "Research at Microsoft: Beyond the Horizon," Discovery Park, Purdue University, West Lafayette, IN, March 3, 2016, **Distinguished Speaker**.

89. "Research at Microsoft: Beyond the Horizon," University of Washington, Seattle, WA, December 10, 2015, **Distinguished Speaker**.

90. "Computational Thinking," Departamento de Informatica, Universidade Nova de Lisboa, Lisbon, Portgual, November 25, 2015, **2015 Department Distinguished Lecture**.

91. "Computational Thinking," Sarah and James Bowdoin Day ceremony, Bowdoin College, Brunswick, ME, October 30, 2015.

92. "Memories of a CSD Department Head," CSD50, Carnegie Mellon University, Pittsburgh, PA, October 23, 2015.

93. "Research at Microsoft: Beyond the Horizon," IMAGINEnext, Microsoft and CMU, Carnegie Mellon Univesrity, Pittsburgh, PA, October 22, 2015.

94. "DARPA ISAT," Defense Science Study Group, Alexandria, VA, October 21, 2015.

95. "Future of Asian Science and Technology," Microsoft Asian Leadership Conference, Redmond, WA, May 29, 2015.

96. "Formal Methods: An Industrial Perspective," 15-150 Guest Lecture, Carnegie Mellon University, Pittsburgh, PA, April 28, 2015.

97. "Computing and Computational Thinking," MathAcrossCampus, University of Washington, Seattle, WA, February 27, 2015.

98. "Privacy Compliance in Big Data Systems," University of California, Berkeley, CA, November 3, 2014.

99. "Computational Thinking," Tulane University, New Orleans, LA, October 13, 2014.

100. "Towards a Theory of Trust in Networks of Humans and Computers," Computing the Future: Celebrating Computer Science and Artificial Intelligence, MAC50 Celebration, MIT, Cambridge, MA, May 28, 2014.

101. "Towards a Theory of Trust in Networks of Humans and Computers," Informatics Colloquium, Universite Pierre and Marie Curie, Paris, May 20, 2014.

102. "Computational Thinking," **Wheeler Lecture**, Computer Laboratory, University of Cambridge, Cambridge, UK, May 14, 2014.

103. "Towards a Theory of Trust in Networks of Humans and Computers," Distinguished Lecture Series in Computer Science, University of Chicago, May 8, 2014. **Distinguished Lecturer**.

104. "Thinking about Computational Thinking," University of Washington, Phi Beta Kappa Visiting Scholars Program, Seattle, WA, April 30, 2014.

105. "Formal Methods: An Industrial Perpsective," 15-150 Guest Lecture, Carnegie Mellon University, Pittsburgh, PA, April 22, 2014.

106. "Computational Thinking," University of Colorado-Boulder, Phi Beta Kappa Visiting Scholars Program, Boulder, CO, April 17, 2014.

107. "Computational Thinking," Computational Journalism Speaker Series, Columbia University, New York City, NY, February 4, 2014.

108. "Towards a Theory of Trust in Networks of Humans and Computers," Cornell University, Ithaca, NY, in celebration of Fred Schneider's 60th Birthday, December 5, 2013.

109. "Computational Thinking," Phi Beta Kappa Visiting Scholars Program, Xavier University, Cincinnati, OH, October 17, 2013.

110. "Towards a Theory of Trust in Networks of Humans and Computers," MSR Security Reading Group, Redmond, WA, October 3, 2013.

111. "Asian Perspectives on Science and Technology Policy: Contrasts and Commonalities with the US," Session on the Budgetary and Policy Context for R&D in FY 2014, AAAS Forum on Science and Technology Policy, Washington, DC, May 2, 2013. **Invited Speaker**.

112. "Functional Programming in the Real World," 15-150 Lecture, Carnegie Mellon University, April 29, 2013.

113. "Cyber-Physical Meets CyberTrust," TRUST External Advisory Board Meeting, Washington, DC, November 16, 2012.

114. "Computational Thinking," Columbia University, New York, NY, Joseph Traub's 80th Birthday Symposium, November 9, 2012.

115. "Towards a Theory of Trust in Networks of Humans and Computers," TRUST Security Seminar, University of California, Berkeley, CA, November 1, 2012. **Invited Speaker**.

116. "Computational Thinking," Microsoft Research Asia Faculty Summit, Tianjin, China, October 26, 2012.

117. "Towards a Theory of Trust," Tsinghua University, Beijing, China, September 14, 2012.

118. "Insights into DC: The Budget Cycle, NSF, and More," Robotics Institute Faculty Meeting, August 17, 2012.

119. "Computational Thinking," Andrew's Leap Program, Carnegie Mellon University, July 13, 2012.

120. "Trustworthy Computing Research at CMU," CIA, Langley, VA, June 14, 2012.

121. "Trustworthy Computing Research at CMU," Office of Naval Research, Pittsburgh, PA, June 13, 2012.

122. "Computational Thinking," Cornell University, Ithaca, NY, May 17, 2012.

123. "Computational Thinking," University of Waterloo, Waterloo, Canada, May 1, 2012. **Distinguished Lecturer**.

124. "Computational Thinking," Boston University, inaugural celebration for the Hariri Institute for Computing and Computational Science and Engineering. April 21, 2012. **Invited Speaker**.

125. "Composition of Systems and Policies for Security," CMU-NSA Lablet Review, Pittsburgh, PA, via videoconference, April 17, 2012.

126. "Towards a Theory of Trust in Networks of Humans and Computers," Information Trust Institute, University of Illinois, Urbana-Champaign, IL, March 27, 2012. **Distinguished Lecturer**.

127. "Computational Thinking," University of Toronto, Toronto, Canada, February 7, 2012. **Distinguished Lecturer**.

128. "Computational Thinking," Hong Kong University, October 12, 2011.

129. "What's Hot in Computing?," Institute for Advanced Studies and College of Engineering, Hong Kong University of Science and Technology, October 12, 2011. **Distinguished Lecturer**.

130. "What's Hot in Computing?," Hong Kong University, October 11, 2011. **William Mong Distinguished Lecture**.

131. "Computational Thinking," Indiana University, Informatics and Computing Colloquium, Bloomington, IN, for September 9, 2011. **Distinguished Lecturer**.

132. "Masters-Level Cybersecurity Education at Carnegie Mellon," National Security Agency, Linthicum, MD, August 10, 2011.

133. "What's Hot in Computing?," Carnegie Mellon Volunteer Forum, CMU, Pittsburgh, PA, June 3, 2011.

134. "What's Hot in Computing?," CMU-Qatar Campus, Doha, Qatar, April 13, 2011.

135. "Computational Thinking," CMU-Qatar Campus, Doha, Qatar, April 12, 2011. **Distinguished Lecturer**.

136. "The Importance of Broader Impacts at NSF," University of California, Santa Barbara, CA, April 1, 2011.

137. "Computational Thinking," University of California, Santa Barbara, CA, April 1, 2011. **Distinguished Lecturer**.

138. "Computational Thinking," University of Alabama, Birmingham, AL, UAB ACM Distinguished Speaker, March 28, 2011. **Distinguished Speaker**.

139. "Computational Thinking," Chinese University of Hong Kong, February 14, 2011.

140. "Computational Thinking," Northwestern University, Evanston, IL, Dean's Distinguished Speakers Series, February 9, 2011. **Distinguished Speaker**.

141. "Computational Thinking," New York City College of Technology, New York, NY, February 4, 2011.

142. "Funding Opportunities and Funding Hints," Human-Computer Interaction Institute, Carnegie Mellon, Pittsburgh, PA, December 14, 2010.

143. "Computational Thinking in Education," Computer Science Education Week, Carnegie Mellon, Pittsburgh, PA, December 8, 2010.

144. "Computational Thinking (and Its Potential in Healthcare," Vanderbilt University, Nashville, TN, November 11, 2010.

145. "Computational Thinking," Rochester Institute of Technology, Rochester, NY, Dean's Lecture Series, November 5, 2010.

146. "Computational Thinking," IST Distinguished Lecture Series, Institute of Science and Technology, Vienna, Austria, September 27, 2010. **Distinguished Lecturer**.

147. "Computational Thinking," 40 Year Anniversary Event, University of Zurich, Zurich, Switzerland, September 24, 2010.

148. "Computational Thinking," Initiative in Innovative Computing Colloquium, Harvard University, Cambridge, MA, May 5, 2010. **Distinguished Lecturer**.

149. "Computational Thinking," University of North Carolina, Charlotte, NC, sponsored by CRA-W and Coalition to Diversify Computing, April 30, 2010. **Distinguished Lecturer**.

150. "Computational Thinking," Science, Technology, and Education in Pakistan (STEP) Lecture Series, Carnegie Mellon, April 23, 2010.

151. "Computational Thinking," Brown University, Providence, RI, April 19, 2010. **Distinguished Lecturer**.

152. "Computational Thinking," University of Puerto Rico Rio, San Juan, Puerto Rico, April 8, 2010.

153. "Computer and Information Science and Engineering," Texas Tech faculty and administrators, Arlington, VA, March 31, 2010.

154. "Frontiers in Research and Education in Computing: A View from the National Science Foundation," University of Louisiana, Lafayette, LA, March 18, 2010. **Distinguished Lecturer**.

155. "Computational Thinking and Thinking About Computing," Louisiana State University, Baton Rouge, LA, March 17, 2010. **Distinguished Lecturer**.

156. "Computational Thinking and Thinking About Computing," Heidelberg Institute for Theoretical Studies, Heidelberg, Germnany, March 8, 2010. **Distinguished Lecturer**.

157. "Frontiers in Research and Education in Computing: A View from the National Science Foundation," 20th Anniversary Celebration, University of California, Riverside, Riverside, CA, February 17, 2010.

158. "Confidentiality Policy Extraction," University of Wisconsin, Madison, WI, January 27, 2010. **Distinguished Lecturer**.

159. "Computational Thinking," University of Texas, Arlington, TX, January 20, 2010. **Distinguished Lecturer**.

160. "Unleashing Waves of Innovation," Federal Communications Commission, October 26, 2009.

161. "Computational Thinking and Thinking About Computing," Colorado State University, October 21, 2009. **Distinguished Lecturer**.

162. "Computational Thinking," St. Joseph's University, Philadelphia, PA, October 8, 2009.

163. "Frontiers in Research and Education in Computing: A View from the National Science Foundation," Microsoft Research Asia, Beijing, China, September 21, 2009.

164. "Computational Thinking and Thinking About Computing," Institute for Human and Machine Cognition, Pensacola, FL, September 2, 2009.

165. "Computational Thinking and Thinking About Computing," Yahoo! Research, Santa Clara, CA, July 29, 2009. **Distinguished Lecturer**.

166. "Cyber Physical Systems," Capitol Hill Luncheon for Senator Reid and Senator Rockefeller and staff, Hart Building, Washington, D.C., July 9, 2009.

167. "Frontiers in Research and Education in Computing: A View from the National Science Foundation," AT&T Laboratories, Floram Park, NJ, June 10, 2009. **Distinguished Speaker**.

168. "We Compute" Panel, Strategic Planning Government Forum, Arlington, VA, May 8, 2009

169. "Computational Thinking and Thinking About Computing," University of Michigan, April 15, 2009.

170. "Computational Thinking," Kent State, Kent, OH, April 1, 2009.

171. "Cyber-Physical Systems: Research Challenges," University of Texas, Austin, TX, March 26, 2009.

172. "Frontiers in Research and Education in Computing: A View from the National Science Foundation," University of Maryland, College Park, MD, March 12, 2009.

173. "Cyber-Physical Systems: Research Challenges," University of Illinois, Urbana-Champaign, IL, February 12, 2009.

174. "Frontiers in Research and Education in Computing: A View from the National Science Foundation," IBM Research, Hawthorne, NY, December 4, 2008.

175. "Supporting Basic Research at the National Science Foundation," Microsoft Asia 10th Anniversary Faculty Summit, Beijing, China, November 3, 2008. **Invited Speaker**.

176. "Network Science and Engineering Research Challenges," MIT Laboratory for Information and Decision Systems, Cambridge, MA, October 9, 2008.

177. "Computational Thinking: Two and a Half Years Later," Computational Thinking Seminar Series, Carnegie Mellon University, Pittsburgh, PA, September 26, 2008.

178. "Frontiers in Research and Education in Computing: A View from the National Science Foundation," Google Lab Seattle, Freemont, WA, July 29, 2008.

179. "eScience For All: Not If, But When," The Broader Impact of Science, Microsoft Faculty Summit, Redmond, WA, July 29, 2008. **Invited Panelist**.

180. "Computational Thinking and Thinking About Computing," Santa Fe Institute, Santa Fe, NM, July 11, 2008.

181. "Network Science and Engineering: Research Challenges," Stanford University, Palo Alto, CA, May 21, 2008.

182. "Computational Thinking and Thinking About Computing," University of Florida, Gainesville, Florida, April 17, 2008.

183. "Computational Thinking and Thinking About Computing," Villanova University, Villanova, Pennsylvania, Distinguished Lecture Series of the Delaware Valley, April 7, 2008. **Distinguished Lecturer**.

184. "Computational Thinking and Thinking About Computing," Eastern Michigan University, Ypsilanti, Michigan, April 2, 2008.

185. "Computational Thinking and Thinking About Computing," Georgia Tech, Atlanta, GA, March 28, 2008.

186. "Confidentiality Policy Extraction," Cornell University, Ithaca, New York, Gerald Salton Lecture, February 28, 2008.

187. "Computational Thinking and Thinking About Computing," Computer Science and Artificial Intelligence Laboratory, MIT, Cambridge, MA, November 30, 2007.

188. "Computational Thinking," William and Mary College, Williamsburg, Virginia, November 9, 2007. **Distinguished Speaker**.

189. "Computational Thinking," CS4HS Program, University of Washington, July 20, 2007. **Keynote Speaker**.

190. "Automatic Generation and Analysis of Attack Graphs," Tsinghua University, Beijing, China, June 5, 2007.

191. "Computational Thinking," Microsoft Research Asia, Beijing, China, June 4, 2007.

192. "Automatic Generation and Analysis of Attack Graphs," University of Utah, April 26, 2007. **Organick Memorial Lecture**.

193. "Computational Thinking," University of Utah, April 25, 2007. **Organick Memorial Lecture**.

194. "Automatic Generation and Analysis of Attack Graphs," SUNY Stony Brook, February 28, 2007. **Distinguished Lecture**.

195. "Automatic Generation and Analysis of Attack Graphs," University of Wisconsin-La Crosse, February 19, 2007. **Distinguished Lecture**.

196. "Computational Thinking," University of Wisconsin-La Crosse, February 19, 2007. **Distinguished Lecture**.

197. "Automatic Generation and Analysis of Attack Graphs," McGill University, January 19, 2007. **Distinguished Lecture**.

198. "Automatic Generation and Analysis of Attack Graphs," University of Illinois, Chicago, November 9, 2006. **Distinguished Lecture**.

199. "Automatic Generation and Analysis of Attack Graphs," Laboratory of Education and Research in Security Assured Information Systems (LERSAIS), University of Pittsburgh, September 22, 2006. **Distinguished Lecture**.

200. "Formal Methods" ProLogic, Fairmont, VA September 20, 2006.

201. "Computational Thinking," ProLogic, Fairmont, VA, September 20, 2006.

202. "Computational Thinking," Computer Science Pedagogy Colloquium, Carnegie Mellon University, September 19, 2006.

203. "Computational Thinking," CS4HS Program, Carnegie Mellon University, July 22, 2006. **Keynote Speaker**.

204. "Automatic Generation and Analysis of Attack Graphs," NSF TRUST Center, Women in Science and Engineering Program, UC Berkeley, July 10–11, 2006.

205. "Automatic Generation and Analysis of Attack Graphs," ETH, Zurich, June 12, 2006.

206. "Computational Thinking," DARPA Workshop on Computer Science Futures, Pittsburgh, PA, May 31, 2006.

207. "An Attack Surface Metric," CyLab Corporate Partners Meeting, Pittsburgh, PA, April 20, 2006.

208. "Automatic Generation and Analysis of Attack Graphs," Dartmouth College, April 10, 2006.

209. "Computational Thinking and CS@CMU," Hong Kong University of Science and Technology, November 5, 2005.

210. "Predictable Software," Shanghai Jiao Tong University, November 3, 2005.

211. "CS@CMU," Tsinghua University, October 28, 2005.

212. "CS@CMU," Chinese Academy of Sciences, October 28, 2005.

213. "CS@CMU," Beijing University, October 28, 2005.

214. "Predictable Software," Microsoft Asia, Beijing, China, October 27, 2005.

215. "Software Security," National Chiao Tung University, Hsinchu, Taiwan, June 7, 2005.

216. "Automatic Generation and Analysis of Attack Graphs," National Chiao Tung University, Hsinchu, Taiwan, June 6, 2005.

217. "Automatic Generation and Analysis of Attack Graphs," University of Minnesota, **Distinguished Lecture**, February 14, 2005.

218. "Automatic Generation and Analysis of Attack Graphs," University of Pennsylvania, **Distinguished Lecture**, November 23, 2004.

219. "Automatic Generation and Analysis of Attack Graphs," The Center for Education and Research in Information Assurance and Security (CERIAS) Seminar, Purdue University, September 28, 2004.

220. "Automatic Generation and Analysis of Attack Graphs," Carnegie Mellon Software Engineering Institute, June 3, 2004.

221. "Automatic Generation and Analysis of Attack Graphs," Florida International University, Miami, FL, April 23, 2004. **Distinguished Lecture**.

222. "Measuring Relative Attack Surfaces," Microsoft Research, Redmond, WA, August 21, 2003.

223. "Security Research," Microsoft Research, Redmond, WA, July 24, 2003.

224. "Work in Progress: A Model for Attack Surfaces," Microsoft Research, Redmond, WA, March 20, 2003.

225. "Vulnerability Analysis Using Attack Graphs," **Yamacraw Distinguished Speaker Series**, Savannah, GA, February 18, 2003.

226. "Vulnerability Analysis Using Attack Graphs," University of Washington, Seattle, WA, February 11, 2003.

227. "Vulnerability Analysis of Networks Using Attack Graphs," University of Illinois, Urbana-Champaign, IL, February 7, 2002.

228. "Formal Methods: Past, Present, and Future," University of Illinois, Urbana-Champaign, IL, February 7, 2002.

229. "Vulnerability Analysis of Networks Using Attack Graphs," Microsoft Research Labs, Redmond, WA, January 28, 2002.

230. "The Rare Glitch Project Overview," Honeywell Laboratories, Minneapolis, MN, December 3, 2001.

231. "School of Computer Science: Educational Programs," IT-Center, Dortmund, Germany, November 22, 2001.

232. "Survivability Analysis of Networked Systems," Cornell University, **Computer Research Associates– Women and Lucent Distinguished Lecturer Series**, Cornell University, October 4, 2001.

233. "Survivability Analysis of Networked Systems," Information and Communications University, Taejon, Korea, May 14, 2001.

234. "Survivability Analysis of Networked Systems," DARPA OASIS PI meeting, Norfolk, VA, February 14, 2001.

235. "Survivability Analysis of Distributed Systems," University of British Columbia, **Distinguished Lecture Series**, November 9, 2000.

236. "Reasoning About Security Protocols," National University of Singapore, August 2, 2000.

237. "Mobility and Security," National University of Singapore, August 2, 2000.

238. "Reasoning About Security Protocols," Cornell University, **Distinguished Lecture Series**, November 11, 1999.

239. "Reasoning About Security," University of Utah, **Distinguished Lecture Series**, November 4, 1999.

