

# **Asim Roy**

## **Professor of Information Systems**

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## **Asim Roy**

### **Education:**

**Ph.D.**, Operations Research, University of Texas at Austin, Austin, Texas, Dec 1979

**M.S.**, Operations Research, Case Western Reserve University, Cleveland, Ohio, June 1977

**B.E.**, Mechanical Engineering, University of Calcutta, Calcutta, India, 1971

**Graduate Studies**, Industrial Engineering, Rutgers University, New Brunswick, New Jersey, Spring, 1975

### **Professional Experience:**

Professor August 1999 –	Information Systems Dept. Arizona State University Tempe, Arizona 85287
Associate Professor August 1989 – July 1999	Information Systems Dept. Arizona State University
Visiting Scholar Spring, 1991	Psychology Dept. (David Rumelhart's Group) Stanford University
Assistant Professor July 1983 - August 1989	Management Science & Information Systems Arizona State University
Faculty Research Participant Summer, 1988	Artificial Intelligence Group Robotics and Intelligent Systems Engineering Physics and Math. Division Oak Ridge National Laboratory
Assistant Professor January 1983 - June 1983	Department of Decision Sciences College of Business Administration University of Nebraska, Omaha
Manager, Optimization Center October 1981 - August 1982	Execucom Systems Corporation Austin, Texas
Planning Consultant December 1979 - October 1981	Execucom Systems Corporation Austin, Texas
Mayo Clinic-ASU Alliance Fellow Summer, 2017	Mayo Clinic Rochester, MN & Jacksonville, FL

## **Publications in Refereed Journals / Books:**

1. **Roy, A.**, Minai, A. A., Thivierge, J. P., Achler, T., & Weng, J. (2024). What AI and Neuroscience Can Learn from Each Other—Open Problems in Models and Theories. *Cognitive Computation*, 16(5), 2331-2333.
2. **Roy, A.** (2023). Space-Based Moving Target Indicators. *Phalanx*, 56(4), 16-23.  
<https://www.jstor.org/stable/27275436>
3. Mukhopadhyay, S., Samaddar, S., Solis, A., **Roy, A.** 2021. *Disease detection analytics: A simple linear convex programming algorithm for breast cancer and diabetes incidence decisions*, **Decision Sciences**, 52(3), 661-698. <https://onlinelibrary.wiley.com/doi/abs/10.1111/deci.12348>.
4. **Roy A.**, Bruce C., Schulte P., Olson L., Pola M. 2020. *Failure prediction using personalized models and an application to heart failure prediction*, **Big Data Analytics**, 5(1), 1-19.
5. **Roy A.** 2020. *Commentary: The Value of Failure in Science: The Story of Grandmother Cells in Neuroscience*, **Frontiers in Neuroscience**, 14, 59. <https://doi.org/10.3389/fnins.2020.00059>.
6. **Roy, A.**, Qureshi, S., Pande, K., Nair, D., Gairola, K., Jain, P., ... & Sharma, S. 2019. *Performance comparison of machine learning platforms*. **INFORMS Journal on Computing**, 31(2), 207-225. <https://pubsonline.informs.org/doi/abs/10.1287/ijoc.2018.0825>
7. **Roy A**, Perlovsky Leonid, Besold Tarek R., Weng Juyang, Edwards Jonathan C. W. 2018. *Editorial: Representation in the Brain*. **Frontiers in Psychology**, Vol. 9, pp. 1410, DOI=10.3389/fpsyg.2018.01410, ISSN=1664-1078  
<https://www.frontiersin.org/article/10.3389/fpsyg.2018.01410>
8. **Roy A.** 2017. *The theory of localist representation and of a purely abstract cognitive system: The evidence from cortical columns, category cells and multisensory neurons*. **Frontiers in Psychology/Cognition**, 8, 186, doi: 10.3389/fpsyg.2017.00186  
<http://journal.frontiersin.org/article/10.3389/fpsyg.2017.00186/full>
9. **Roy, A.** 2015. *On Findings of Category and Other Concept Cells in the Brain: Some Theoretical Perspectives on Mental Representation*. **Cognitive Computation**, 7(3), 279-284.
10. **Roy A.** 2013. *An extension of the localist representation theory: grandmother cells are also widely used in the brain*. **Frontiers in Psychology/Cognitive Science**, 4, 300.  
doi:10.3389/fpsyg.2013.00300  
[http://www.frontiersin.org/cognitive\\_science/10.3389/fpsyg.2013.00300/full](http://www.frontiersin.org/cognitive_science/10.3389/fpsyg.2013.00300/full)
11. **Roy, A.**, Mackin, P., Mukhopadhyay, S. 2013. *Methods for Pattern Selection, Class-specific Feature Selection and Classification for Automated Learning*, **Neural Networks**, 41, pp. 113-129.
12. **Roy, A.** 2012. "A theory of the brain: localist representation is used widely in the brain." **Frontiers in Psychology/Cognitive Science**, 3:551. doi: 10.3389/fpsyg.2012.00551  
[http://www.frontiersin.org/cognitive\\_science/10.3389/fpsyg.2012.00551/full](http://www.frontiersin.org/cognitive_science/10.3389/fpsyg.2012.00551/full)
13. Pat Mackin, **Asim Roy**, Jyrki Wallenius. 2011. "An Interactive Weight Space Reduction Procedure for Nonlinear Multiple Objective Mathematical Programming," **Mathematical Programming**, Vol. 127, No. 2, pp. 425-444, April 2011.
14. Seiichi Ozawa, Toshihide Tabuchi, Sho Nakasaka and **Asim Roy**. 2010. "An Autonomous Incremental Learning Algorithm for Radial Basis Function Networks," **Journal of Intelligent Learning Systems and Applications**, Vol. 2, No. 4, pp. 179-189, Dec. 2010.
15. Seiichi Ozawa, **Asim Roy**, Dmitri Roussinov. 2009. "A Multi-Tasking Learning Model for Online Pattern Recognition." **IEEE Transactions on Neural Networks**, 20, 3, pp. 430-445, March 2009.
16. **Roy, A.**, Patrick Mackin, Jyrki Wallenius, James Corner, Mark Keith, Gregory Schmick and Hina Arora. 2008. "An Interactive Search Method Based on User Preferences." **Decision Analysis (an INFORMS journal)**, Vol. 5, No. 4, pp. 203-229, Dec. 2008.
17. **Roy, A.** 2008. "Connectionism, controllers and a brain theory." **IEEE Transactions on Systems, Man and Cybernetics, Part A**. Vol. 38, No. 6, pp. 1434-1441. November 2008.
18. **Roy, A.** 2003. On some external characteristics of brain-like learning and some logical flaws of connectionism. In **Neural Information Processing: Research and Development**. J. C. Rajapakse and L. Wang (eds), Springer - Verlag, 2003, pp. 167-179.