240. "Reasoning About Security Protocols," IBM Research Laboratories, Yorktown Heights, NY, June 28, 1999.

241. "Formal Methods: Past, Present, and Future," DePaul University, **Distinguished Lecture Series**, October 2, 1998.

242. "Formal Methods: Past, Present, and Future," University of Washington, **Distinguished Lecture Series**, February 19, 1998.

243. "A Story in the Practice of Formal Methods," Brown University, April 11, 1997.

244. "Formal Methods: Past, Present, and Future," Programming Systems Cultural Exchange Series, Carnegie Mellon, February 17, 1997.

245. "Formal Methods: Past, Present, and Future," University of Pennsylvania, **Distinguished Lecture Series**, January 28, 1997.

246. "Mathematics for Software Engineers," Harvard University, November 26, 1996.

247. "Using Belief to Reason About Cache Coherence in Distributed Systems," United Nations University, Institute of Information Sciences and Technology, December 27, 1995.

248. "A Behavioral Notion of Subtyping," United Nations University, Institute of Information Sciences and Technology, December 27, 1995.

249. "Using Belief to Reason About Cache Coherence in Distributed Systems," Princeton University, May 2, 1995.

250. "Using Belief to Reason About Cache Coherence in Distributed Systems," University of Maryland, March 27, 1995.

251. "Why Formal Methods?," University of Manitoba, Winnipeg, Canada, March 21, 1995.

252. "What is a Formal Method?," BNR/NT Design Forum, Bell-Northern Research Ltd., June 16, 1994.

253. "Larch," Williams College, Williamstown, MA, April 23, 1994.

254. "What is a Formal Method?," Williams College, Class of 60's Scholar Program, Williamstown, MA, April 22, 1994.

255. "Concurrent Multi-Threaded Transactions," University of Washington, January 21, 1994.

256. "Concurrent Multi-Threaded Transactions," Technical University of Delft, Delft, The Netherlands, September 20, 1993.

257. "Concurrent Multi-Threaded Transactions," ECRC, Munich, Germany, July 22, 1993.

258. "Larch," Queen's University, Kingston, Canada, April 2, 1993.

259. "Family Values: A Semantic Notion of Subtyping," Carnegie Mellon, POP Seminar Series, March 12, 1993.

260. "Specifications in Software Development," National Security Agency, NSASAB Panel on Formal Methods, Ft. George Meade, MD, February 10, 1993.

261. "What is a Formal Method?," National Security Agency, NSASAB Panel on Formal Methods, Ft. George Meade, MD, February 10, 1993.

262. "Avalon: Language Support for Reliable Distributed Systems," The Chinese University of Hong Kong, December 28, 1992.

263. "Larch," INRS/Bell Northern Research, Verdun, Canada, November 6, 1992.

264. "Persistence + Undoability = Transactions," University of Massachusetts, Amherst, MA, May 8, 1992.

265. "What is a Formal Method?," Winona State University, Winona, Minnesota, April 10, 1992.

266. "What is a Formal Method?," University of Wisconsin-La Crosse, La Crosse, Wisconsin, April 9, 1992.

267. "What is a Formal Method?," Carroll College, Waukesau, Wisconsin, April 9, 1992.

268. "Persistence + Undoability = Transactions," MIT Laboratory for Computer Science, Cambridge, MA, April 6, 1992.

269. "Unintrusive Ways to Integrate Formal Specifications in Practice," Motorola, Inc., Phoenix, Arizona, March 9, 1992.

270. "What is a Formal Method?," Motorola, Inc., Phoenix, Arizona, March 9, 1992.

271. "Avalon: Language Support for Reliable Distributed Systems," Hewlett-Packard Laboratories, Bristol, England, January 7, 1992.

272. "Unintrusive Ways to Integrate Formal Specifications in Practice," Concordia University, Montreal, Canada, November 28, 1991.

273. "Specifications as Search Keys," AT&T Bell Laboratories, Murray Hill, NJ, August 12, 1991.

274. "Specifications as Search Keys," DEC/Cambridge Research Lab., Cambridge, MA, March 21, 1991.

275. "Specifications as Search Keys," MIT Laboratory for Computer Science, Cambridge, MA, March 20, 1991.

276. "Specifying Avalon Objects in Larch," Michigan State University, East Lansing, MI, January 29, 1991.

277. "Avalon: Language Support for Reliable Distributed Systems," University of Illinois, Urbana-Champaign, IL, January 28, 1991.

278. "Avalon: Language Support for Reliable Distributed Systems," University of California at Santa Barbara, Santa Barbara, CA, December 7, 1990.

279. "Avalon: Language Support for Reliable Distributed Systems," Cornell University, Ithaca, NY, November 8, 1990.

280. "Avalon: Language Support for Reliable Distributed Systems," Academia Sinica, Taipei, Taiwan, August 1, 1990.

281. "What is a Formal Method?," Academia Sinica, Taipei, Taiwan, August 1, 1990.

282. "Verifying Atomic Data Types," Technion University, Israel, April 6, 1990.

283. "What is a Formal Method?," Information Networking Institute, Pittsburgh, PA, January 29, 1990.

284. "Specifying and Verifying Abstract Data Types," Information Networking Institute, Pittsburgh, PA, January 29, 1990.

285. "What is a Formal Method?," Argonne National Laboratories, Chicago, IL, November 16, 1989.

286. "Formal Specifications in Software Engineering," National Computer Security Center, Baltimore, MD, October 19, 1989.

287. "What is a Formal Method?," Army Science Board Committee on Software in the Army, SEI, Pittsburgh, PA, October 13, 1989.

288. "Avalon: Language Support for Reliable Distributed Systems," IBM Research Laboratories, Yorktown Heights, NY, August 14, 1989.

289. "Avalon: Language Support for Reliable Distributed Systems," University of Tunis, Tunisia, May 26, 1989.

290. "Specifying Avalon Objects in Larch," MIT Laboratory for Computer Science, Cambridge, MA, April 25, 1989.

291. "Beyond Rewrite Rule Engines: Affirm, Reve, Larch Prover," Carnegie Mellon University, Pittsburgh, PA, October 25, 1988.

292. "Avalon: Language Support for Reliable Distributed Systems," University of Science and Technology of China, Hefei, China, May 21, 1988.

293. "The Larch Family of Specification Languages," University of Science and Technology of China, Hefei, China, May 21, 1988.

294. "Avalon: Language Support for Reliable Distributed Systems," East-China Research Institute of Computer Technology, Shanghai, China, May 18, 1988.

295. "Axioms for Concurrent Objects," Shanghai Jiao Tong University, Shanghai, China, May 17, 1988.

296. "The Larch Family of Specification Languages," Shanghai Jiao Tong University, Shanghai, China, May 16, 1988.

297. "The Larch Family of Specification Languages," Northwestern University, Xi'an, China, May 13, 1988.

298. "Specifying and Verifying Abstract Data Types," Northwestern University, Xi'an, China, May 13, 1988.

299. "Specifying Graceful Degradation in Distributed Systems," Institute of Software, Academia Sinica, Beijing, China, May 10, 1988.

300. "Avalon: Language Support for Reliable Distributed Systems," Institute of Software, Academia Sinica, Beijing, China, May 9, 1988.

301. "Specifying and Verifying Abstract Data Types," Tsinghua University, Beijing, China, May 6, 1988.

302. "Specifying and Verifying Abstract Data Types," Information Technology Institute, Beijing, China, May 5, 1988.

303. "Axioms for Concurrent Objects," Institute of Software, Academia Sinica, Beijing, China, May 5, 1988.

304. "The Larch Family of Specification Languages," Institute of Software, Academia Sinica, Beijing, China, May 4, 1988.

305. "Specifying and Verifying Abstract Data Types," Institute of Software, Academia Sinica, Beijing, China, May 3, 1988.

306. "Avalon: Language Support for Reliable Distributed Systems," Center for Dependable Systems, CMU, Pittsburgh, PA, March 23, 1988.

307. "Formal Specifications of Concurrent and Distributed Systems," National Computer Security Center, Ft. George G. Meade, MD, March 16, 1988.

308. "Miro: A Visual Approach to Specifying Security," National Computer Security Center, Ft. George G. Meade, MD, February 23, 1988.

309. "The Larch Family of Specification Languages," Tektronix, Beaverton, OR, October 30, 1987.

310. "Avalon: Language Support for Reliable Distributed Systems," Oregon Graduate Center, Beaverton, OR, October 29, 1987.

311. "The Larch Family of Specification Languages," Software Engineering Institute, Pittsburgh, PA, April 24, 1987.

312. "Axioms for Concurrent Objects," University of Texas, Austin, TX, March 27, 1987.

313. "Axioms for Concurrent Objects," MCC, Austin, TX, March 26, 1987.

314. "A Larch Specification of the Library Example," UNISYS, Los Angeles, CA, April 6, 1987,

315. "Axioms for Concurrent Objects," AT&T Bell Laboratories, Murray Hill, NJ, November 14, 1986.

316. "Axioms for Concurrent Objects," MIT Laboratory for Computer Science, Cambridge, MA, October 14, 1986.

317. "Formal Specifications in Software Engineering," Carnegie Mellon University, Pittsburgh, PA, October 3, 1985.

318. "The Larch Family of Specification Languages," Stanford Research Institute, Menlo Park, CA, April 8, 1986.

319. "Adding Temporal Logic to a Formal Specification Language," Carnegie Mellon University, Pittsburgh, PA, March 22, 1985.

320. "Adding Temporal Logic to a Formal Specification Language," University of California at Berkeley, Berkeley, CA, March 7, 1985.

321. "Practical Problems with Writing Specifications," Imperial College, London, England, October 26, 1984.

322. "Developing Program Specifications Following a Two-Tiered Approach," University of Saarbrucken, Saarbrucken, West Germany, June 1, 1984.

323. "Developing Program Specifications Following a Two-Tiered Approach," University of California at Santa Barbara, Santa Barbara, CA, May 14, 1984.

324. "Developing Program Specifications Following a Two-Tiered Approach," UCLA, Los Angeles, CA, May 10, 1984.

325. "A Two-Tiered Approach to Specifying Programs," System Development Corporation, Santa Monica, CA, April 20, 1984.

326. "A Two-Tiered Approach to Specifying Programs," IBM Research Laboratory, San Jose, CA, March 23, 1984.

327. "A Two-Tiered Approach to Specifying Programs," USC Institute for Information Sciences, Marina del Rey, CA, February 17, 1984.

328. "Design and Analysis of Computer Algorithms," Institute of Southwestern China, Canton, China, June 1979.

329. "Design and Implementation of Programming Languages," Institute of Southwestern China, Canton, China, June 1979.

Conference and Workshop Talks

1. "Trustworthy AI," IEEE Trust, Privacy and Security in Intelligent Systems, and Application, Washington, DC, scheduled for October 28, 2024. **Keynote Speaker**.

2. "Career Highlights Through a Formal Methods Lens," Formal Methods Europe, Milan, Italy, scheduled for September 12, 2024. **Invited Speaker**.

3. "AI and Sciencem,"Science in the Age of AI, National Academy of Sciences and British Royal Society, London, UK, June 11, 2024. **Invited Speaker**.

4. "AI and Science," AI and Scientific Discovery, National Academy of Science, NAS Annual Meeting, Washington DC, April 27, 2024. **Invited Speaker and Panel Moderator**.

5. "Trustworthy AI," Future Science Prize Symposium, Hong Kong, virtual talk, October 14, 2023. **Keynote Speaker**.

6. "Trustworthy AI," Formal Methods 2023, Lubeck, Germany, virtual talk, March 9, 2023. **Luminary Speaker**.

7. "Trustworthy AI," International AI Cooperation and Governance Forum 2022, hosted by Tsinghua University and the UN Development Programme, Beijing, virtual talk, December 9–10, 2022. **Keynote Speaker**.

8. "Trustworthy AI," K1st World, Stanford, CA, Palo Alto, CA, virtual talk, November 17, 2022.

9. "Trustworthy AI," World AI Conference, Shanghai, China, virtual talk, September 1, 2022. **Keynote Speaker**.

10. "Trustworthy AI," AI Governance (Trustworthy AI) Workshop, Industrial Technology Research Institute, Taiwan, virtual event, August 1, 2022. **Keynote Speaker**.

11. "Trustworthy AI," Open Data Science Conference East, virtual event, April 20, 2022. **Keynote Speaker**.

12. "Trustworthy AI," Hot Science of Security, virtual event, April 6, 2022. **Keynote Speaker**.

13. "Trustworthy AI," Cloud Security Alliance Global China Region, December 19, 2021, Shanghai, China, virtual event. **Distinguished Speaker**.

14. "Trustworthy AI," 24th Brazilian Symposium on Formal Methods, December 10, 2021, virtual event. **Keynote Speaker**.

15. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering and Technology (MMLDT-CSET), September 27, 2021, virtual event. **Keynote Speaker**.

16. "Trustworthy AI," Responsible Machine Learning, Women in Data Science and Institute for Advanced Analytics, North Carolina State University, June 4, 2021. **Keynote Speaker**.

17. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," International Conference on Software Engineering, May 27, 2021. **Keynote Speaker**.

18. "Trustworthy AI," Machine Learning and Systems (MLSys) 2021, April 7, 2021. **Keynote Speaker**.

19. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," TTI/Vanguard, March 23, 2021. **Keynote Speaker**.

20. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," IEEE BigData 2020, December 11, 2020. **Keynote Speaker**.

21. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," Open Data Science Conference West, October 29, 2020. **Invited Speaker**.

22. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," Novartis Data Science Conference, October 29, 2020. **Keynote Speaker**.

23. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society,", ACM International Conference on AI and Finance, New York, NY, October 15, 2020. **Keynote Speaker**.

24. "Trustworthy AI," Responsible Machine Learning Summit, University of California, Santa Barbara, October 9, 2020. **Keynote Speaker**.

25. "Computational Thinking," Computational Thinking in School Conference, ACM India, October 2, 2020. **Keynote Speaker**.

26. "Trustworthy AI," 20th High Confidence Software and Systems Conference, September 15, 2020. **Keynote Speaker**.

27. "Ten Research Challenges in Data Science," Women in Data Science NYC, New York, NY, August 11, 2020. **Keynote Speaker**.

28. "Trustworthy AI," 50th IEEE/IFIP International Conference on Dependable Systems and Networks (DSN) 2020, June 30, 2020. **Keynote Speaker**.

29. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," Beijing Academy of AI Conference, June 20, 2020. **Keynote Speaker**.

30. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," 2020 Symposium on Statistics and Data Science, Pittsburgh, PA, June 5, 2020. **Keynote Speaker**.

31. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," Forging Connections Between Machine Learning, Data Science and Power Systems Research, NSF, Alexandria, VA, March 6, 2020. **Keynote Speaker**.

32. "Data Science Meets Open Science," Open Science Day, EPFL 50th Anniversary, Lausanne, Switzerland, October 18, 2019.

33. "Trustworthy AI: New Properties for New Complex Systems," Formal Methods at Scale, National Science and Technology Council's Special Cyber Operations Research and Engineering Subcommittee (NSTC SCORE), Rosslyn, VA, September 25, 2019.

34. "Data for Good: Data Science at Columbia," 40th IEEE Sarnoff Symposium, Newark, NJ, September 23, 2019.

35. "Privacy-Preserving Technologies Meet Machine Learning," TTI/Vanguard, Washington, DC, September 12, 2019.

36. "Data for Good: Ensuring the Responsible Use of Data to Benefit Society," 21st Century Computing Conference, Shanghai, China, August 30, 2019. **Keynote Speaker**.

37. "Ten Research Challenges in Data Science," World Artificial Intelligence Conference, Shanghai, China, August 29, 2019. **Invited Speaker**.

38. "How Data Science Empowers Business Decisions," iPinYou AI Conference, Shanghai, China, August 28, 2019. **Invited Speaker**.

39. "Foundations of Data Science: Privacy-Preserving Technologies," Joint Statistical Meeting, Denver, CO, August 1, 2019.

40. "Data for Good," ACM Federated Computing Research Conference, Phoenix, AZ, June 27, 2019. **Keynote Speaker**.

41. "Data for Good: Data Science at Columbia University," Future Forum Shenzhen Symposium, Shenzhen, China, May 25, 2019.

42. "Data for Good: Scary AI and the Dangers of Big Data," Conference on Social Justice and Emerging Technologies, CUNY School of Law, Long Island City, NY, April 12, 2019.

43. "Data for Good: Scary AI and the Dangers of Big Data," Technology, Disruption, and Social Innovation, China Institute Executive Summit, New York, NY, April 11, 2019. **Invited Speaker**.

44. "Data for Good: Data Science at Columbia," Women in Data Science, Hudson Yards, NY, March 14, 2019. **Keynote Speaker**.

45. "Data for Good: Data Science at Columbia," 2019 Internet2 Global Summit, Washington DC, March 6, 2019. **Keynote Speaker**.

46. "Influence of Computational Thinking on Education," Future of Computing Education Workshop, MIT, Cambridge, MA, February 27, 2019. **Invited Speaker**.

47. "Data for Good: Why Big Data Changes Everything," Goldman Sachs Quantinomics, New York, NY, September 13, 2018.

48. "Data for Good," 24th ACM International Conference on Knowledge Discovery and Data Mining (KDD), London, UK, August 21, 2018. **Keynote Speaker**.

49. "Data Science at Columbia and for Space Science," Dawn of Private Space Science Symposium, Columbia University, New York, NY, June 3, 2018.

50. "Data for Good: Data Science at Columbia," Annual Meeting of the Brazilian National Academy of Sciences, Rio de Janeiro, Brazil, May 9, 2018. **Keynote Speaker**.

51. "Data for Good: Scary AI and the Dangers of Big Data," Startup Columbia Festival, Columbia University, New York, NY, April 6, 2018. **Keynote Speaker**.

52. "Data Science at Columbia," Global Population Research Center Mini-Conference, Columbia University, New York, NY, March 30, 2018.

53. "Data Science at Columbia: Data for Good," Workshop on Accountable Decision Systems, Cornell Tech, New York, NY, February 22, 2018.

54. "Data for Good," NYC Data Science Series, Cornell Tech, New York, NY, February 20, 2018.

55. "Academic Cloud," NSF Workshop on Enabling Computer and Information Science and Engineering Research and Education in the Cloud, Alexandria, VA, January 8, 2018.

56. "Research Careers in Academia, Industry, and Beyond," 3rd Annual Advancing Computer Science Careers through Enhanced Networking and Training (ASCENT), Columbia University, New York, NY, December 15, 2017.

57. "New Threats, New Targets, and New Opportunities," Israeli Cyber Forum, Crytography Panel, Columbia University, New York, NY, October 18, 2017.

58. "Computational Thinking," Trippel Helix Conference on Computational Thinking and Digital Competences in Primary and Secondary Education, Stockholm, Sweden, September 8, 2017.

59. "Research at Microsoft: Beyond the Horizon," CXO Summit, Redmond, WA, March 29, 2017.

60. "Embracing Uncertainty," ACM SIGCSE 2017, Seattle, WA, March 9, 2017. **Keynote Speaker**.

61. "Computational Thinking," Computational Thinking for All, University of Tokyo, Tokyo, Japan, February 27, 2017. **Keynote Speaker**.

62. "Research at Microsoft: Beyond the Horizon," Academic Reserach Summit, Bangalore, India, January 25, 2017.

63. "Crashing Drones and Hijacked Cameras: CyberPhysical Meets CyberTrust," ACM India Annual Event, Kolkata, India, January 21, 2017.

64. "Diversity and Inclusion at Microsoft Research," Codess Houston, Grace Hopper Conference, Houston, TX, October 19, 2016.

65. "Crashing Drones and Hijacked Cameras: CyberPhysical Meets CyberTrust," System-on-a-Chip Conference, Seattle, WA, September 7, 2016. **Keynote Speaker**.

66. "Inverse Privacy," MyData 2016 Academic Workshop: Making Sense of the Value of Personal Data, Helsinki, Finland, August 31, 2016.

67. "Crashing Drones and Hijacked Cameras: CyberPhysical Meets CyberTrust," 25th USENIX Security Symposium, Austin, TX, August 10, 2016. **Keynote Speaker**.

68. "Safe Cyber-Physical Systems That You Can Bet Your Life On," Safe Artificial Intelligence, sponsored by Office of Science and Technology Policy and Carnegie Mellon, Pittsburgh, PA, June 28, 2016. **Invited Panelist**.

69. "Crashing Drones and Hijacked Cameras: CyberPhysical Meets CyberTrust," iNNOVEX2016, Airport City, Israel, February 3, 2016. **Keynote Speaker**.

70. "Computational Thinking," Microsoft Research India Academic Research Summit, Pune, India, January 29, 2016.

71. "Crashing Drones and Hijacked Cameras: CyberPhysical Meets CyberTrust," Annual Computer Security Applications Conference (ACSAC '31), Los Angeles, CA, December 9, 2015. **Invited Essayist Keynote**.

72. "Crashing Drones and Hijacked Cameras: Safety and Security in IoT," Nonlinear Conference, Alchemist, Mountain View, CA, November 6, 2015. **Keynote Speaker**.

73. "Computational Thinking," Computational Thinking Forum, Yongsei University Seoul, Korea, October 8, 2015.

74. "Computational Thinking," 23rd IFIP World Computer Congress (WCC 2015), Daejeon, Korea, October 7, 2015. **Plenary Speaker**.

75. "Cyber-Physical Systems," Post-CPS Week Workshop, Microsoft Research, Redmond, WA, April 17, 2015.

76. "Privacy Principles, Properties, and Mechanisms," CCC Privacy by Design Workshop, Berkeley, CA, February 5, 2015.

77. "Computational Thinking," TechVista 2015, Bangalore, India, January 23, 2015. **Keynote Speaker**.

78. "Computational Thinking," Advanced Research and Technology Symposium, MIT Lincoln Laboratory, Cambridge, MA, December 2, 2014. **Keynote Speaker**.

79. "Joys of Academia, Government, and Industry," 2014 Rising Stars in EECS Workshop, University of California, Berkeley, CA, November 3, 2014. **Keynote Speaker**.

80. "Computational Thinking in the Sciences and Beyond," 11th Asian Faculty Summit, Beijing, China, October 30, 2014. **Distinguished Speaker**.

81. "Cyber-Physical Systems," 4th CyberLinx Series, National Security Agency, Ft. Meade, MD, October 24, 2014. **Invited Speaker**.

82. "Formal Methods: An Industrial Perspetive," 14th International Conference on Runtime Verification, Toronto, Canada, September 23, 2014. **Keynote Speaker**.

83. "Software Engineering Research Opportunities," Round Table with CTO/CXO on Emerging Software Engineering Challenges, 36th International Conference in Software Engineering, Hyderabad, India, June 6, 2014. **Keynote Speaker**.

84. "The Impact of Computer Science Research on Science, Technology, and Society," MSR-INRIA Joint Centre Scientific Event, Palaiseau, France, May 19, 2014. **Keynote Speaker**.

85. "The Impact of Computer Science Research on Science, Technology, and Society," TechVista, Jaipur, India, January 24, 2014. **Keynote Speaker**.

86. "What's Hot in Computing," LeadersLab Workshop, Price Waterhouse Coopers, December 10, 2013.

87. "Formal Methods: An Industrial Perspetive," High-Integrity Language Technologies, Pittsburgh, PA, November 14, 2013. **Keynote Speaker**.

88. "Computational Thinking," 9th University Course Forum of Computer Science, Chongqing, China, November 2, 2013. **Keynote Speaker**.

89. "The Impact of Computer Science Research on Science, Technology, and Society," 21st Century Computing Conference, Hefei China, November 1, 2013. **Keynote Speaker**.

90. "A Framework for Privacy Research," 4th Annual Microsoft Privacy Workshop, Redmond, WA, October 23, 2013. **Keynote Speaker**.

91. "Formal Methods: An Industrial Perspective," Computer-Aided Verification (CAV) 2013, St. Petersburg, Russia, July 19, 2013, **Keynote Speaker**.

92. "Microsoft Research Impact on Science, Technology, and Society," Microsoft Faculty Summit, Redmond, WA, July 16, 2013. **Keynote Speaker**.

93. "Computational Thinking," Fifth Israeli Presidential Conference, Jerusalem, Israel, Master Class, June 20, 2013 **Invited Speaker**.

94. "Towards a Theory of Trust in Networks of Humans and Computers," The GREPSEC Workshop, women and underrepresented groups in security, San Francisco, CA, May 18, 2013, **Invited Speaker**.

95. "Creating New Initiatives: The NSF Perspective," Interacting with Agencies/Creating New Initiatives Session, Leadership in Science Policy Institute, Computing Community Consortium, Washington, DC, April 11, 2013. **Invited Speaker**.

96. "A Day in Your Life," How Fundamental Computing Research Touches Everyday Lives, American Association for the Advancement of Science (AAAS) Annual Meeting, Boston, MA, February 16, 2013.

97. "Trust in Networks of Humans and Computers." pecha kucha, Cybersecurity IdeasLab, World Economic Forum, Davos, Switzerland, January 26, 2013.

98. "Towards a Theory of Trust," 21st Century Computing Conference, Tianjin, China, **Distinguished Speaker**. October 25, 2012.

99. "Computational Thinking," CPATH Symposium, Folsom Lake College, Folsom, CA, via videoconference, **Keynote Speaker**. September 28, 2012.

100. "Computational Thinking: It's For Everyone," pecha kucha, CMU IdeasLab, The Annual Meeting of the New Champions 2012 World Economic Forum, Summer Davos, Tianjin, China, September 12, 2012.

101. "Cyber-Physical Meets CyberTrust," International Symposium for Resilient Control Systems, Salt Lake City, UT, **Keynote Speaker**, August 15, 2012.

102. "Towards a Theory of Trust in Networks of Humans and Computers," Workshop on Semantic Computing and Security, Oakland, CA, **Keynote Speaker**, May 24, 2012.

103. "Computational Thinking," General Electric Asian-Pacific American Forum, Washington, DC, April 30, 2012. **Invited Speaker**.

104. "Career Advice," Planning Your Research Career session, CRA Career Mentoring Workshop, Washington, DC, February 27, 2012. **Invited Speaker**.

105. "A Day in Your Life," NITRD 20th Anniversary Symposium, Washington, DC, February 16, 2012. **Invited Speaker**.

106. "What's Hot in Computing?," TEDx, Leadership Pittsburgh, Nemacolin, PA, November 19, 2011.

107. "Creating New Initiatives: The NSF Perspective," Interacting with Agencies/Creating New Initiatives Session, Leadership in Science Policy Institute, Computing Community Consortium, Washington, DC, November 7, 2011. **Invited Speaker**.

108. "What's Hot in Computing?," SBAC-PAD 2011: The 23rd International Symposium on Computer Architecture and High Performance Computing, Vitoria, Brazil, October 26, 2011. **Keynote Speaker**.

109. "Computational Thinking," IEEE Symposium on Visual Languages, Pittsburgh, PA, September 20, 2011. **Keynote Speaker**.

110. "Tips for the Job Search Process," The Job Search Process (pre-PhD), CRA-W Career Mentoring Workshop, San Jose, CA, June 4, 2011.

111. "Computational Thinking," Opportunities for Undergraduate Research in Computer Science (OurCS) Workshop, Carnegie Mellon University, Pittsburgh, PA, March 4, 2011. **Keynote Speaker**.

112. "Crowds and Clouds," American Association for the Advancement of Science (AAAS) Annual Meeting, Panel Session on Cloud Computing, Washington, DC, February 18, 2011.

113. "Computational Thinking," Merging Knowledge, celebration of 5th anniversary of Centre for Computational and Systems Biology, Microsoft Research and University of Trento, Trento, Italy, December 2, 2010. **Invited Speaker**.

114. "Usable Verification: Balancing Thinking and Automating," Usable Verification Workshop, Redmond, WA, November 15, 2010.

115. "Computational Thinking," Systems Thinking in Public Health, University of Pittsburgh, October 6, 2010.

116. "Computational Thinking's Role in CyberLearning," Open Community Meeting, NSF Task Force on Cyberlearning and Workforce Development, Arlington, VA, September 22, 2010. Participation via videoconference. **Invited Panelist**.

117. "Peer Review in Computing," Plenary Session Panel, Computing Research Associates Conference, Snowbird, UT, July 19, 2010. **Invited Panelist**.

118. "Frontiers of Computing: A View from the National Science Foundation," Tsinghua Vision 2020, Tsinghua University, Beijing, China, July 12, 2010. **Invited Speaker**

119. "Trends in Science and Engineering: A View from the National Science Foundation," The Third US-China Computer Science Leadership Summit, Peking University, Beijing, China, June 14–15, 2010.

120. "Cyber-Physical Systems," New Programming Paradigms for Cyber-Physical Systems, Fujitsu Labs, Mountain View, CA, June 10, 2010. **Keynote Speaker**

121. "Toward a US Cybersecurity R&D Agenda," US Cybersecurity R&D, Oakland, CA, May 19, 2010.

122. "Frontiers of Computing: A View from the National Science Foundation," UAE Forum in Information and Communication Technology Research 2010 (ICTRF2010), Khalifa University, Abu Dhabi, UAE, May 9, 2010. **Keynote Speaker**

123. "Crowds and Clouds," The Crowd and The Cloud: Innovation and Collaboration, Georgetown University, Washington, DC, April 20, 2010. **Keynote Speaker**

124. "Computational Thinking," NSF CPATH PI Meeting, Arlington, VA, March 25, 2010. **Keynote Speaker**

125. "Cyber-Physical Systems," Inter-Agency Workshop on Cyber-Physical Systems, Alexandria, VA March 11, 2010.

126. "Computational Thinking in K-12," NSF CPATH Research Experiences for Teachers, Arlington, VA, March 4, 2010. **Keynote Speaker**

127. "Computational Thinking," 2010 EDUCAUSE Learning Initiative Annual Meeting on New Learning Environments for a Web 2.0 World, Austin, Texas, January 21, 2010. **Keynote Speaker**.

128. "Formal Methods for Privacy," Formal Methods 2009, Eindhoven, The Netherlands, November 4, 2009. **Keynote Speaker**.

129. "Frontiers in Research and Education in Computing: A View from the National Science Foundation," OOPSLA 2009, October 28, 2009, Orlando, FL. **Keynote Speaker**.

130. "Innovation in Information Technology," Accelerating Energy Innovation: Lessons from Multiple Sectors, National Bureau of Economic Research, Washington, D.C., October 23, 2009. **Invited Panelist**.

131. "Computational Thinking and Thinking About Computing," China Computer Science Vision 2020, Tsinghua University, Beijing, China, October 14, 2009. **Invited Speaker**

132. "Frontiers in Research and Education in Computing: A View from the National Science Foundation," ACM International Conference on Mobile Computing and Networking, September 22, 2009. **Keynote Speaker**.

133. "Frontiers in Research and Education in Computing: A View from the National Science Foundation," 46th Design Automation Conference, San Francisco, CA, July 28, 2009. **Invited Speaker**

134. "Cyber-Physical Systems: NSF Perspective," Cyber-Physical Systems Security, Newark, NJ, July 22, 2009. Sponsored by US Department of Homeland Security. **Invited Speaker**

135. "Computational Thinking," SIG Computing Teachers Breakfast Forum, National Education Computing Conference, June 29, 2009. **Invited Speaker**

136. "Computational Thinking," Enseignement de TICs dans les Grandes Ecoles de Paris Tech, Paris, France, June 24, 2009. **Invited Speaker**

137. "Research Challenges for the ICT Community," Roundtable on Building a Green Future: Clean Innovation, Investments, and Jobs, OECD Workshop on ICTs, The Environment and Climate Change, Helsingor, Denmark, May 27, 2009. **Invited Panelist**

138. "Computational Thinking and Thinking About Computing," TTI/Vanguard Conference, Washington, DC, May 7, 2009. **Invited Speaker**

139. "Computational Thinking and Thinking About Computing," Consortium for Computing Sciences in Colleges, Northeast Division, Plattsburgh, NY, April 25, 2009. **Invited Speaker**.

140. "Frontiers in Research and Education in Computing: A View from the National Science Foundation," IEEE Wireless Telecommunications Symposium, Prague, CZ, April 22, 2009. **Invited Speaker**.

141. "Computational Thinking and Thinking About Computing," Future and Emerging Technologies Conference, Prague, CZ, April 22, 2009. **Invited Speaker**.

142. "Multidisciplinary Research at NSF," Panel on Multidisciplinary Research in ICT, Future and Emerging Technologies Conference, Prague, CZ, April 21, 2009. **Invited Panelist**.

143. "Computational Thinking," Computational Thinking for Everyone Workshop, National Academies, February 19, 2009, Washington, DC. **Invited Panelist**.

144. "Computational Thinking," American Association for the Advancement of Science (AAAS) Annual Meeting, Chicago, IL, February 15, 2009. **Invited Speaker**.

145. "Cyber-Physical Systems," NSF Informational Workshop on Cyber-Physical Systems, December 15, 2008.

146. "Computational Thinking," Science in Society: Dialogues and Scientific Responsibility, Workshop on Information and Communications Technology, Paris, France, November 25, 2008. **Invited Speaker**

147. "Computer Science Outside the Box," Computer Science Outside the Box Workshop, co-sponsored by NSF, CRA, CCC, November 10, 2008.

148. "Computational Thinking," Geographic Information Science, Park City, UT, September 24, 2008. **Invited Speaker**.

149. "Network Science and Engineering," NSF Informational Workshop on Network Science and Engineering, September 5, 2008.

150. "A View from DC," Computing Research Associates Conference, Snowbird, UT, July 15, 2008. **Invited Speaker**.

151. "Cyber-Physical Systems Research Challenges," ACM Third International Workshop on Feedback Control Implementation and Design in Computing Systems and Networks, Annapolis, MD, June 6, 2008. **Keynote Speaker**.

152. "Computational Thinking and Thinking About Computing," SIGMETRICS, Annapolis, MD, June 5, 2008. **Keynote Speaker**.

153. "Cyber Security Research Challenges," Cybersecurity Summit 2008, Arlington, VA, May 8, 2008.

154. "Cyber-Physical Systems Research Challenges," Cyber-Physical Systems Summit, St. Louis, Missouri, April 24, 2008. **Keynote Speaker**.

155. "Cyber-Physical Systems Research Challenges," CPSWEEK 2008, St. Louis, Missouri, April 24, 2008. **Invited Speaker**.

156. "Computational Thinking and Thinking About Computing," 22nd IEEE International Conference Parallel and Distributed Processing Symposium, Miami, Florida, April 16, 2008. **Banquet Speaker**.

157. "Cyber-Physical Systems Research Challenges," National Workshop on High-Confidence Automotive Cyber-Physical Systems, Troy, Michigan, April 3, 2008.

158. "Computational Thinking and Thinking About Computing," 46th Annual ACM Southeast Conference, Auburn, Alabama, March 28, 2008. **Invited Speaker**.

159. "Data-Intensive Computing at NSF," Data-Intensive Computing Symposium, Mountain View, CA, March 26, 2008. **Invited Speaker**.

160. "Computational Thinking and Thinking About Computing," Grand Challenges in Computing (United Kingdom) 2008, London, England, March 19, 2008. **Keynote Speaker**.

161. "Computational Thinking and Thinking About Computing" From Computers to Ubiquitous Computing, by 2020, Royal Society of London, London, England, March 17, 2008. **Invited Speaker**.

162. "Network Science and Engineering," GENI Engineering Conference, Arlington, VA, March 3, 2008. **Keynote Speaker**.

163. "Computational Thinking and Thinking About Computing," Biotechnology Symposium, California State University, Oakland, California, January 11, 2008. **Invited Speaker**.

164. "Research Needs and NSF/CISE Perspective," Software for Dependable Systems: Sufficient Evidence? Symposium, National Academies, Washington, D.C., October 23, 2007. **Invited Panelist**.

165. "Looking Ahead for Computing and at NSF," Informatics Europe, Berlin, Germany, October 8, 2007. **Keynote Speaker**.

166. "Computational Thinking," OurCS, Carnegie Mellon, Pittsburgh, PA, October 5, 2007. **Keynote Speaker**.

167. "Privacy Research Ideas," Data Confidentiality Research Workshop, Arlington, Virginia, September 5, 2007.

168. "Computer Science Meets Science and Engineering," High-End Computing File System and I/O Workshop, Arlington, Virginia, August 6, 2007.

169. "Formal Methods for Software Systems," High Confidence Real-Time Operating Systems, Arlington, Virginia, July 9, 2007. **Keynote Speaker**.

170. "Software Security," First IEEE and IFIP International Symposium on Theoretical Aspects of Software Engineering (TASE 2007), June 7, 2007, Shanghai, China. **Keynote Speaker**.

171. "Computational Thinking," SIGCSE 2007, Special Session on Computational Thinking, Covington, Kentucky, March 8, 2007.

172. "Computational Thinking and CS@CMU," TechVista 2007, Microsoft India, Bangalore, India, January 23, 2007. **Keynote Speaker**.

173. "An Attack Surface Metric," 10th IASTED International Conference on Software Engineering and Applications, Dallas, Texas, November 13, 2006. **Keynote Speaker**.

174. "Software Assurance," Executive Women's Forum, Phoenix, AZ, September 14, 2006. **Invited Panelist**.

175. "Attack Graph Generation and Analysis," ACM Symposium on Information, Computer, and Communications Security, Taipei, Taiwan, March 22, 2006. **Invited Speaker**.

176. "Strong Girls, Strong Women," Making the Connection Breakfast, March 1, 2006, Carnegie Mellon, Pittsburgh, PA, **Keynote Speaker**.

177. "The View from Carnegie Mellon: What We Did and What We're Doing," National Center for Women and Information Technology (NCWIT) Leadership Team and Alliance Meeting, Pittsburgh, PA, November 17, 2005. **Keynote Speaker**.

178. "Predictable Software," Computing in the 21st Century Conference, Hong Kong, November 5, 2005. **Invited Speaker**.

179. "Predictable Software," Computing in the 21st Century Conference, Hangzhou, China, November 1, 2005. **Invited Speaker**.

180. "Computational Thinking and CS@CMU," Microsoft Research Asia Faculty Summit, Hangzhou, China, October 31, 2005. **Invited Speaker**.

181. "Towards an Algebra for Security Policies," 26th International Conference on Applications and Theory of Petri Nets, Miami, FL, June 23, 2005. **Distinguished Speaker**.

182. "Automatic Generation and Analysis of Attack Graphs,", 11th Information Security Conference, Kaohsiung, Taiwan, June 9, 2005. **Keynote Speaker**.

183. "Automatic Generation and Analysis of Attack Graphs," NATO ARW Verification of Infinite State Systems with Applications to Security (VISSAS) 2005, Timisoara, Romania, March 21, 2005. **Invited Speaker**.

184. "Measuring Relative Attack Surfaces," Workshop on Advanced Developments in Software and Systems Security, Taipei, December 7, 2003.

185. "Vulnerability Analysis Using Attack Graphs," Microsoft Academic Conference Germany 2003, Dresden, Germany, November 12, 2003. **Invited Speaker**.