19. **Roy, A.** 2003. The hardest test for a theory of cognition: The Input Test. **Brain and Behavioral Sciences**, 26 (5), pp. 618-619.
20. **Roy, A.** 2002. On Neural Networks, Connectionism and Brain-like Learning. In **From Synapses to Rules: Discovering Symbolic Rules from Neural Processed Data**. Apolloni, B. and Kurfess, F. (eds), Kluwer Academic, Chp. 16, p. 315 - 342.
21. **Roy, A.** 2002. On Connectionism and rule extraction. In **Perspectives in Neural Computing**, Tagliaferri, R. and Marinaro, M. (eds), Springer Verlag, p. 269-287.
22. **Roy, A.** 2001. Connectionism is nothing but control theory. **Connexions**, No. 5.
23. **Roy, A.** 2001. A New Learning Theory and Polynomial-time Autonomous Learning Algorithms for Generating Radial Basis Function (RBF) Networks. In **Radial Basis Function Neural Networks 1: Recent Developments in Theory and Applications**, Howlett, R. J. and Jain, L. C. (eds), Physica Verlag, Chp. 10, p. 253-280.
24. **Roy, A.** 2000. On Connectionism, Rule Extraction and Brain-like Learning. **IEEE Transactions on Fuzzy Systems**, Vol. 8, No. 2, pp. 222-227.
25. **Roy, A.** 2000. Artificial Neural Networks: A Science in Trouble. **Vivek**, Vol. 13, No. 2, pp. 17-24. Also appeared in **SIGKDD Explorations**, Vol.1, No. 2, pp. 33-38.
26. **Roy, A., Govil, S. & Miranda, R.** 1997. A Neural Network Learning Theory and a Polynomial Time RBF Algorithm. **IEEE Transactions on Neural Networks**, Vol. 8, No. 6, pp. 1301-1313.
27. **Roy, A. & Mukhopadhyay, S.** 1997. Iterative Generation of Higher-Order Nets in Polynomial Time Using Linear Programming. **IEEE Transactions on Neural Networks**, Vol. 8, No. 2, 402-412.
28. **Roy, A., Govil, S. & Miranda, R.** 1995. An Algorithm to Generate Radial Basis Function (RBF)-like Nets for Classification Problems. **Neural Networks**, Vol. 8, No. 2, pp. 179-202.
29. **Roy, A., Kim, L.S. & Mukhopadhyay, S.** 1993. A Polynomial Time Algorithm for the Construction and Training of a Class of Multilayer Perceptrons. **Neural Networks**, 6, 4, 535-545.
30. **Mukhopadhyay, S., Roy, A., Kim, L.S. & Govil, S.** 1993. A Polynomial Time Algorithm for Generating Neural Networks for Pattern Classification - its Stability Properties and Some Test Results. **Neural Computation**, Vol. 5, No. 2, pp. 225-238.
31. **Roy, A. & Wallenius, J.** 1992. Nonlinear Multiobjective Optimization: An Algorithm and Some Theory. **Mathematical Programming**, Vol. 55, No. 2, pp. 235-249.
32. **Roy, A. & Wallenius, J.** 1991. Nonlinear and Unconstrained Multiple-Objective Optimization: Algorithm, Computation, and Application. **Naval Research Logistics**, Vol. 38, pp. 623-635.
33. **Roy, A. & Mukhopadhyay, S.** 1991. Pattern Classification Using Linear Programming. **ORSA Journal on Computing**, Vol. 3, No. 1, pp. 66-80.
34. **Roy, A.** 1989. Optimal Offer Strategies in Mergers and Acquisitions. **Decision Sciences**, Vol. 20, No. 3, pp. 591-601.
35. **Roy, A., Lasdon, L. & Plane, D.** 1989. End-User Optimization with Spreadsheet Models. **European Journal of Operational Research**, Vol.39, No. 2, pp. 131-137.
36. **Roy, A.** 1988. Acquiring Firms With Higher PE Ratios. **Long Range Planning**, 21, 5, 96-102.
37. **Roy, A.** 1988. Optimal Acquisition Fraction and a Theory for Partial Acquisitions. **Journal of Business, Finance and Accounting**, Vol. 15, No. 4, pp. 543-555.
38. **Roy, A.** 1987. From What If to What's Best in DSS. **Decision Support Systems**, 3, 1, 27-35.
39. **Roy, A., Lasdon, L. & Lordeman, J.** 1986. Extending Planning Languages to Include Optimization Capabilities. **Management Science**, Vol. 32, No. 3, pp. 360-373.
40. **Roy, A. & Lasdon, L.** 1985. Structural Analysis of Optimization Problems Formulated in Planning Languages. **Journal of Optimization Theory and Applications**, Vol. 47, No. 3, pp. 337-347.
41. **Roy, A.** 1985. Partial Acquisition Strategies for Business Combinations. **Financial Management**, Vol. 14, No. 2, pp. 16-23.
42. **Roy, A. & Lasdon, L.** 1983. On Detection of Linear and Nonlinear Optimization Problems. **Operations Research Letters**, Vol. 2, No. 4, pp. 149-154.
43. **Roy, A., De Falomir, E. & Lasdon, L.** 1982. An Optimization-Based Decision Support System For a Product Mix Problem. **INTERFACES**, Vol. 12, No. 2, pp. 26-33.