186. "Vulnerability Analysis Using Attack Graphs," Microsoft Research Academic Conference, Budapest, Hungary, November 11, 2003. **Invited Speaker**.

187. "Vulnerability Analysis Using Attack Graphs," Microsoft Research, Cambridge, England, November 10, 2003.

188. "Vulnerability Analysis Using Attack Graphs," Formal Methods for Components and Objects," Leiden, The Netherlands, November 4–7, 2003. **Invited Speaker**.

189. "Vulnerability Analysis Using Attack Graphs," Carnegie Mellon Center for Computers, Communications, and Security, September 30, 2003.

190. "CSTB Security Studies," NSF EDUCAUSE, Washington, D.C., October 22–23, 2002.

191. "What, Who, and How of Tomorrow," Monterey Workshops: Radical Innovations of Software and Systems Engineering in the Future, Venice, Italy, October 6–10, 2002. **Invited Speaker**.

192. "Mathematics in Computer Science Curricula," Sixth International Conference on Mathematics of Program Construction, Dagstuhl, Germany, July 8–10, 2002. **Invited Speaker**.

193. "Survivability Analysis of Networked Systems," IEEE Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises, Workshop on Enterprise Security, Pittsburgh, PA, June 10–12, 2002. **Invited Speaker**.

194. "Survivability Analysis of Networked Systems," FORTE 2001, Cheju Island, Korea, August 31, 2001. **Invited Speaker**.

195. "Code-Level Specification," Specifying and Checking Properties of Software, University of Washington/Microsoft Research Summer Institute, August 12, 2001. **Invited Speaker**.

196. "Scenario Graph Generation and MDP-Based Analysis," ARO Kickoff Meeting, Philadelphia, PA, May 24–25, 2001.

197. "Survivability Analysis of Networked Systems," Seventh Asia Pacific Software Engineering Conference (APSEC'2000), Singapore, December 5–8, 2000, **Keynote Speaker**.

198. "Software Survivability Analysis," NASA Ames, Design for Safety 2000 Workshop, Moffett Training Center, California, October 12, 2000. **Invited Speaker**.

199. "Towards a Science of Survivability," Third Information Survivability Workshop (ISW-2000), Boston, MA, October 24-26, 2000.

200. "Analyzing Survivability Properties of Specifications of Networks," Workshop on Dependability Despite Malicious Faults, New York City, NY, June 28, 2000

201. "Weaving Formal Methods into the Undergraduate Computer Science Curriculum," Eighth International Conference on Algebraic Methodology and Software Technology (AMAST 2000), Iowa City, IA, May 23, 2000. **Invited Speaker for Education Day**.

202. "Whither Larch?," Larch Users Group Meeting, FM'99, September 24, 1999. Toulouse, FR.

203. "Formal Methods: Past, Present, and Future," 1998 Asian Computing Science Conference, Manila, The Philippines, December 10, 1998, **Keynote Speaker**.

204. "Formal Methods: Past, Present, and Future," Fourth Software Reuse Symposium: From Architectures to Products, Ft. Meade, MD, August 19, 1998. **Invited Speaker**.

205. "Subtyping for Distributed Object Stores,", Second IFIP International Workshop on Formal Methods for Open Object-based Distributed Systems (FMOODS), July 23, 1997, University of Kent at Canterbury. **Invited Speaker**.

206. "Mathematics for Software Engineering," Mathematical Foundations of Programming Semantics, Boulder, CO, June 4, 1996. **Invited Speaker**.

207. "Model Checking Software Systems: A Case Study," ACM SIGSOFT Foundations of Software Engineering, October 12, 1995.

208. "Teaching Mathematics to Software Engineers," ZUM'95, Z Users Group, Limerick, Ireland, September 9, 1995, **Invited Speaker for Education Day**.

209. "Specifications and Their Use in Defining Subtypes," ZUM'95, Z Users Group, Limerick, Ireland, September 8, 1995. **Invited Speaker**.

210. "Teaching Mathematics to Software Engineers," Fourth International Conference on Algebraic Methodology and Software Technology (AMAST '95), Montreal, Canada, July 3, 1995. **Invited Speaker for Education Day**.

211. "Using Belief to Reason About Cache Coherence in Distributed Systems," Formal Specification: Foundations, Methods, Tools and Applications, Warsaw, Poland, May 30, 1995.

212. "The Role of Logic Programming in Software Engineering" Int'l Conf. on Logic Programming '94, Santa Marguerita Ligure, Italy, June 13, 1994. **Invited Speaker**.

213. "Specifications and Their Use in Defining Subtypes," OOPSLA '93, Washington, D.C., September 28, 1993.

214. "A New Definition of Subtyping," ECOOP '93, Kaiserslautern, Germany, July 28, 1993.

215. "Composing Transactional Concepts," ECOOP '93 Workshop on Object-Based Distributed Programming, Kaiserslautern, Germany, July 26, 1993.

216. "Specifications in Software Development," Logic in Computer Science Conference, Santa Cruz, CA, June 23, 1992. **Invited Speaker**.

217. "Extensions to Standard ML to Support Transactions," Workshop on ML and its Applications, San Francisco, CA, June 21, 1992.

218. "Persistence + Undoability = Transactions," Foundations of Inf. Systems Specification and Design, Dagstuhl, Germany, March 17, 1992.

219. "Revisiting Abstraction Functions for Reasoning about Concurrency," Fifth Refinement Workshop: Theory and Practice, London, UK, January 8, 1992. **Invited Speaker**.

220. "Unintrusive Ways to Integrate Formal Specifications in Practice," VDM '91, Delft, The Netherlands, October 25, 1991.

221. "Textual Specifications of Visual Specifications," Workshop on Formal Methods in Computer Graphics, Marina di Carrara, Italy, June 17, 1991. **Keynote Speaker**.

222. "ML as a Basis for Distributed Object Management," Standard ML Workshop, Princeton University, NJ, June 8, 1990.

223. "Larch," ACM Workshop on Formal Methods in Software Development, Napa, CA, May 10, 1990.

224. "Reliable Distributed Computing with Avalon/Common Lisp," IEEE Computer Society 1990 International Conference on Computer Languages, New Orleans, LA, March 14, 1990.

225. "What is a Formal Method?," Formal Methods Workshop 1989, sponsored by the Governments of the US, the UK, and Canada, Halifax, Nova Scotia, July 25, 1989. **Invited Speaker**.

226. "Specifying Security Constraints with Relaxation Lattices," Computer Security Foundations Workshop II, Franconia, NH, June 12, 1989.

227. "Verifying Atomic Data Types," REX Workshop on Stepwise Refinement of Distributed Systems: Models, Formalism, Correctness, Plasmolen, The Netherlands, May 29-June 2, 1989.

228. "Specifying Avalon Objects in Larch," Seminar on Foundations of Innovative Software Development, Conference on Theory and Practice of Software Development (TAPSOFT)," Barcelona, Spain, March 16, 1989. **Invited Speaker**.

229. "Reasoning About Atomic Objects," Symposium on Formal Techniques in Real-Time and Fault-Tolerant Systems," Warwick, England, September 23, 1988.

230. "Specifying Recoverable Objects," Sixth Annual Pacific Northwest Software Quality Conference, Portland, OR, September 19, 1988.

231. "Durra: a Task-Level Description Language," International Conference on Parallel Processing, St. Charles, IL, August 19, 1987.

232. "Specifying Graceful Degradation in Distributed Systems," Sixth Symposium on Principles of Distributed Computing, Vancouver, Canada, August 11, 1987.

233. "A Summary of the Library Problem," Fourth Int'l Workshop on Software Specification and Design, Monterey, CA, April 4, 1987.

234. "A Larch Specification of the Library Example," Fourth Int'l Workshop on Software Specification and Design, Monterey, CA, April 3, 1987.

235. "Specifying Functional and Timing Behavior for Real-Time Applications," Conference on Parallel Architectures and Languages Europe, Eindhoven, June 16, 1987.

236. "Axioms for Concurrent Objects," Fourteenth Symposium on Principles of Programming Languages, Munich, W. Germany, January 21, 1987.

237. "Extending Ina Jo with Temporal Logic," IEEE Symposium on Security and Privacy, Oakland, CA, April 7, 1986.

238. "Geometric Reasoning: A New Paradigm for Processing Geometric Information," IEEE International Symposium on New Directions in Computing, Trondheim, Norway, August 12, 1985.

239. "Specifying and Prototyping: Some Thoughts on Why They Are Successful," Theory and Practice of Software Development, Berlin, West Germany, March 25, 1985.

240. "The Practice of Specifications," Workshop on Formal Aspects of Specification, Swindon, England, October 22, 1984.

241. "Helping Specifiers Evaluate Their Specifications," AFCET Second International Conference on Software Engineering, Nice, France, June 5, 1984.

Professional Societies, Foundations, and Boards Talks

1. "DC and Research," with Katrina Armstrong, Columbia Board of Trustees, Washington DC, March 1, 2024.

2. "AI Strategy for Columbia University," with Shih-Fu Chang, Columbia Board of Trustees, Washington DC, March 1, 2024.

3. "US-China Relations: Effect on Research" Columbia Board of Trustees, Academic Affairs, October 6, 2023.

4. "Research Security Updates," Columbia Board of Trustees, Academic Affairs, June 2, 2023.

5. "Research at Columbia," Columbia Board of Trustees, Academic Affairs and Health Sciences Committees, June 3, 2022.

6. "Data Science and Health," Pacific Northwest event, hosted by Brad Smith and Kathy Surace-Smith, April 28, 2021.

7. "Columbia, Driving New York's Tech Economy," Columbia at Home event with SEAS, April 1, 2021.

8. "Data for Good: Ensuring the Rsponsible Use of Data to Benefit Society," ACM Tech Talk, April 30, 2020.

9. "A Gentle Introduction to Data Science, AI, and Machine Learning," Columbia Investment Management Company Board, New York, NY, December 3, 2019.

10. "Data Science at Columbia," Columbia Global Centers' Advisory Board Summit, New York, NY, December 3, 2019.

11. "Data Science at Columbia," A Conversation with Kirstin Grind and Jeannette Wing, Columbia Bay Area Alumni Event, The Commonwealth Club, San Francisco, CA, October 23, 2019.

12. "Data for Good: Data Science at Columbia," Chinese Institute of Engineers, Greater New York Chapter, Flushing, NY, October 19, 2019. **Keynote Speaker**.

13. "Practical Applications of Data Science," ACM Queue Editorial Board, New York, NY, May 17, 2019.

14. "Data Science at Columbia," Board of Visitors, School of Engineering and Applied Sciences, Columbia University, New York, NY, May 3, 2019.

15. "Data for Good: Data Science at Columbia," Columbia Club of Greater Washington DC, Washington DC, April 23, 2019.

16. "Columbia's Position in Technology," Columbia University Board of Trustees, San Francisco, CA, March 2, 2018.

17. "Data Science at Columbia," Columbia University Board of Trustees, New York, NY, October 7, 2017.

18. "Data Science at Columbia," Data and Society Council, New York, NY, October 5, 2017.

19. "Data Science at Columbia," Columbia Global Centers' Directors Summit, New York, NY, September 28, 2017.

20. "Thinking About Computational Thinking," University of Washington Phi Beta Kappa Centennial, Seattle, WA, April 30, 2014.

21. "Privacy Research at Carnegie Mellon," Information Security and Privacy Advisory Board, National Institute of Standards and Technology, May 30, 2012.

22. "What's Hot in Computing?," Hong Kong Carnegie Mellon Alumni Chapter, Hong Kong, October 10, 2011.

23. "What's Hot in Computing?," Seattle Carnegie Mellon Alumni Chapter, Seattle, WA, March 23, 2011.

24. "What's Hot in Computing?," Carnegie Mellon Advancement, Pittsburgh, PA, February 28, 2011.

25. "Computational Thinking," Models of Infectious Disease Agent Study (MIDAS) Network, University of Pittsburgh, Pittsburgh, PA, October 7, 2010.

26. "NSF and CISE Updates and PCAST Summary," National Academy of Engineering, Section 5, Washington, D,C October 4, 2010. Participation via videoconference.

27. "CISE Education and Workforce Programs," ACM Education Policy Council, Washington, DC, February 23, 2010.

28. "CISE Updates," CRA Executive Leadership Summit, Washington, D.C., February 22, 2010.

29. "The Budget Process," CRA Government Affairs Committee, Washington, D.C., February 21, 2010.

30. "Connecting Learning and Education for a Knowledge Society," National Science Board, February 4, 2010.

31. "CISE Updates," National Academy of Engineering, Section 5, Irvine, CA, October 5, 2009.

32. "Frontiers of Research and Infrastructure in CISE," Coalition of Academic Scientific Computation, Arlington, VA, April 29, 2009.

33. "Computational Thinking," CISE and EHR Brown Bag, NSF, Arlington, VA, March 18, 2009.

34. "Computing and CISE," Environment Research and Education Advisory Committee, NSF, Arlington, VA, October 15, 2008.

35. "Computational Thinking and Thinking About Computing," Philosophical Society of Washington, Washington, DC, October 10, 2008

36. "CISE Updates," National Academy of Engineering, Section 5, Washington, DC, October 6, 2008.

37. "Computational Thinking for Everyone," National Academies, Washington, DC, September 19, 2008.

38. "Increasing Female Students in Computer Science at Carnegie Mellon University: What We Did and What We're Doing," Women's Equality Day, NSF, Arlington, VA, August 26, 2008.

39. "Data-Intensive Computing," Corporate Alliance Meeting, NSF, Arlington, VA, June 18, 2008.

40. "Broadening Participation in Computing," Committee on Equal Opportunities in Science and Engineering (CEOSE), NSF, Arlington, VA, June 16, 2008.

41. "CISE Updates," Office of Cyberinfrastructure Advisory Committee Meeting, NSF, Arlington, VA, May 15, 2008.

42. "CISE Director's Review," NSF, Arlington, VA, May 13, 2008.

43. "What's Up at CISE," Committee on Science Policy, Society of Industrial and Applied Mathematics (SIAM), Washington, DC, November 15, 2007.

44. "What's Up at CISE," Social, Behavioral, and Economic Sciences, Advisory Committee Meeting, NSF, Arlington, VA, November 8, 2007.

45. "What's Up at CISE," Board on Mathematical Sciences and Their Applications, National Academies, Washington, DC, November 2, 2007.

46. "Looking Ahead at CISE," Office of Cyberinfrastructure Advisory Committee Meeting, NSF, Arlington, VA, November 1, 2007.

47. "Computing Themes and CISE Programs," National Academy of Engineering, Section 5, Washington, DC, October 1, 2007.

48. "Looking Ahead at NSF/CISE," DARPA ISAT, Woods Hole, MA, August 14, 2007.

49. "Looking Ahead at NSF/CISE," IT Deans Meeting, Computing Research Association, July 19, 2007.

50. "Looking Ahead at NSF," CRA Executive Leadership Summit, Washington, DC, February 26, 2007.

Addresses, Interviews, Testimonies, and Speeches

1. Opening Remarks, Columbia and HBCU Partnerships - Diversifying the Research and Economic Development Model: A First Conversation, virtual event, February 24, 2022.

2. Anil Ananthaswamy, "How Computing Has Transformed," https://www.technologyreview.com/2021/10/27/1037134 science-challenges-trustworthy-ai/, MIT Technology Review, October 27, 2021.

3. Kim Martineau, "Meet the Computer Scientist Overseeing Columbia's $1 Billion Research Portfolio," https://news.columbia.edu/news/meet-computer-scientist-overseeing-columbias-1-billion-research-portfolio, Columbia News, October 4, 2021.

4. "Race and Research," After the Fact, The Pew Charitable Trusts, podcast, April 13, 2021.

5. "The Role of Computer Science in the Data Science World," https://soundcloud.com/datahack-radio/episode-10-jeannette-m-wing, podcast, DataHack Radio, Analytics Vidya, September 17, 2018.

6. Kim Martineau, "Jeannette Wing on Developing 'Data for Good'," *The Record, Columbia News*, Commencement 2018, Vol. 43, No. 07, 2018.

7. David Craig, "Using Data for Good," *Columbia Magazine*, Spring/Summer 2018, p. 23.

8. "Research at Microsoft: Beyond the Horizon," Executive Briefing, Raytheon, Redmond, WA, March 24, 2017.

9. "History of CISE," Oral History Project, Babbage Institute, interview date March 14, 2017.

10. "A Career in Computer Science," Young Women's College Preparatory, Houston, TX, February 8, 2017.

11. "Research at Microsoft: Beyond the Horizon," Executive Briefing, British Petroleum, Redmond, WA, September 13, 2016.

12. "Computational Thinking," STEM Fair, Sammamish High School, Sammamish, WA, May 18, 2016. **Keynote Speaker**.

13. "Research at Microsoft: Beyond the Horizon," Executive Briefing, General Electric, Redmond, WA, May 17, 2016

14. "Leveraging the US Science and Technology Enterprise," US Senate Commerce Committee Hearing, May 11, 2016.

15. "Research at Microsoft: Beyond the Horizon," Executive Briefing, HP, Redmond, WA, April 4, 2016.

16. "Research at Microsoft: Beyond the Horizon," Executive Briefing, Merck, Redmond, WA, February 17, 2016

17. "Research at Microsoft: Beyond the Horizon," Executive Briefing, Temasek Holdings, Redmond, WA, October 1, 2015.

18. An Insight, An Idea with Jeannette Wing, World Economic Forum, Davos, Switzerland, January 27, 2013.

19. Passion, Support System Guided CMU's Wing Through School, http://bit.ly/KwfIYx, Pittsburgh Business Times, May 4, 2012.

20. Interview with Jeannette Wing, http://scientificdatasharing.com/interviews/interview-with-jeannette-wing/, Scientific Data Sharing Project, December 5, 2010.

21. Experiences at the National Science Foundation, Friendship Village of the South Hills, Pittsburgh, PA, December 9, 2010.

22. AI Futures, AI Workshop, Carnegie Mellon, December 4, 2010.

23. Jeannette Wing, EECS Alumni/ae: taking EECS to the limits, MIT EECS Newsletter, http://eecs-newsletter.mit.edu/articles/2010-fall/eecs-alumniae-creating-new-paths-everywhere/5/, Fall 2010.

24. What's Hot in Computer Science?, Olympus Show and Tell, Pittsburgh, PA, October 5, 2010. Pittsburgh Post-Gazette news story: http://www.post-gazette.com/pg/10280/1093187-28.stm, October 7, 2010.

25. "Denken wie ein Computerwissenschafter," Mario Wasserfallerm APA-ZukunftWissenm, http://www.zukunftwissen.und-wissenschaft/service_volltext.html?level=1&id=CMS1285674564180, September 27, 2010.

26. "CMU Professor Reflects on Time At National Science Foundation," Pittsburgh Post-Gazette, September 8, 2010, http://www.post-gazette.com/pg/10251/1085705-115.stm.

27. "Computer Science," Presentation to President's Council of Advisors on Science and Technology, September 1, 2010, http://www.tvworldwide.com/events/pcast/100902/.

28. "The Importance of Broader Impacts at NSF," Broader Impacts in Research and Discovery Summit (BIRDS), Arlington, VA, June 22, 2010.

29. Welcome Address, BIOCISE Workshop, Arlington, VA, May 25, 2010.

30. Welcome Address, Information Integration and Informatics PI Meeting, Rossyln, VA, April 22, 2010.

31. Welcome Address, Computational Thinking Applied to Big Data in Healthcare Workshop, DARPA/NLM/NSF, Crystal City, VA, March 29, 2010.