## **Patents**

**1. APPLICATION PENDING (2022) – Image Recognition Utilizing Deep Learning Non-Transparent Black Box Model**

PCT Patent Application Filed, Application No.: PCT/US22/41365, Filed: August 24, 2022, Skysong Ref. No.: M22-044P-WO1-b\$.

**2. APPLICATION PENDING (2019) - Method and Apparatus for event prediction for a physical system based on data solely collected from the physical system (Skysong Innovation (SI) reference No. - **M19-067L**)**

This invention arose from my work with Mayo Clinic, Jacksonville in summer 2017 as part of the ASU-Mayo Clinic Alliance Fellows Program. ASU and Mayo Clinic filed a joint utility patent application in October 2019.

**3. ISSUED PATENT (2023) - Method and Apparatus for Large Scale Machine Learning. U.S. Patent No. 11544570 B2, GRANTED ON Jan 3, 2023. EXPIRES on Dec 11, 2039.**

[https://patents.google.com/patent/US11544570B2/en?q=\(Method+and+Apparatus+for+Large+Scale+Machine+Learning\)&inventor=Asim+Roy&oq=Method+and+Apparatus+for+Large+Scale+Machine+Learning+Asim+Roy](https://patents.google.com/patent/US11544570B2/en?q=(Method+and+Apparatus+for+Large+Scale+Machine+Learning)&inventor=Asim+Roy&oq=Method+and+Apparatus+for+Large+Scale+Machine+Learning+Asim+Roy)

**4. ISSUED PATENT (2014) - Systems and related methods of user-guided searching. U.S. Patent No. 8713001 B2, GRANTED ON April 29, 2014. EXPIRES ON Jan 12, 2032.**

[https://patents.google.com/patent/US8713001B2/en?q=\(Systems+and+related+methods+of+user-guided+searching\)&inventor=Asim+Roy&oq=Systems+and+related+methods+of+user-guided+searching+Asim+Roy](https://patents.google.com/patent/US8713001B2/en?q=(Systems+and+related+methods+of+user-guided+searching)&inventor=Asim+Roy&oq=Systems+and+related+methods+of+user-guided+searching+Asim+Roy)