32. Welcome Address, Computer Systems Research Workshop, Arlington, VA, March 25, 2010.

33. "Microsoft and NSF Enable Research in the Cloud," February 4, 2010.

34. "Computational Thinking for Everyone," Workshop II, National Academies, Washington, DC, February 4, 2010.

35. "Computer Security Expert Jeannette Wing," *in Cool Careers in Information Sciences*, Sally Ride Science Publishers, 2009.

36. Welcome Address, Discovery and Innovation in Health IT, San Francisco, CA, October 29, 2009.

37. Welcome Address, NSF Workshop on Design and Automation, Arlington, VA, July 8, 2009.

38. Cyber Security Hearing, testimony to House Committee on Science and Technology's Subcommittee on Technology and Innovation and Subcommittee on Research and Science Education, June 16, 2009.

39. Welcome Address, Collaborative Research in Computational Neuroscience PI Meeting, Pittsburgh, PA, June 7, 2009.

40. "Jeannette Wing, The Computational Thinker," Susan Karlin, *IEEE The Institute* (online), member profile, April 6, 2009.

41. Welcome Address, Science of Power Management Workshop, Arlington, VA, April 9, 2009

42. "Computational Thinking," Research Experiences for Undergraduates (REU) Sites PI Meeting, Arlington, VA, March 12, 2009.

43. The Grill: Jeannette M. Wing, interview by Gary Anthes, *Computerworld*, Vol. 43, No. 8, February 23, 2009, pp. 16–18.

44. Last Byte: Q&A The Upper Limit, interview by Leah Hoffman, *Communications of the ACM*, Vol. 52, No. 1, January 2009, pp. 111–112.

45. "Computational Thinking," Computational Thinking Olympiad Planning Committee, Arlington, VA, November 21, 2008.

46. "Thinking Like a Computer Scientist," Kojo Nnamdi Show, WAMU 88.5, National Public Radio, November 19, 2008.

47. Welcome Address, Molecular Communication, Arlington, VA, February 20, 2008.

48. Welcome Address, Grace Hopper Conference, Orlando, Florida, October 18, 2007.

49. Welcome Address, NSF Nanoelectronics Workshop, Arlington, Virginia, October 15, 2007.

50. Welcome Address, NSF Quantum Information Systems Workshop, Arlington, Virginia, September 10, 2007.

51. "A Conversation with Jeannette Wing about Computational Thinking," IT Conversations with Jon Udell, `http://www.itconversations.com/shows/detail1844.html`

52. "Dan Siewiorek, the Epitome of Carnegie Mellon," Dan60, December 4, 2006.

53. "Q&A with Jeannette M. Wing," interview by Lauren Aaronson, *IEEE Spectrum* (online), July 2006.

Invited Participant

1. "Innovation and Adaptation in the Age of Disruption," Panel on "AI and Science: The Big Picture," National Academy of Scences, PNAS and PNAS Nature, Washington, DC, scheduled for March 19–20, 2025. **Invited Speaker and Panelist**.

2. "AI and Science," Committee on Science, Technology, and Law, National Academies, Washington, DC, virtual participant, May 13, 2024. **Invited Speaker**.

3. "What is the experience of scientists who encounter ethical and societal issues in their work?", Science Philanthropy Alliance Members Meeting, Rockefeller Center, New York, NY, May 8, 2024. **Invited Panelist**.

4. Breakthrough Technologies: AI and Quantum, New York Hall of Science and NSF Artificial and Natural Intelligence (ARNI) Center, Columbia University, New York, NY, April 15, 2024. **Invited Panel Moderator**.

5. Research Integrity, National Academies and Government-University-Industry Research Roundtable, webinar, April 11, 2024. **Invited Panelist**.

6. Generative AI and Civic Society, School of Data, BetaNYC, CUNY School of Law, New York City, March 23, 2024. **Invited Panelist**.

7. Department of Homeland Security Academic Partnership Council (HSAPC) Subcommittee on Foreign Malign Influence (FMI) in Higher Education, March 21, 2024. **Invited Panelist**.

8. "A Framework for Addressing the Future of AI in Society," National Academies, The Annenberg Foundation Trust at Sunnylands, and the Annenberg Public Policy Center, 29–30, 2023 (virtual), Rancho Mirage, CA, February 8–10, 2024.

9. "International Talent Programs in the Changing Global Environment," National Academies, virtual participant, October 11, 2023. **Invited Panelist**.

10. Computational Cybersecurity in Compromised Environments, Florida Institute of Technology, Melbourne, FL, September 12–14, 2023.

11. "Safety in the Age of Generative AI," AI Native Event, Zetta Venture Partners, NT, NY, September 7, 2023. **Invited Panelist**.

12. "Trustworthy AI," Global Alliance of Science and Arts, Columbia University, NY, NY, August 18, 2023. **Invited Lecturer**.

13. "International Research Collaboration, Economic Competitiveness, and National Security," Committee on Science, Technology, and Law, National Academies, Washington, DC, May 15, 2023. **Invited Speaker**.

14. "Software Development and Assurance Pipeline," DARPA Forward Conference Series, San Diego, December 14, 2022. **Invited Panelist**.

15. Women in Leadership in Academia Roundtable with Nature and Scientific American, virtual event, October 12, 2022. **Invited Panelist**.

16. Member Roundtable on American Democracy: Science and Engineering, American Academy of Arts and Sciences, virtual event, September 29, 2022. **Invited Panelist**.

17. Global Forum Honoring Professor C.S. Wu, Nanjing University Alumni Association US, hybrid event, Washington, DC, September 24, 2022. **Invited Panelist**.

18. "New Models for Research and Research Funding," Future of Computing Research, USC/ISI, virtual event, September 13, 2022. **Invited Panelist**.

19. Leadership Panel Discussion, Asian American Academy for Science and Engineering, 2022 Summer Academy for High School Students, hybrid event, Princeton Univesrity, June 25, 2022.

20. Scaling High Quality AI, Executive Roundtable, TruEra, June 22, 2022. **Invited Panelist**.

21. "Perfectly Imperfect: A Mentoring Mosaic," CUIMC Women in Science Lecture Series, CUIMC, May 11, 2022. **Invited Panelist**.

22. NSF Women's History Month Distinguished Lecture Panel, NSF, virtual event, March 30, 2022. **Invited Panelist**.

23. "The Future of Universities and Research: How Do Universities Remain Competitive in a Changing Environment?," American Technion Society Presidential Forum, Cornell Tech, March 18, 2022. **Invited Panelist**.

24. "Diversity, Equity, and Trust in Science," Symposium on Promoting Credibility, Reproducibiity, and Trust in Science, Columbia University and NYC institutions, virtual event, March 11, 2022. **Invited Panel Moderator**.

25. "Changing regulatory policies,including vis a vis ESG, tech and internet companies," China and the West Economic Dialogues, Columbia University, Peking University, and Tsinghua University, December 13, 2021, virtual event. **Invited Panelist**.

26. "Asian Americans as Leaders in US Academia–Breaking Through the Bamboo Ceiling," Columbia University Asian Faculty Association, October 29, 2021. **Invited Panelist**.

27. "The Impact of AI on IoT," Women in Engineering IoT Forum 2021, virtual event, June 25, 2021. **Invited Panelist**.

28. Global Digital Economy Governance, Tsinghua PBC School of Finance Annual Conference on Global Economic Governance Forum 2021, virtual event, May 22, 2021. **Invited Panelist**.

29. Panel on Future of Machine Learning and AI, Applied Machine Learning Day, Geneva Science and Diplomacy Anticipator, virtual event, May 10, 2021. **Invited Speaker and Panelist**.

30. Privacy, Ethics and Trust in Connected Healthcare Workshop, IEEE and Northeast Big Data Hub, virtual event, April 28, 2021. **Invited Distinguished Panelist**.

31. Trustworthiness/AI, Science of Security Hard Problems Special Session, NSA, April 14, 2021. **Invited Panelist**.

32. Panel on Data Science, 3rd Anniversary Event, Halicioglu Data Science Institute, University of San Diego, virtual event, March 1, 2021. **Invited Panelist**.

33. "Robust Artificial Intelligence," Lorentz Center, The Netherlands, January 13, 2021. **Invited Panelist**.

34. "Data Handling and Security," Brain-Computer Interfaces Symposium: Innovation, Security and Society, panel moderator, November 19, 2020.

35. Coded Bias, Zuckerman Mind, Brain, Behavior Institute and Data Science Institute, Columbia University, screening and panel, October 21, 2020.

36. "Data and Cancer," Columbia Inside, October 6, 2020.

37. Faculty Panel, Columbia Engineering Experience, September 15, 2020. **Invited Panelist**.

38. "Data Science Standards," 26th ACM International Conference on Knowledge Discovery and Data Mining (KDD), virtual event, August 24, 2020. **Invited Panelist**.

39. Women in Engineering, SEAS Summer Series, Columbia University, August 7, 2020. **Invited Panelist**.

40. COSMOS NewLAW Research Experience for Teachers/Research and Mentoring, welcoming remarks, July 31, 2020.

41. "Best Practices for Leading DS Efforts in Your Organization," Symposium on Data Science and Statistics, virtual event, June 3, 2020. **Invited Panelist**.

42. "My Journey as a Scientist Through Academia, Government, and Industry," Emerging Scholars Program, Research Day, Columbia University, New York, NY, April 17, 2020. **Invited Panelist**.

43. Women in Engineering, School of Engineering and Applied Sciences, Columbia University, New York, NY, April 16, 2020. **Invited Panelist**.

44. AI and Privacy Panel, Digital Finance Summit, Columbia University, New York, NY, February 7, 2020. **Invited Panelist**.

45. Future Role of Centers, Three Decades of DIMACS Conference, New Brunswick, NJ, November 21, 2019. **Invited Panelist**.

46. Foundations of Data Science, fireside chat, Third Data Science Academic Leadership Summit, Sante Fe, NM, November 8, 2019.

47. Updates on Data Science at Columbia, Third Data Science Academic Leadership Summit, Sante Fe, NM, November 7, 2019.

48. ACM Symposium on Computer Science and Law, New York, NY, session moderator, October 28-29, 2019.

49. National Intergovernmental Audit Forum Executive Roundtable, Federal Reserve Bank of New York, New York, NY, October 25, 2019.

50. Big Data Innovation Hubs, kickoff meeting, NSF, Alexandria, VA, October 7, 2019.

51. Formal Methods at Scale, National Science and Technology Council's Special Cyber Operations Research and Engineering Subcommittee (NSTC SCORE), Rosslyn, VA, September 25, 2019.

52. The Future of Business, fireside chat with Costis Maglaras, alumni event, New York, NY, September 24, 2019.

53. Future of Data Science, ACM/IMS 2019 Event on Data Science, San Francisco, CA, June 15, 2019. **Invited Panelist**.

54. "The Bit Player," World Science Festival, Astoria, NY, May 28, 2019. **Invited Panelist**.

55. AI and Governance, Digital Futures Forum, Columbia University, New York, NY, panel moderator, May 10, 2019.

56. Data for Good: Applying Data and Quantitative Methods to Improve Lives, Goldman Sachs Systematic Investing Conference, New York, NY, May 9, 2019. **Invited Panelist**.

57. "US-China Competition and Cooperation: Can we afford to live apart?" Technology, Disruption, and Social Innovation, China Institute Executive Summit, New York, NY, April 11, 2019. **Invited Panelist**. **Invited Speaker**.

58. Advances in Precision Medicine: Big Data Conference, Columbia University, New York, NY, April 8, 2019.

59. Perspectives on Luminaries on Computing, Hello World, Hello MIT, Cambridgem, MA, February 26, 2019.

60. Energy Technology Innovation, 14th Annual Columbia Energy Symposium, New York, NY, February 8, 2019. **Invited Panelist**.

61. Consciousness: Effects on Thought and Thinking Panel, Greater Good Gathering, Columbia University, New York, NY, February 7, 2019. **Invited Panelist**.

62. NSF Expeditions 10th Anniversary, Washington, DC, December 9–11, 2018. **Invited Panelist**.

63. "Explore Columbia University's Commitment to Data, Decisions and the Future of Medicine," Columbia University Campaign Event, Hong Kong, November 15, 2018.

64. a16z, Andreessen Horowitz Tech Summit, Los Angeles, CA, November 5–7, 2018.

65. "The Challenges of Translational Data Science," Translational Data Science Workshop, New York University, Brooklyn, NY, October 25, 2018.

66. Ethics and Privacy in Data Science, Second Data Science Leadership Summit, Park City, UT, October 13, 2018. **Invited Panelist**.

67. Data Science Organizational Structures, Second Data Science Leadership Summit, Park City, UT, October 12, 2018. **Invited Speaker**.

68. "Will the Future Work?," Bridging Ideas - Celebrating 15 years of Alliance, Paris, France, October 10, 2018. **Invited Panelist**.

69. Data and Justice Panel, Vera Institute of Justice, hosted by Citi, New York, NY, October 3, 2018. **Invited Panel Moderator**.

70. Cybersecurity Forum, Columbia World Projects, Columbia University, New York, NY, September 25, 2018.

71. Digital Technology and Social Innvotion for Sustainable Development, School of International and Public Affairs, Columbia University, New York, NY, September 20, 2018. **Invited Panelist**.

72. "Unlock the Value of Blockchain and Transparent Data," Ascend, Greenwich, CT, September 11, 2018. **Invited Panelist**.

73. "Who is a Data Scientist? Defining the Analytics Profession and Cutting Out the Hype and Confusion," 24th ACM International Conference on Knowledge Discovery and Data Mining (KDD), London, UK, August 22, 2018. **Invited Panelist**.

74. KDD Women's Lunch Panel, 24th ACM International Conference on Knowledge Discovery and Data Mining (KDD), London, UK, August 22, 2018. **Invited Panelist**.

75. "Societal Impact of Data Science and Artificial Intelligence," 24th ACM International Conference on Knowledge Discovery and Data Mining (KDD), London, UK, August 21, 2018. **Invited Panelist**.

76. Future of Data Science, sponsored by the Alan Turing Institute, Data Science Institute of Imperial College of London, KDD, London, UK, August 20, 2018.

77. Debate on Ethics and Morality for Robots, Federated Logic Conference (FLOC), Oxford, UK, July 16, 2018.

78. Panel on Digital Identities, Privacy, and Security Issues, State of the Field Workshop on the Digital Transformation, Columbia University, New York, NY, June 15, 2018. **Invited Panelist**.

79. Global Energy Summit Panel, New York, NY, April 19, 2018.

80. Birnberg Lecture Panel Discussion, Columbia College of Dental Medicine, New York, NY, April 11, 2018.

81. Panel on Election Hacking, Eric H. Holder Initiative for Civil and Political Rights, Columbia University, New York, NY, March 29, 2018.

82. Industry-Academia Collaboration Panel, Northeast Big Data Hub Annual Meeting, Columbia University, New York, NY, March 27, 2018.

83. AI Panel, Sberbank Business Breakfast, World Economic Forum, Davos, Switzerland, January 25, 2018.

84. "Revitalizing the University-Industry-Government Partnership Creating New Opportunities for the 21st Century," National Academies, Washington, DC, November 15, 2017.

85. CUNY Computer Science Faculty Meeting, New York, NY, November 3, 2017.

86. Work Economic Forum Digital Economics Workshop, Columbia University, New York, NY, November 1, 2017. **Invited Panel Moderator**.

87. Montrone Seminar Series, Bernstein Center for Leadership and Ethics, Columbia University, New York, NY, October 31, 2017. **Invited Faculty Moderator**.

88. "Reality Jamming," DARPA/ISAT Workshop, Columbia University, New York, NY, October 26-27, 2017.

89. "Chaos/Control? Discussing What Financial Services Can Learn from Tech," Bloomberg's Thought Leaders Panel, New York, NY, October 19, 2017.

90. Israeli Cyber Forum, Crytography Panel, Columbia University, New York, NY, October 18, 2017.

91. Engineering Womens Forum: Faculty Roundtable, Columbia University, New York, NY, October 16, 2017.

92. "Application of AI in our work and lives, and implication for professionals," Ascend, Greenwich, CT, October 5, 2017. **Invited Panel Moderator**.

93. "Media Trends 2020," NYC Media Lab Sixth Annual Summit, The New School University, New York, NY, September 28, 2017. **Invited Panelist**.

94. Case Study: Seeding Excellence for an Emerging Field, Science Philanthropy Alliance, with Armen Avanessians, Columbia University, New York, NY, July 14, 2017.

95. Women in Circuits and Systems Panel, IEEE Circuits and Systems Symposium, Baltimore, MD, May 29, 2017.

96. Technology Panel, SupChina: Women and China, A Forum to Discuss How Women are Shaping the Rising Global Power, The China Institute, New York, NY, May 18, 2017. **Invited Panelist**.

97. Future of Computational Thinking, Computational Thinking for All, Tokyo, Japan, February 27, 2017. **Invited Panelist**.

98. Innovation of Business Panel, The Future of Intelligence, Nobel Prize Dialogue Tokyo 2017, Tokyo, Japan, February 26, 2017. **Invited Panelist**.

99. Challenges of Science and Technlogy Panel, The Future of Intelligence, Nobel Prize Dialogue Tokyo 2017, Tokyo, Japan, February 26, 2017. **Invited Panelist**.

100. The Technology of the Future, AAAS 2017 Annual Meeting, Boston, MA, February 17, 2017. **Invited Moderator**.

101. National Frontiers Track (AI, Machine Learning, Robotics), White House Frontiers Conference, co-hosts Carnegie Mellon University and University of Pittsburgh, Pittsburgh, PA, October 13, 2016.

102. AI Panel, Mobile Future Forward Conference, Seattle, WA, September 27, 2016.

103. Growth of Computer Science Undergraduate Enrollments, National Academies Computer Science and Telecommunications Board, Washington, DC, August 15, 2016.

104. Entities, Facts, Questions, Answers: Building the Foundations for Semantic Information Processing, Office of Science and Technology Policy, Washington, DC, July 29, 2016.

105. Retaining the Innovation Spark: How can large organizations keep being creative?, iNNOVEX2016, Airport City, Israel, February 3, 2016. **Invited Panelist**.

106. Restoring the Foundation Symposium, American Academy of Arts and Sciences, Congressional Roundtable, Washington, DC, October 20, 2015.

107. Panel on Conmputational Thinking in Korea, Computational Thinking Forum, Yongsei University Seoul, Korea, October 8, 2015.

108. Sentience, Qualia, and Computing, DARPA/ISAT Workshop, Woods Hole, MA, August 21, 2015.

109. Whither the Data? Toward Understanding Flows in Complex Data Ecosystems, DARPA/ISAT Workshop, Virtual Field Trip, August 6, 2015.

110. Will Centaurs Be The Winners?, DARPA/ISAT Workshop, Virtual Field Trip, July 17, 2015.

111. Cassandra Problem: Building Trust in Predictive Models, DARPA/ISAT Workshop, Arlington, VA, April 15–16, 2015.

112. SimBioTech: Silicon Meets Biotechnology, DARPA/ISAT Workshop, Seattle, WA, March 3–4, 2015.

113. Naturally Expressed Rapid Design (NERD), DARPA/ISAT Workshop, Airlie Center, Warrenton, VA, August 14–15, 2014.

114. Survivalist/Intermittent Computing and Communications, DARPA/ISAT Workshop, Airlie Center, Warrenton, VA, August 11, 2014.

115. The EverCloud: Anticipating and Countering Cloud-Rot, DARPA/ISAT Workshop, Seattle, WA, March 31–April 1, 2014.

116. Trusting Networks of Humans and Computers, DARPA/ISAT Workshop, San Francisco, CA, March 20–21, 2014.

117. Big Data: Government and Industry Examples, Data Science Forum, Presidential Inaugural Series, Carnegie Mellon, Pittsburgh, PA, November 14, 2013.

118. Fifth Israeli Presidential Conference, June 18-20, 2013. Education: The Test of Tomorrow Panel, Jerusalem, Israel, June 19, 2013. **Invited Panelist**.

119. Decoding the Digital Gender Divide, World Economic Forum, Davos, Switzerland, January 24, 2013.

120. Science of Security Community Meeting, National Harbor, MD, November 29–30, 2012.

121. Anonymity and Accountability, NSF Secure and Trustworthy Computing PI meeting, National Harbor, MD, November 27–29, 2012, session co-chair.

122. Future Directions and Research Funding, MSRA Faculty Summit, Tianjin, China, October 27, 2012.

123. The Role of Higher Education in China's Economy, University Roundtable, Tianjin, China, September 13, 2012.

124. Big Data, The Annual Meeting of the New Champions 2012 World Economic Forum, Summer Davos, Tianjin, China, September 12, 2012. **Invited Panelist**.

125. Microsoft Faculty Summit, Redmond, WA, July 16-17, 2012.

126. Microsoft Think Tank Summit, Redmond, WA, July 15, 2012.

127. TEDx, Leadership Pittsburgh, Nemacolin, PA, November 19–20, 2011.

128. NSF TRUST Center Autumn 2011 Conference, Washington, DC, November 2–3, 2011.

129. Microsoft Faculty Summit, Redmond, WA, July 18–20, 2011.

130. Google Faculty Summit, New York, NY, July 13–15, 2011.

131. Role of Information Sciences and Engineering in Sustainability, sponsored by the Computer Computing Consortium and NSF, Washington, DC, February 3–4, 2011.

132. Usable Verification, sponsored by Microsoft Research and NSF, Redmond, WA, November 15–16, 2010.

133. Innovation in Computing in Computing and IT for Sustainability, National Academies, Washington, DC, May 27, 2010. **Invited Panelist**.

134. Government Panel, National Cyber Leap Year Summit, NITRD, Arlington, VA, August 17–19, 2009.

135. Microsoft Faculty Summit, Redmond, WA, July 13–14, 2009.

136. Rebooting Computer Science Summit, January 12–14, 2009, Mountain View, CA.

137. Science in Society: Dialogues and Scientific Responsibility, Mouvement Universel de la Responsibilite Scientifique (MURS), European Union, Paris, France, November 24–25, 2008.

138. "Mindswap on Cloud Computing," Microsoft Research Asia, Beijing, China, November 3, 2008.

139. "Academia and Government Working Together to Promote Interdisciplinary Research," Panel on Interdisciplinary Research, Microsoft New England, September 22, 2008. **Invited Panelist**.

140. Microsoft Faculty Summit, Redmond, WA, July 28–29, 2008.

141. "Computing at Scale: Challenges and Opportunities," Google Faculty Summit, Mountain View, CA, July 24, 2008. **Invited Panelist**.

142. "Data-Intensive Computing Symposium," Computer Community Consortium, Sunnyvale, CA, March 26, 2008.

143. "National Cyber-Defense Initiative (NCDI) Workshop on Game-changing Solutions for Cyber Security," Intelligence Advanced Research Projects Activity (IARPA), College Park, Maryland, November 7, 2007.

144. "The Science of Thinking: Europe's Next Challenge," Science Business, Brussels, Belgium, September 19, 2007.

145. Google Faculty Summit, Mountain View, CA, July 26–27, 2007.

146. "Optimism for the Future of Computing," Microsoft Faculty Summit, Redmond, Washington, July 16, 2007. **Invited Panelist**.

147. NSF CyberInfrastructure Team, panel session, Washington, DC, July 11, 2007.

148. SIGCSE 2007, Birds-of-a-Feather session on Computational Thinking, organized by Peter Henderson, Covington, Kentucky, March 8, 2007.

149. Science 2020 Forum, Venice, Italy, September 4–5, 2006. Organized by Microsoft Research Cambridge.

150. PCAST Subcommittee on Cybersecurity, University Club of Chicago, August 30, 2006.

151. Metricon 1.0, Vancouver, BC, August 1, 2006.

152. Google Faculty Summit, Mountain View, CA, July 27–28, 2006.

153. Microsoft Faculty Summit, Redmond, WA, July 17–18, 2006.

154. NSF Cyber Trust PI Meeting, Newport, CA, September 25–27, 2005.

155. Google Faculty Summit, Mountain View, CA, August 5, 2005.

156. ARO High Confidence Embedded Systems, PI Meeting, Lincoln, Nebraska, May 10–11, 2005.

157. NATO ARW Verification of Infinite State Systems with Applications to Security (VISSAS) 2005, Timisoara, Romania, March 17–22, 2005.

158. CRA Computing Leadership Summit, Washington DC, February 28, 2005.

159. DARPA ISAT Study "Bolt-on Security," Alexandria, VA, February 19–20, 2004.

160. Workshop on Advanced Developments in Software and Systems Security," Taipei, Taiwan, December 5–7, 2003.

161. Computer Research Associates Conference on Grand Research Challenges in Information Security and Assurance, November 16–19, 2003.

162. Carnegie Mellon Sustainable Computing Consortium, **Invited panelist**, Pittsburgh, PA, September 30, 2003.

163. Workshop on Software Engineering for Embedded Systems, Monterey Workshop Series, Chicago, IL, September 24–26, 2003.

164. NSF/NIST Invitational Workshop on Cybersecurity Workforce Needs Assessment and Educational Innovation, Washington, DC, August 7–8, 2003.

165. Microsoft Faculty Summit, Redmond, WA, July 28–29, 2003. **Invited panelist** on Trustworthy Computing, July 29, 2003.

166. ARO High Confidence Embedded Systems, PI Meeting, Pittsburgh, PA, May 1–2, 2003.

167. Microsoft Research Security Workshop, Snoqualmie, WA, February 28, 2003.

168. Microsoft Research Concurrency Workshop, Snoqualmie, WA, February 24–25, 2003.

169. NSF EDUCAUSE, Cybersecurity in Higher Education, Washington, DC, October 22–23, 2002.

170. ARO High Confidence Embedded Systems, PI Meeting, Atlanta, GA, May 30-31, 2002.

171. Electronic Tools Infrastructure (ETI) Workshop, IT-Center, Dortmund, Germany, November 23–24, 2001.

172. Using Uncertainty Within Computation, AAAI 2001 Fall Symposium, North Falmouth, Cape Cod, MA, November 2–4, 2001. Invited panelist: "Future Research Directions on Uncertainty Within Computation."

173. Specifying and Checking Properties of Software, University of Washington/Microsoft Research Summer Institute, August 12–16, 2001.

174. ARO High Confidence Embedded Systems, PI Kickoff Meeting, Philadelphia, May 24–25, 2001.

175. DARPA High Assurance Scientific Computing, Arlington, VA, March 13–15, 2001.

176. DARPA OASIS PI Meeting, Norfolk, VA, February 13–16, 2001.

177. High Dependability Computing Consortium (HDCC) Workshop, NASA/Ames, January 10–12, 2001.

178. Formalism in Software Engineering Education and Practice, Asia-Pacific Software Engineering Conference (APSEC), Singapore, December 6, 2000, invited panelist.

179. SEI and IEEE Computer Society, Third Information Survivability Workshop (ISW-2000), Boston, MA, October 24–26, 2000.

180. NASA/Ames, Design for Safety 2000 Workshop, Moffett Training Center, California, October 10–12, 2000.

181. DARPA High Confidence Aviation Systems Workshop, Arlington, Virginia, June 21, 2000.

182. DARPA IASET PI Meeting, Alexandria, Virginia, April 25–26, 2000.

183. DARPA Formal Methods PI Meeting, Alexandria, Virginia, October 25-26, 1999.

184. ISAT/DARPA Annual Meetings: April 24-25, 2001, April 26, 2000, January 19, 2000, May 6, 1999, January 20-21, 1999, IDA; August 20–24, 2001, July 10–14, 2000, August 23–27, 1999; Woods Hole, MA, November 11–13, 2000, Seattle, WA.

185. University of Washington/Microsoft Research Summer Institute on Technologies to Improve Software Development, Seattle and Semiamoo, August 2–6, 1999.

186. ONR and NSF Workshop in Computer Security, Fault Tolerance, and Software Assurance: From Needs to Solutions, Williamsburg, VA, November 10–12, 1998.

187. DARPA Formal Methods PI Meeting, Palo Alto, October 29–30, 1998.

188. NSF Software Workshop, Baltimore, Maryland, October 15–16, 1998.

189. DARPA EDCS PI Meeting, Baltimore, Maryland, July 21–23, 1998.

190. DARPA ITO PI Meeting, Austin, Texas, November 10–12, 1997.

191. Panel on Funding for Software Research, COMPSAC, Washington, DC, August 14, 1997.

192. DARPA CAETI Meeting, Berkeley, CA, November 19–22, 1996.

193. DARPA ITO PI Meeting, Dallas, Texas, October 7–8, 1996.

194. DARPA CAETI Meeting, University of Arlington, Texas, March 20–22, 1996.

195. ZUM'95, Education Day, Z Users Group, Limerick, Ireland, September 9, 1995.

196. Formal Specification: Foundations, Methods, Tools and Applications, Warsaw, Poland, May 29–June 1, 1995.

197. Workshop on Industrializing Formal Specification Techniques, Ft. Lauderdale, April 5–8, 1995.

198. ARPA Persistent Object Bases/Interoperability Meeting, La Jolla, CA, Oct. 31–Nov. 2, 1994.

199. ARPA Software Composition Meeting, Charleston, SC, May 3–5, 1994.

200. Research and Development for the NII: Technical Challenges, Gaithersburg, MD, NIST, February 28–March 1, 1994. Co-chair of Track on Interoperability.

201. ACM SIGPLAN Workshop on Interface Definition Languages, January 20, 1994. Program chair.

202. ECOOP '93 Workshop on Granularity of Objects in Distributed Systems, Kaiserslautern, Germany, July 26, 1993.

203. ECOOP '93 Workshop on Object-Based Distributed Programming, Kaiserslautern, Germany, July 26–27, 1993. Invited panelist and speaker.

204. NSASAB Panel on Formal Methods, Ft. George Meade, MD, February 9–10, 1993.

205. NSF Workshop on the Future of Programming Languages and Compilers, Charleston, SC, January 6–7, 1993.

206. Software Technology Conference, DARPA Software and Intelligent Systems Technology and Computing Systems Technology Offices, Los Angeles, CA, April 28–30, 1992.

207. Foundations of Information Systems Specification and Design, International Conference and Research Center for Computer Science, Dagstuhl-Seminars, Saarbrucken, Germany, March 16–20, 1992.

208. HPCC Software PI Meeting, DARPA Computing Systems Technology Office, San Diego, CA, January 15–17, 1992.

209. Fifth Refinement Workshop: Theory and Practice of Formal Software, British Computer Society, London, UK, January 8–10, 1992.

210. Intelligent Information Systems Workshop on Data/Knowledge Management, Como, Italy, October 28–30, 1991.

211. Formal Methods '91, Governments of the US, the UK, and Canada, Drymen, Scotland, September 24–27, 1991.

212. Formal Methods in Computer Graphics, Eurographics Association, Marina di Carrara, Italy, June 17–19, 1991.

213. DARPA Information Science and Technology Office PI Meeting, Providence, RI, Feb. 27–March 1, 1991.

214. Programming Concepts and Methods, IFIP Working Group 2.3, Catalina Island, CA, December 10–14, 1990.

215. Research Agenda for Software Engineering and Large Scale Systems, DARPA Information Science and Technology Office, Washington, DC, June 27–29, 1990.

216. IFIP TC 2 Working Conference on Programming Concepts and Methods, Sea of Galilee, Israel, April 2–5, 1990.

217. Object-Oriented Database Concepts, Panel Session OOPSLA '89, S. Zdonik, organizer, New Orleans, October 4, 1989.

218. Formal Methods Workshop '89, Governments of the US, the UK, and Canada, Nova Scotia, July 23–27, 1989.

219. Stepwise Refinement of Distributed Systems: Models, Formalism, Correctness, Eindhoven, The Netherlands, May 29–June 2, 1989.

220. Integrated Approach for Fault Tolerance: Current State and Future Requirements, University of Maryland at College Park, Institute for Advanced Computer Systems, May 4–5, 1989.

221. Trusted System Design Validation Workshop, Computational Logic Inc., DARPA, Austin, TX, December 1–2, 1988.

222. DARPA PI meeting, Information Science and Technology Office, Austin, TX, November 14–18, 1988.

223. Future of Programming Languages Workshop, ONR, Miami, FL, October 13–14, 1988.

224. Methodologies and Object-Oriented Programming Workshop, ACM OOPSLA, Orlando, FL, October 5, 1987.

225. How Will We Specify Concurrent Systems in the Year 2000?, Western Committee of the IEEE Computer Society, Lake Arrowhead, CA, September 16–18, 1987.

226. IFIP Working Group 2.3 Meeting, Pittsburgh, PA, August 15–19, 1988.

227. Fourth International Workshop on Software Specification and Design, ACM SIGSOFT, IEEE Computer Society, AFCET, The Alvey Programme, and LCRST, Monterey, CA, April 3–4, 1987.

228. Large Grained Parallelism, IEEE Computer Society, Providence, RI, October 27–29, 1986.

229. Testing and Proving: Two Approaches to Assurance, Naval Research Laboratory, in conjunction with COMPASS '86, Georgetown University, Washington, DC, July 9–11, 1986.

230. Third International Workshop on Software Specification and Design, ACM SIGSOFT, IEEE Computer Society, AFCET, the Alvey Programme, and LCRST, London, UK, August 26–27, 1985.

231. Verification Workshop III, DOD Computer Security Center, Watsonville, CA, February 19–21, 1985.

232. Workshop on Formal Aspects of Specification, The Alvey Programme, Imperial College, London, UK, October 22–24, 1984.

233. Workshop on Formal Software Development Methods, Dansk Datamatik Center (Denmark) and Standard Telephone and Cable (England), Copenhagen, Denmark, May 21–25, 1984.

234. Second International Workshop on Models and Languages for Software Specification and Design, IEEE Computer Society, LCRST, Oregon Graduate Center, and Laval University, Orlando, FL, March 30, 1984.

Grant and Gift Support

Current

- "Collaboration with Toyota Konpon Research," Toyota Konpon Research Institute, April 1, 2024–March 31, 2025. co-PI: Brand. $100,000.
- "CIC-E: COVID Information Commons Extension for Pandemic Recovery,"
  NSF, October 1, 2021–September 30, 2025. PI: Hudson, co-PI: Wing. $2,000,000.
- "Privacy-Enhancing Technologies and Systems,"
  Columbia-IBM Center for Blockchain and Data Transparency, $40,000. co-PIs: Geambasu and Wing.
- "Verifying Fairness in Machine Learning,"
  NSF, PI Wing. $320,000.
- "BD Hubs: NORTHEAST: The Northeast Big Data Innovation Hub,"
  NSF, June 2019–May 2024. PI Wing; co-PIs Vasant Hanovar, James Hendler, and Andrew McCallum, $4,000,000.

Past

- "Trustworthy AI,"
  NSF, March 1, 2022–February 28, 2023. $300,000.
- "US-UK AI Workshop"
  NSF, $38,417.
- "Formal Specification of Trust Properties for AI Systems,"
  Alfred P. Sloan Foundation, July 2020–June 2022. PI: Wing; co-PIs: Shipra Agrawal and Roxana Geambasu, $300,000.
- "Verifying Fairness in Machine Learning,"
  NSF, PI Wing. $320,000.
- "Efficient Formal Safety Analysis of Neural Networks,"
  JP Morgan, March 2019–March 2022. PI: Junfeng Yang, co-PIs Suman Jana and J.M. Wing, $150,000.
- "RAPID: NSF COVID Information Commons,"
  NSF, May 2020–October 2021. PI Wing, $200,000.
- "Scikit-learn maintenance and enhancement to gradient boosting and search,"
  Chan-Zuckerberg Initiative. December 2019-November 2021. Former PIs: Andreas Mueller and Nicolas Hug.$150,000.
- "TRIPODS+X: VIS: Creating an Annual Data Science Forum,"
  NSF Division of Mathematical Sciences, PI Dana Randall, co-PIs Newell Washburn and Srinivas Aluru, October 2018–November 2021, $200,000.
- "Static Analysis of Probabilistic Programs,"
  Facebook Research, September 2020–August 2021. PI: Wing, co-PI: Andrew Gelman, $50,000.
- "Cybersecurity Risk Conference,"
  NSF, September 2017–February 2021. PI, former PI: Kathleen McKeown.
- "BD Hubs: NORTHEAST: The Northeast Big Data Innovation Hub," NSF, October 2015–November 2021, $2,129,350.00. PI since August 2018. Former PI: Kathleen McKeown.
- Columbia-IBM Center for Blockchain and Data Transparency, July 2018–June 2021. PI.
- "ACM-IMS Interdisciplinary Summit on the Foundations of Data Science,"
  NSF, June 2019–May 2020. PI: Wing, co-PI: David Madigan, $49,862.
- Thong/Tse Columbia Data Science Institute Research Fund, July 2018–June 2019, $250,000.
- "Data for Good: Research Projects and Data Collaboratives," The Eric and Wendy Schmidt Fund for Strategic Innovation, July 2018–June 2019, $500,000.
- "Data Science Leadership Summit,"
  NSF CISE Information and Intelligent Systems 1821451, March 2018–February 2019, $41,472.
  Alfred P. Sloan Foundation, $20,000.
  Gordon and Betty Moore Foundation, $15,000.
- "Team for Research in Ubiquitous Secure Technologies,"
  NSF Science and Technology Center, $35 million, five years, renewed for five years: 2005-2015. Academic partners: UC Berkeley, Stanford, Carnegie Mellon, Cornell, Vanderbilt. PI: Shankar Sastry. CMU co-PI (Wing), starting Fall 2012.
- "Science of Cyber Security: Modeling, Composition, and Measurement,"
  ONR MURI, Stanford lead (PI: John Mitchell), June 2011–May 2016, $1,750,000 (CMU share).
- "TC: Medium: Semantics and Enforcement of Privacy Policies: Information Use and Purpose,"
  National Science Foundation, co-PI: Anupam Datta, August 2011–July 2015, $1,197,126.
- "Secure Composition of Systems and Policies,"
  A. Datta, R. Harper, L. Jia, and J.M. Wing, NSA-CMU Science of Security Lablet, July 2012–June 2013, $211,096.

- "Secure Composition of Systems and Policies,"
  A. Datta, L. Jia, and J.M. Wing, NSA-CMU Science of Security Lablet, December 2011–July 2012, $153,000.
- "Crowdsourced Program Verification,"
  co-PIs: Michael Ernst, Zoran Popovic, DARPA, April 2011–March 2012, $485,000.
- Google, unrestricted gift for Computer Science Department, 2010. $500,000.
- Google, unrestricted gift for undergraduate computer science program, Computer Science Department, 2010. $100,000.
- "Microsoft Research - Carnegie Mellon University Center for Computational Thinking,"
  Microsoft Corporation, 2010-2013, $1,500,000.
- "Microsoft Research - Carnegie Mellon University Center for Computational Thinking,"
  Microsoft Corporation, 2007-2010, $1,500,000.
- "An Attack Surface Metric,"
  SAP, November 2006–December 2007, $200,000. August-November 2008, $20,000.
- "Perpetually Available and Secure Information Systems,"
  Army Research Office, 60 months, PI: Pradeep Khosla. $35,531,264.
- "Project Olympus,"
  Heinz Foundation, 2006-2007, PI: L. Blum. $400,000.
- "Extracting Security Policies From Source Code,"
  CMU CyLab, September 1, 2006–August 31, 2007, $75,000
- "An Attack Surface Metric,"
  CMU CyLab, September 1, 2006–August 31, 2007, $75,000
- "Measuring Attack Surfaces,"
  CMU SEI, September 1, 2005–December 31, 2006, $137,000.
- "Security Through Interaction Modeling,"
  NSF CyberTrust, October 1, 2004-September 30, 2009, $6.4 million, Co-PIs: Mike Reiter, Bruce Maggs, Dena Tsamitis, and Chenxi Wang.
- "Entry and Exit Points,"
  CMU CyLab, September 1, 2005–August 31, 2006, $75,000
- "Software Composition Flaws,"
  CMU CyLab, September 1, 2005–August 31, 2006, $75,000
- "Software Design and Security,"
  CMU SEI, June 1, 2004–August 31, 2005, $200,000
- "Women@IT: Expanding the IT Pipeline at the Graduate Level and Beyond," Sloan Foundation January 1, 2004–December 2006. PI: Lenore Blum. $400,000.
- "Verification Tools for Autonomous and Embedded Systems,"
  National Science Foundation, J. Wing (PI), September 1, 2001–August 31, 2005. Co-PIs: R. Bryant, E. Clarke. $1,000,000.
- "Verification Tools for Embedded Systems,"
  Army Research Office, University Research Initiative, J. Wing (PI), May 1, 2001–April 30, 2006. Extended to July 28, 2007. Co-PIs: E. Clarke, D. Garlan, B. Krogh, and R. Simmons, $4,393,644.
- "Software Design and Security,"
  CMU CyLab, September 1, 2004–August 31, 2005, $70,000
- "A Formal Methods Tool Suite for Education,"
  National Science Foundation US-Western Europe, January 1, 2002–February 28, 2005, co-PI: Bernhard Steffan. $18,700.
- "Formal Verification Tools and Techniques for Autonomous Systems,"
  NASA/Ames, J. Wing (PI), January 1, 2001–December 31, 2003. Co-PIs: E. Clarke, D. Garlan, B. Krogh, and R. Simmons, $175,000.

- "Science-based Methods for Information Assurance Design and Assessment,"
  DARPA, April 2000–April 2002. PIs: T. Longstaff and J. Wing, $1,098,097.
- "Formal Methods for Affordable Avionics Software,"
  Lockheed Martin, 1999. $50,000.
- "A Framework for Verifying Security Protocols,"
  National Security Agency, January 1999–September 2000. PIs: E. Clarke and J. Wing, $200,000.
- "A Technology Investigation Supporting Software Architecture and Analysis for Evolution,"
  DARPA, June 1996–August 1999. PIs: D. Garlan and M. Shaw, $1,247,335.
- "Model Checking of Software Systems," (supplement)
  NSF, July 1998–December 1999. Co-PIs: D. Jackson and J. Wing, $16,977.
- "Model Checking of Software Systems,"
  NSF, September 1996–August 1999. Co-PIs: D. Jackson and J. Wing, $300,000.
- "Nitpick Development," NIST, August 1997–July 1998, $25,000.
- "Educational Infrastructure: TinkerTeach,"
  DARPA, August 1995–August 1997. Co-PI's: D. Garlan, M. Shaw, and J. Wing, $520,000.
- "Composable Software Systems,"
  DARPA, August 1993–July 1997. Co-PI's: D. Garlan, M. Shaw, and J. Wing, $4,301,900.
- "Object Management,"
  DARPA, August 1990–July 1993, $4,783,000.
- "First International Workshop on Larch,"
  NSF Cooperative Programs with Western Europe, July 1992, $9,975.
- "A Library of Concurrent Objects,"
  NSF Software Capitalization Program, July 1991–June 1992, $20,000.
- "Highly Concurrent Objects,"
  NSF/DARPA Joint Initiative on Parallel Computing Theory, July 1989–July 1992. Co-PIs: S. Brookes and J. Wing (original co-PI: M. Herlihy), $300,000.
- "Visual Specifications of Software Systems,"
  National Computer Security Center, September 1988–December 1991, $331,242.
- "Research on Concurrent Systems,"
  Office of Naval Research, July 1989–September 1991, $100,000.
- "Reliable Distributed Systems,"
  DARPA, June 1987–July 1990. Original PI: A. Spector, $3,951,000.
- "Formal Methods for Reasoning About Distributed Systems,"
  NSF Division of Computer and Computation Research, August 1987–July 1989, $62,752.
- "A Study of the Specification of Large Programs,"
  NSF Engineering Research Initiation Grant Program. June 1984–August 1987, $47,722.
- "A Geometric Reasoning Laboratory,"
  USC Faculty Research and Innovation Fund. 1985. Co-PI's: F. Arbab, M. Chignell, B. Karasek, B. Khoshinevis, and J. Wing, $30,000.

Educational Activities

Courses Taught

Post-graduate

- Formal Methods, Software Engineering Evangelists for Korea (SEEK) Program, Institute for Software Research, International, Carnegie Mellon, Summers 2000, 2001, 2002.
- Formal Methods, School of Computer Science Summer School, Carnegie Mellon, Summer 1996.
- Formal Methods, Carnegie Mellon Information Networking Institute: Advanced Training Institute, Mid-Career Program, M. Sirbu, Director, Fall 1989, Spring 1990.
- Science of Programming, Institute for Retraining in Computer Science (IFRICS), sponsored by the MAA, Potsdam, NY, Summer 1986.
- Design and Implementation of Modular Software, Intermetrics, Inc., Cambridge, MA, Fall 1982; MIT, Summer 1982, 1980; University of California at Santa Cruz, Summer 1980, laboratory assistant.

Graduate

- Privacy-Preserving Technologies, Columbia, Spring 2019.
- Privacy Research Seminar, CMU, Spring 2011.
- Software Security, CMU, Spring 2004, co-instructor.
- Analysis of Software Artifacts, CMU, MSE Program, Spring 1995, 1996; Fall 2001.
- Methods of Software Development, CMU, MSE Program, Fall 2000.
- Security and Cryptography, CMU, Fall 1997, 1998, 1999.
- Software Systems Core Course, CMU, Fall 1996.
- Models of Software Systems, CMU, MSE Program, Fall 1993, 1994, 1995, 2005, 2006.
- Reasoning about Concurrent and Distributed Systems, CMU, Spring 1994.
- Specifications in Software Development, MIT, Fall 1992.
- Programming Systems Core, CMU, Fall 1990, 1991.
- Advanced Topics in Formal Methods, CMU, Spring 1990.
- Term Rewriting Systems and Beyond (as Illustrated by Larch), CMU, Spring 1989.
- Recent Developments in the Specification of Concurrent Systems, CMU, Spring 1988.
- Language Issues in Distributed Computing, CMU, Fall 1986.
- Task-Level Concurrent Programming, CMU, Spring 1986.
- Issues in the Specification and Design of Concurrent Systems, USC, Spring 1985.

Undergraduate

- Functional Programming, CMU, Fall 2012.
- Principles of Programming, CMU, Spring 1999, 2000, 2001, 2002.
- Computer Systems Engineering (6.033), MIT, Spring 1992.
- Software Engineering, CMU, Spring 1991, 1993, 1997, 1998.
- Operating Systems, CMU, Fall 1988.
- Comparative Programming Languages, CMU, Spring 1986, 1987; Fall 1987, 1989.
- Translation of Programming Languages, USC, Fall 1984, Spring 1985.
- Concepts in Programming Languages, USC, Spring 1984.
- Fundamentals of Computer Science, Part II, USC, Fall 1983, Spring 1984.

Current Students

Doctoral

1. Samuel Deng, secondary advisor, (primary advisor: Daniel Hsu), 2021–.

Bachelor's

1. Millie Chen, Computer Engineering.
2. Ashish Dubey, Economics and Political Science.
3. Nicole Pi, Computer Science.
4. Yilin Zhao, Physics.

Former Students

Doctoral

1. Ryan Bernstein, "Abstractions for Probabilistic Programming to Support Model Development," April 2023.
2. Michael Tschantz, "Formalizing and Enforcing Purpose Restrictions," May 2012.
   International Computer Science Institute, UC Berkeley, Berkeley, CA.
3. Pratyusa Manadhata, "An Attack Surface Metric," August 2008,
   Micro Focus, Sacramento, CA.
4. Oleg Sheyner, "Scenario Graphs and Attack Graphs," May 2004,
   Chimera Capital Management, Southborough, MA. ACM Dissertation Award Nominee 2004. SCS Dissertation Award 2004.
5. Theodore Wong, "Decentralized Recovery for Survivable Storage Systems," May 2004,
   23andMe, Bay Area, CA.
6. Rob O'Callahan (joint with D. Jackson), "Generalized Aliasing as a Basis for Program Analysis Tools," November 2000.
   Mozilla, New Zealand, ACM Dissertation Award Honorable Mention 2002.
7. Hao-Chi Wong (Pure and Applied Logic), "Protecting Individuals' Interests in Electronic Commerce Protocols," October 2000.
   Intel, CA.
8. Craig Damon, "Selective Enumeration," (joint with D. Jackson), August 2000.
   Vermont Technology College, Burlington, VT.
9. Darrell Kindred, "Theory Generation for Security Protocols," April 1999.
   SPARTA, Columbia, MD.
10. Amy Moormann Zaremski, "Signature and Specification Matching," January 1996.
    Xerox Webster Research Center, Rochester, NY.
11. Scott Nettles, "Safe and Efficient Persistent Heaps," December 1995.
    University of Texas, Austin, TX.
12. J. Gregory Morrisett, "Compiling With Types" (joint with R. Harper), December 1995.
    Cornell University, Ithaca, NY.
13. Fritz Knabe, "Language Support for Mobile Agents," December 1995.
    Verily Life Sciences, Boston, MA.
14. Bruce L. Horn, "Constrained Objects," (joint with J. Morris), December 1993.
    Consultant, Bay Area, CA.
15. Richard A. Lerner, "Specifying Objects in Concurrent Programs," May 1991.
    Clickshare Service Corporation, Springfield, MA.

16. David L. Detlefs, "Concurrent, Atomic Garbage Collection," October 1990.
    Facebook, Seattle, WA.

Doctoral Secondary Advisor

1. Miguel Arroyo, " Bespoke Security for Resource Constrained Cyber-Physical Systems," secondary advisor, (primary advisor Simha Sethumadhavan), October 2020.
   Rockstar Games, Carlsbad, CA.

Doctoral Committee Member

Yumou Wei (Applied Physics and Applied Mathematics), May 2024; Jeffrey Ryan Bender, April 2023; Xueqing Liu (Biomedical Engineering), Deember 2021; Shayak Sen; May 2018; Will Klieber, August 2013; Sicun (Sean) Gao (Pure and Applied Logic Program, Philosophy), October 2012; Kami Vaniea, September 2012; Jason Franklin, May 2012; Elie Burzstein (LSV, ENS-Cachan, CNRS, INRIA), November 2008; Murali Talipur, December 2006; Sanjit Seshia, May 2005; Michael McDougall (University of Pennsylvania), December 2004; Shawn Butler, May 2003; Adrian Perrig, December 2001; Will Marrero, June 2001; Marius Minea, January 2000; Juergen Dingel, November 1999; John Ockerbloom, January 1998; William Blackmon (Civil Engineering), July 1997; Charles Krueger, July 1997; William Courtright (Electrical and Computer Engineering), April 1997; David Steere, January 1997; Susan Older, December 1996; Qi Lu, May 1996; Chun Gong (University of Pittsburgh), October 1995; Bernhard Humm (University of Wollongong, Australia), September 1994; Nico Plat (Technical University of Delft, The Netherlands), September 1993; Jerry Burch, August 1992; Allan Heydon, October 1991; Olin Shivers, May 1991; John Baugh (Civil Engineering), August 1989.

Master's

1. Samuel Deng (co-advisor, with Suman Jana), 2019-2021.
2. Oren Dobzinski, ECE, "Alert Abstraction Using Attack Graphs," May 2006.
3. E. Chaos Golubitsky, Information Networking Institute Program, "Measuring Attack Surfaces on Open Source IMAP Servers," May 2005.
4. Meera Sridhar, CSD 5th Year Scholars Program, "Experiments Using an Attack Graph Toolkit," August 2004.
5. Jose Rivera, CMU MSE program, independent study, "Development of a Concurrent Terminal Emulator using Formal Methods," October 1995.
6. Chee Chew, MIT Co-op thesis, "Creator: An Interactive Application Builder," May 1993.
7. Tini Widjojo (USC), 1984–1985.
8. Sharon Anderson (USC), 1983–1985.

Bachelor's

1. Meera Sridhar, "The Honeywell Sensor Voter Algorithm: A Case Study," December 2002.
2. Yuchung Ng, "A Nitpick Specification of IPv6," May 1997.
3. Mandana Vaziri-Farahani, "Model Checking Cache Coherence Protocols for Distributed File Systems," ECE honors thesis, May 1995. Runner-up in the First Computing Research Association Outstanding Female Undergraduate Competition.
4. Leslie Blanco, Fall 2023.

Visiting Scholars

Faculty

- Michael Loui, Professor of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, 2000–2001.

Scientists

- Kiyotaka Kuroda, engineer from Mitsubishi Electric Co., Japan, 1994–95.

Postdocs

- Dilsun Kaynar, 2006–07.

Ph.D. Students

- Morten Soerensen, Technical University of Denmark, Lyngby, Denmark, 1994–95.
- Chun Gong, Academia Sinica, Beijing, China, 1988–90.

Other Educational Activities

Participant

- Faculty Seminars on Teaching, CMU, led by E. Fenton, Spring 1987. Series of six lectures on how to improve one's teaching skills.

Video

- CMU Teaching Center. The Center used a videotape of one of my operating systems lectures for university-wide seminars for graduate students and new faculty.

Service Activities

National Organizations

Awards, Honors

- Trailblazers in Higher Education, City and State of New York, 2024.
- National Academy of Engineering, Member 2024.
- National Academy of Innovators, Fellow 2022.
- Honorary Doctor of Technology (Tekn. Dr.), Linkoping University, Linkoping, Sweden, May 2020.
- Hero of Computer Science, Computer Science Department, University of York, 2020.
- Columbia College of Dental Medicine Birnberg Research Award, 2018.
- Microsoft Executive Briefing Center Hero Award, 2017.
- Association for Computing Machinery (ACM) Distinguished Service Award, 2014.
- SIGSOFT Retrospective Paper Award, 2012.
- Computing Research Association Distinguished Service Award, 2011.
- American Academy of Arts and Sciences, Fellow 2010.
- American Association for the Advancement of Science, Fellow 2007.
- Association for Computing Machinery, Fellow 1998.
- Institute of Electrical and Electronic Engineers (IEEE), Fellow 2003.
- Phi Beta Kappa, Tau Beta Pi, Eta Kappa Nu, Sigma Xi.

Boards, Committees

- Special Competitive Studies Project AI Task Force, 2024–.
- MIT Corporation, 2024-2029.
- New York City AI Advisory Network, Office of Technology and Innovation, 2024–.
- Computing Research Association Board, ACM representative, 2023–2025.
- American Association of Universities, Senior Research Officers Steering Committee, 2023–2026.
- NSDD-189 Workshop Planning Committee, National Academies of Science, Engineering, and Medicine, 2022.
- New York State Commission on Artificial Intelligence, Robotics, and Automation, 2020–.
- American Academy of Arts and Sciences, Board of Directors, 2021–; Council, 2020–2024; Advisory Committee on AI, 2023–.
- NSF Center on Trustworthy ML, 2020–2021.
- National Academies of Science, Engineering, and Medicine, US Science and Innovation Leadership Committee, co-chairs Drs. Erica Fuchs and Eric Lander, 2019–2020.
- National Academies of Science, Engineering, and Medicine, Committee on National Statistics, 2019–2022.
- Task Force on Automated Decision Systems, NYC Mayor's Office, 2018–2019.
- National Library of Medicine Blue Ribbon Panel, 2018–2019.
- Science, Engineering, and Technology Advisory Committee, American Academy for Arts and Sciences, Advisory Board, 2017–2021.
- Alibaba DAMO Technical Advisory Board, 2017–2020.
- Association for Women in Mathematics, Advisory Board, 2017–.
- American Academy of Arts and Sciences, Class I Section 6 (Computer Science) membership panel. Member 2011–2017, Chair 2017–2020.

- NSF Accountable Decision Systems Advisory Board, 2017–.
- Initiative on Science, Engineering, and Technology, American Academy for Arts and Sciences, Advisory Board, 2016–2017.
- Institute for Pure and Applied Mathematics, member of Board of Trustees, 2016–2020.
- American Association for the Advancement of Science, Section T (Information, Computing and Communication), Chair-Elect, 2015–2016; Chair, 2016–2017.
- Wallenberg Autonomous Systems Program Scientific Advisory Board, Lund, Sweden, 2015–2018.
- International Jury for its START and Wittgenstein Prizes, Austrian Science Fund, 2015–2018.
- Heidelberg Institute of Theoretical Studies, Scientific Advisory Board, Heidelberg, Germany, 2014–2016.
- American Academy of Arts and Sciences Committee on New Models for the US Science and Technology Policy, 2014.
- Gordon and Betty Moore Foundation Data-Driven Discovery Innovators Award Selection Committee, 2014.
- Heidelberg Laureates Forum Committee, 2012–2016.
- NSA Board of Judges, Best Scientific Cybersecurity Paper, 2012–2018.
- DARPA Information and Science Technology Panel (ISAT), member, 1999–2002; Vice Chair, 2012–2014; Chair, 2014–2016; Steering Committee, 2012–2018.
- CRA Committee on Best Practices for Hiring, Promotion, and Scholarship, 2013–2014.
- ACM Computing Surveys Editor-in-Chief Search Committee, 2012–2013.
- Concurrency Made Easy, External Advisory Board, European Research Council Grant, PI: Bertrand Meyer, ETH Zurich, 2012–.
- General Electric Software Academic Advisory Board, 2011-2012.
- Computing Research Association Board of Directors, 2011-2013.
- ACM Infosys Awards Committee, 2012–; chair, 2013–2014.
- JACM Task Force, 2011–2012.
- Federal Steering Committee on the Strategic Health IT Advanced Research Projects (SHARP) Program, The Office of the National Coordinator for Health Information Technology (ONC), 2010.
- Networking and Information Technology Research and Development (NITRD) Planning Group for Health Information Technology, co-chair, 2009–2010.
- National Science and Technology Committee (NSTC) Subcommittee on Quantum Information Science, co-chair, 2009–2010.
- Networking and Information Technology Research and Development (NITRD) Senior Steering Group for Cyber Security, co-chair, 2008–2010.
- Networking and Information Technology Research and Development (NITRD), co-chair, 2007–2010.
- CRA Image of Computing Task Force, advisory board, 2007.
- Networking and Information Technology (NITRD) Technical Advisory Group, President's Council of Advisors on Science and Technology (PCAST), July 1, 2006-September 30, 2007.
- ACM Council, Member-at-Large, 2006–2007.
- ACM Task Force on China, co-chair, 2006–2007.
- ACM Education Council, 2006.
- Microsoft Research and Programs Advisory Board, July 2006–June 2007.
- Microsoft Faculty Fellowship Committee, 2006–2007.

- Idaho National Laboratory National and Homeland Security Strategic Advisory Committee, 2005–2007.
- The National Academies: Computer Science and Telecommunications Board, 2001-2007, member; 2004–2005, Chair.
- Sloan Foundation Fellowship Award Committee, 2003–2009.
- Intel Research Pittsburgh Advisory Board, 2005–2007.
- Microsoft Trustworthy Computing Academic Advisory Board, 2003–2007, 2010–.
- Institute for Security Technology Studies Advisory Committee, Dartmouth College, 2004–2006.
- Committee on Science and Technology for Countering Terrorism: Information Technology, 2001–2002.
- European Network of Excellence on Advanced Cooperating Tools for Specification and Validation, 2002.
- ACM Kanellakis Award, 1999-2004. Committee Chair, 2002–2003.
- National Science Foundation (NSF) Scientific Advisory Board, Computer and Information Science and Engineering Directorate, 1995–1998.
- National Security Agency (NSA) Scientific Advisory Board, Ft. George Meade, MD., 1994–1996.
- Council for International Exchange of Scholars, Discipline Advisory Committee for Fulbright Scholar Awards, 1991–1994.
- ACM Karl V. Karlstrom Outstanding Educator Award Committee, 1993–1996. Chair, 1994–1995.
- Educational Testing Service, Quantitative Exam for Engineering GRE, 1993–1994. Examiner for the GRE Computer Science Test, 1988–1990.

Lecturer

- ACM National Lecturer, 1991–1992.
- ACM Distinguished Speaker, 2006–2007, 2010–2014.
- Phi Beta Kappa Visiting Scholar, 2013–2015.

Regional Organization

Honors

- Distinguished Daughter of Pennsylvania, 2008.
- Women in Science Award, Women and Girls Foundation of Southwest Pennsylvania, 2005.

Journal Organizations

Advisory Board

- Harvard Data Science Review, 2018–.

Editorial Board

- Proceedings of the National Academics, guest editor, 2024.
- Harvard Data Science Review, Diving into Data, column co-editor, 2020–2021.
- ACM/IMS Transactions on Data Science, Senior Associate Editor, 2021–. Formerly ACM Transactions on Data Science, Senior Associate Editor, 2018–2021.
- Foundations and Trends in Privacy and Security, Now Publishers, co-editor in chief, 2013–2022.
- Lecture Notes in Computer Science Subline on Advanced Research in Computing and Software Science, 2009–.

- Communications of the Association for Computing Machinery, 2007–2021.
- International Journal of Software and Informatics, 2007–2016.
- Journal of the Association for Computing Machinery, 1999–2018.
- Software Tools for Technology Transfer, 2001–2016.
- Formal Aspects of Computing Journal, British Computer Society, Springer-Verlag, 1988–; North American Editor, 1997–.
- Formal Methods in System Design, 1994–2021.
- Journal of Information Science and Engineering, 2005–2011.
- IEEE Transactions on Dependable and Secure Computing, 2006–2010.
- ACM Transactions on Programming Languages and Systems, 1992-1999.
- ACM Transactions on Software Engineering and Methodology, 1989-1999.
- Proceedings of the IEEE, 1995-1996.

Guest Editor

- Three special issues on FM'99: *Formal Aspects of Computing Journal*, vol. 12, no. 3, September 2000, *Formal Methods in System Design*, vol. 17, no. 3, December 2000, *IEEE Transactions on Software Engineering*, vol. 26, no. 8, August 2000; with Jim Woodcock.
- Special issue on Software Specification and Verification, *Formal Methods in System Design*, vol. 8, no. 2, March 1996.

Steering Committee

- LNCS Advanced Research in Computing and Software Science (ARCoSS).

Conference and Workshop Organizations

General Chair

- ACM/IMS Foundations of Data Science, October 19–20, 2020.

Program Chair

- US-UK AI Workshop, sponsored by NSF and EPSRC, virtual event, May 3–4, 2022, co-chair with Michael Wooldridge.
- Machine Learning in Science and Engineering, virtual event, December 14-15, 2020, co-chair with Dana Randall and Newell Washburn.
- Trustworthy AI Symposium, New York, NY, October 30–November 1, 2019, co-chair with Shipra Agrawal.
- D4GX (Data for Good Exchange), Bloomberg, New York, NY, September 15, 2019, co-chair with Sreejith Menon.
- First Data Science Leadership Summit, New York, NY, March 26, 2018.
- First International Symposium on Secure Software Engineering, Washington, DC, March 13–15, 2006, co-chair with Anthony Hall.
- Formal Methods 1999, Toulouse, France, Fall 1999, co-chair of technical symposium with Jim Woodcock.
- Interface Definition Languages Workshop, Portland, OR, January 20, 1994.
- First International Workshop on Larch, Endicott House, Dedham, MA, July 13–15, 1992, co-chair with Ursula Martin.
- Second Workshop on Large Grained Parallelism, IEEE Computer Society, Hidden Valley, PA, October 1987.

Workshop Organizer

- US/UK Workshop on AI, sponsored by NSF and EPSRC, May 3–4, 2022, virtual event, co-chair with Michael Wooldridge.
- Data Science Leadership Summit, sponsored by NSF, Alfred P. Sloan Foundation, and Gordon and Betty Moore Foundation, New York, NY, March 26, 2018.
- NSF Workshop on Enabling Computer and Information Science and Engineering Research and Education in the Cloud, Alexandria, VA, January 8–9, 2018.
- Privacy Workshop, sponsored by CCC, ITIF, and CMU, Washington, DC, March 4, 2013, co-chair with Daniel Castro.
- Software Security, UW-MSR-CMU Summer Institute, Skamania Lodge, Stevenson, WA, June 15–June 18, 2003, co-chair with Jim Larus and John Zahorjan.
- Mobility and Security, ISAT Study Group Workshops I and II, Pittsburgh, PA, January 10–11, 2000; Oakland, CA, March 27–28, 2000, co-chair with George Cybenko.
- Model Checking and Security Protocols, workshop associated with Logic in Computer Science, Bloomington, Indiana, June 25, 1998, co-chair with Nevin Heintze.
- Formal Methods Working Group, ACM Workshop on Strategic Directions in Computing Research, MIT, Cambridge, MA, June 14–15, 1996, co-chair with Edmund Clarke.
- Interface Definition Languages Workshop, Portland, OR, January 20, 1994.
- First International Workshop on Larch, Endicott House, Dedham, MA, July 13–15, 1992, co-organized with Ursula Martin.

Session Chair

- "Anonymity and Accountability," NSF Secure and Trustworthy Computing (SaTC) PI meeting, co-chair with Rebecca Wright, National Harbor, MD, November 28, 2012.
- "Interoperability" track, Research and Development for the NII: Technical Challenges, Gaithersburg, MD, NIST, February 28–March 1, 1994.
- "Software Development for Parallel and Distributed Systems," 13th International Conference on Software Engineering, Austin, May 13–17, 1991.
- "What are the Theoretical and Practical Limitations of Formal Methods?," Formal Methods 1989, Nova Scotia, July 24–27, 1989.
- "Role of Formal Specifications," Testing and Proving: Two Approaches to Assurance, Naval Research Laboratory Invitational Workshop, Washington, DC, July 9–11, 1986.

Program Committee

- Machine Learning in Science and Engineering, Annual Data Science Forum, Atlanta Georgia, June 10–12, 2019.
- Women in Data Science, Annual Data Science Forum, Atlanta Georgia, June 9, 2019.
- Second Data Science Leadership Summit, Park City, UT, October 12–13, 2018.
- Principles of Distributed Computing, Paris, France, July 15–19, 2014.
- Logic in Computer Science, New Orleans, LA, June 25–28, 2013.
- Moving Target Research Symposium, Cyber-Physical Systems Virtual Organization, June 11, 2012.
- International Conference on Information and Communications Security, Beijing, China, November 23–26, 2011.
- Computer Research Association (CRA) Snowbird Conference, Snowbird, Utah, July 2006.
- ACM Symposium on Information, Computer and Communications Security, Taipei, Taiwan, March 21–23, 2006.
- 6th International Conference on Formal Engineering Methods, Seattle, October 2004.

- Symposium on Computer Security, IEEE GlobeCom 2003, San Francisco, December 2003.
- Monterey Workshops: Radical Innovations of Software and Systems Engineering in the Future, Venice, Italy, October 2002.
- IEEE Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises, Workshop on Enterprise Security, Pittsburgh, PA, June 10–12, 2002.
- ACM Principles of Distributed Computing, Monterey, CA, 2002.
- Formal Methods Europe 2002, Copenhagen, Denmark.
- Formal Methods 1999, Toulouse, France.
- OOPSLA, Vancouver, Canada, 1998.
- European Joint Conference on Theory and Practice/Fundamental Approaches to Software Engineering, Lisbon, Portugal, 1998.
- International IEEE Conference on Formal Engineering Methods, Hiroshima, Japan, 1997.
- ACM SIGPLAN Symposium on Prog. Lang. Design and Impl., Las Vegas, NV, 1997.
- ACM Principles of Distributed Computing, Philadelphia, PA, 1996.
- First Workshop on Formal Methods in Software Practice, San Diego, CA, 1996.
- IEEE COMPASS, Gaithersburg, MD, 1995.
- Workshop on Industrial-Strength Formal Specification Techniques, Boca Raton, FL, 1995.
- 17th International Conference on Software Engineering, Seattle, WA, 1995.
- ACM SIGSOFT Foundations of Software Engineering Conference, New Orleans, LA, 1994.
- IEEE COMPASS, Gaithersburg, MD, 1994.
- 16th International Conference on Software Engineering, Italy, 1994.
- ACM Symposium on Operating Systems Principles, Ashville, NC, 1993.
- First International Conference on Requirements Engineering, San Diego, CA, 1993.
- History of Programming Languages, Boston, MA, 1993.
- First International Workshop on Larch, Dedham, MA, 1992.
- ACM SIGPLAN Symposium on Prog. Lang. Design and Impl., San Francisco, CA, 1992.
- 14th International Conference on Software Engineering, Australia, 1992.
- International Conference on Computer Languages, San Francisco, CA, 1992.
- OOPSLA, Phoenix, AZ, 1991.
- Sixth Workshop on Software Specification and Design, Como, Italy, 1991.
- ACM Principles of Distributed Computing, Montreal, Canada, 1991.
- 13th International Conference on Software Engineering, Austin, TX, 1991.
- Distributed Computing Systems, Paris, France, 1990.
- Third ACM Testing Analysis and Verification Symposium, Key West, FL, 1989.
- Third Workshop on Large Grained Parallelism, SEI, Pittsburgh, 1989.
- Fifth Workshop on Software Specification and Design, Pittsburgh, PA, 1989.
- Tenth Tunisian French Computer Science Conference, Tunisia, 1989.

Local Arrangements Chair

- Fifth Workshop on Software Specification and Design, Pittsburgh, May 1989.

Steering Committee, Advisory Board

- National Academies of Science, Engineering, and Medicine, Trustworthy AI, March 3-4, 2021.
- ACM/IMS 2019 Event on Data Science, San Francisco, CA, June 15, 2019.
- AnOther{AI}ra Convening, Advisory Board, 2019.
- AI and Law, Columbia Law Review, April 5, 2019.

- Workshop on Quality of Protection, September 2005.
- NATO Advanced Research Workshop on Cyberspace Security and Defense, International Advisory Committee, 2003–2004.
- Formal Methods in Education, 2000–.
- International Federation for Computational Logic, 1999–2002.
- Logic in Computer Science, 1997–2003.
- Algebraic Methodology and Software Technology, 1995–.
- International Workshop on Software Specification and Design

Refereeing, Reviewing

Journals
ACM Transactions on Programming Languages and Systems, ACM Transactions on Computer Systems, Communications of the ACM, ACM Computing Surveys, ACM Computing Reviews, Harvard Data Science Review, IEEE Communications Magazine, IEEE Computer, IEEE Software (special recognition), IEEE Transactions on Computers, IEEE Transactions on Dependable and Secure Computing, IEEE Transactions on Knowledge and Data Engineering, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Software Engineering, Information Processing Letters, International Journal of Computers and Applications, Journal of Internetworking: Research and Experience, Journal of Symbolic Logic, New Media and Society.

Conferences
Thirteenth International Conference on Information and Communications Security 2011, International Symposium on Fault-Tolerant Computing Systems 1998, Hawaii International Conference on System Sciences 1988 and 1990, ACM Principles of Programming Languages Symposium 1987, Logic in Computer Science 1987, Fourth International Workshop on Software Specification and Design 1987, Sixth International Conference on Software Engineering, ACM LISP and Functional Languages Conference 1986, ACM Functional Programming Languages and Computer Architecture 1981.

Grant Proposals
Army Research Office; National Science Foundation; National Computer Security Center; National Institutes of Health; State of Idaho; University of California; Belgium Office for Scientific, Technical and Cultural Affairs; Natural Sciences and Engineering Research Council of Canada; Hong Kong Research Grants Council; The Israel Academy of Sciences and Humanities (Basic Research Foundation); Swedish Embassy, Office of Science and Technology, Washington, DC; The Netherlands Computer Science Research Foundation; Swiss National Science Foundation; Council of Physical Sciences of the Netherlands Organization for Scientific Research; Vienna Science and Technology Fund.

Books
Addison-Wesley Publishing Company, Reading, MA; Boyd and Fraser Publishing Company, Boston, MA; Cambridge University Press, Stanford, CA; McGraw-Hill Book Company, New York, NY; The MIT Press, Cambridge, MA; Charles E. Merrill Publishing, Co., IL; Prentice-Hall, Englewood Cliffs, NJ Wadsworth Publishing Company, Belmont, CA.

Other
National Research Council, Computer Science and Telecommunications Board, 2012-2013; National University of Ireland Maynooth, 2011; National Science Foundation China, December 16-22, 2010; National Research Council, Computer Science and Telecommunications Board, "Trust in Cyberspace," 1997–1998; National Research Council, Commission on Engineering and Technical Systems, 1992.

University-wide Service

University

- Research Computing Executive Committee, Columbia University, chair, 2021-.
- NASA Goddard Institute for Space Studies (GISS)-Columbia Steering Committee, Columbia University, chair, 2021-.
- Chazen Institute, Columbia Business School, Global Advisory Board, 2021-.
- Columbia Precision Medicine Initiative Coordinating Committee, Columbia University, 2020-.
- Data and Health/Medicine Council, Columbia University, co-chair, 2020-2021.
- Research Leadership Coordination Committee for COVID-19, University Research Committee for COVID-19, Columbia University, 2020-.
- Columbia Population Research Center, Columbia University, Internal Advisory Board, 2019-.
- Columbia World Projects, Advisory Board, ex-officio member, 2018-.
- Irving Institute for Clinical and Translational Research, Internal Advisory Committee, 2017-.
- Research Computing Executive Committee, Columbia University, 2017-.
- Foundations for Research Computing, Columbia University, 2017-.
- Carnegie Mellon School of Computer Science Advisory Board, 2017-2021.
- UK Prestigious Fellowship Committee, 2011.
- Research Review Committee, 2007.
- International Committee, 2006–2007.
- Committee on Globalization, 2005.
- Carnegie Mellon CyLab Technical Advisory Board, 2003–2007.
- Diversity Advisory Council, CMU, 1999–2002.
- Associate Deans on Graduate Policy, CMU, 1998–2004.
- Presidential Search Committee, CMU, 1996–1997.
- Committee on Tenure Level Appointments, CMU, 1993–1995.
- Committee on Special Faculty Appointments, CMU, 1989–1991.
- Faculty Senate, CMU, 1988–90.
- Faculty Affairs Council, CMU, 1988–1990.
- Faculty Senate Elections Committee, CMU, 1989–1990.
- Task Force on the Appointment and Tenure Policy, CMU, 1989–1990, 1993–1994.
- President's Distinguished Lecture Series Committee, CMU, 1988–1990.
- Writing Across the Curriculum Ad-hoc Committee, CMU, 1987.

School

- SCS Hiring Czar, CMU, 2000–2002.
- SCS Self-Assessment Committee, CMU, 1998.
- Master's of Software Engineering Program, core curriculum redesign, 1993.
- SCS Policy Committee, SCS Council, CMU, 1992–2007.
- Dean Search Committee, CMU, 1991–1992.
- Programming Systems Syllabus Revision Ad-hoc Committee, CMU, 1986–1987, 1989–1990.
- Programming Systems Qualifications Committee, CMU, 1986–1989.
- Master's of Software Engineering Program, curriculum review, 1989;
- Graduate Admissions Committee, CMU, 1988–1989.

Department

- Faculty Recruiting, Columbia, 2017–2019.
- Speakers Club, CMU, 1999–2002.

- Ph.D. Program Committee, CMU, 1998–1999.
- Doctoral Review Committee, CMU, 1995–2007. Chair 1996–2004.
- Qualifier Review Committee, CMU, 1995–1996.
- Department Policy (Silver Oaks, SDRC) Committee, CMU, 1994–1999.
- Programming Systems Coordinator, CMU, 1993–2000.
- Faculty Hiring Committee, CMU, 1993–95, 1996–1997.
- Computer Science Graduate Admissions Committee, USC, 1984–1985.
- Computer Science Colloquia, Committee Chair, USC, 1983–1984.

Other Universities

- MIT Corporation Visiting Committee for Sponsored Research, 2023–2027.
- MIT Institute for Data, Systems, and Society Visiting Committee, 2019–2023.
- Boston University Hariri Institute for Computing Advisory Board, 2018–.
- Michigan Institute for Data Science External Advisory Board, 2018–2021.
- Carnegie Mellon School of Computer Science Advisory Board, 2017–2021.
- University of Oklahoma, Blue Ribbon Panel on Research Cyberinfrastructure, 2012.
- Case Western Reserve University, School of Nursing, Dean's Advisory Board, 2012.
- Chinese University of Hong Kong, Visiting Committee on Information Sciences, 2011.
- University of Washington, Computer Science and Engineering Department, Review Committee, external member, 2011.
- Tulane University, Computer Science Task Force, 2010–.
- Chinese University of Hong Kong, Advisory Board, 2005–2007
- Academia Sinica External Review Committee, Taipei, Taiwan, December 8–9, 2003.
- Columbia University Computer Science Department External Review Committee, 2003.
- MIT Aeronautics and Astronautics Department Visiting Committee, 2000–2007.
- MIT Electrical and Computer Science Engineering Department Visiting Committee, 1999–2007, 2014–2018.
- University of Michigan, Computer Science Program, Letters of Arts and Sciences, Visiting Committee, April 1999
- University of Pennsylvania, Computer Science Department, Department Chair Search Committee, external member, 1999.

Other Professional Activities

Advisory Board

- AILens, President and CEO Anupam Datta, 2018-.
- Knowledge AI (C.AI), 2019–2022.
- AIFI, Artificial Intelligence Finance Institute, 2018–2022.
- Mu Security, Sunnyvale, 2006–2007.

Consultant

- General Electric.
- Fujitsu Laboratories America, Sunnyvale, CA.
- Microsoft Research, Redmond, WA.
- European Space Agency.
- Lockheed Martin.

- Digital Equipment Corporation, Technical Languages and Environments, Spit Brook, NH.
- Digital Equipment Corporation, Systems Research Center, Palo Alto, CA.
- Institute of Software, Academia Sinica, Beijing, China.
- Mellon Institute, Pittsburgh, PA.
- System Development Corporation, Santa Monica, CA.
- Jet Propulsion Laboratory, Pasadena, CA.

Visiting Professor

- National University of Singapore, hosted by Dr. Jin Song Dong, August 1–5, 2000.
- University of Saarbrucken, Germany, hosted by Dr. Jacques Loeckx, June 1984.
- Academia Sinica, Jiao Tong University, China University of Science and Technology, hosted by Prof. C.S. Tang, Beijing, Xi'an, Shanghai, Hefei, China, May 1988.