**5. ISSUED PATENT (1994) - Pattern Classification Using Linear Programming. U.S. Patent No. 5299284A, GRANTED ON March 29, 1994. EXPIRED ON March 29, 2011.**

[https://patents.google.com/patent/US5299284A/en?q=\(Pattern+Classification+Using+Linear+Programming\)&inventor=Asim+Roy&oq=Pattern+Classification+Using+Linear+Programming+Asim+Roy](https://patents.google.com/patent/US5299284A/en?q=(Pattern+Classification+Using+Linear+Programming)&inventor=Asim+Roy&oq=Pattern+Classification+Using+Linear+Programming+Asim+Roy)

## **Research Grants**

1. ***“Explainable AI for Computer Vision,”*** Teuvonet Technologies, \$50,000 (June 1, 2024 – May 31, 2025).
2. ***“Automated Real-time Processing of Satellite Images Without Human Intervention Using Explainable AI Models,”*** Teuvonet Technologies, Air Force STTR Phase I, \$31,031 (December 15, 2023 – March 14, 2024).
3. ***“Explainable AI for Computer Vision,”*** Teuvonet Technologies, \$15,001 (September 1, 2022 – May 31, 2023).
4. ***“Explainable AI for Computer Vision,”*** Teuvonet Technologies, \$49,997 (June 1, 2023 – May 31, 2024).
5. ***“Hardware-based Machine Learning,”*** Teuvonet Technologies, \$100,000 (May 24, 2021 – May 31, 2024).
6. ***“Hardware-based Machine Learning,”*** Arizona State University Catalyst Fund (ASUCF), \$81,375 (2020).
7. ***“Hardware-based Machine Learning,”*** Arizona State University Catalyst Fund (ASUCF), \$9,900 (2018).
8. ***“Hardware-based machine learning,”*** Aviage Systems (<https://www.aviagesystems.com/>), \$30,000 (2017-18).
9. ***“Remote Patient Monitoring,”*** Mayo Clinic (Rochester + Jacksonville), \$6,320 (2017).
10. ***“On-line Edge Computing for the Industrial Internet with Large-scale Hypersphere Networks,”*** Arizona State University Catalyst Fund (ASUCF), \$50,000 (2016).

## **Submitted/Working Papers**

1. ***“Explainable AI (XAI) for Object Detection and Application to Satellite Imagery,”*** submitted to IEEE Access.
2. ***“A novel algorithm for improving minority class accuracy for imbalanced data: Application to many real-world problems,”*** submitted to Decision Sciences.
3. ***“Breast Cancer Detection using Explainable AI Models,”*** to be submitted.
4. ***“Rare Airplane Detection Using Explainable AI Models,”*** to be submitted.
5. ***“From CNNs to Symbolic Explanation Models to Protection Against Adversarial Attacks,”*** to be submitted.
6. ***“Multisensory neurons: The evidence for a purely abstract cognitive system,”*** to be submitted.
7. ***“A Radial Basis Function (RBF) algorithm for function approximation based on Kohonen SOMs,”*** to be submitted.
8. ***“Neural Networks for Large Scale Machine Learning,”*** to be submitted.
9. ***“Comparing performance of function approximation and classification algorithms across machine learning platforms,”*** to be submitted.

## **Plenary and Distinguished Speaker / Debates at National and International Conferences**

1. **Plenary Session Chair** – “Panel Discussion on Explainable AI,” *International Joint Conference on Neural Networks (IJCNN2023)*, Gold Coast, Australia, June 18-23, 2023.
2. **Plenary Speaker** - *TMED7 'Big Data & Data Analytics in Precision Medicine', 7<sup>th</sup> Annual Translational Medicine Conference*, Derry/Londonderry, Northern Ireland, Oct. 26-27, 2015.
3. **Plenary Speaker**, *2<sup>nd</sup> International Workshop on Advances in Learning from/with Multiple Learners (ALML 2015)*, Killarney, Ireland, July 16-17, 2015.
4. **Distinguished Speaker**, Annual Meeting of the Italian Neural Network Society (**21st Italian Workshop on Neural Nets WIRN VIETRI 2011**), Vietri sul Mare, Italy, June 3 - 5, 2011. Title of talk: “A theory of the brain - it uses both distributed and local representation.”
5. **Invited Speaker**, College Speaker Series, College of Business Administration, University of Texas at El Paso, March 6, 2009.
6. **Plenary Speaker, ANNIE 2008**: “Limitations of Connectionism and the Search for a New Brain Theory,” *Artificial Neural Networks in Engineering (ANNIE 2008)*, St. Louis, Missouri, November 9-12, 2008.
7. **Invited Talk, Thought Leaders Summit**, International Academy for Advanced Decision Support, Peter Kiewit Institute, University of Nebraska, Omaha, October 17-19, 2002. Title of talk: “Systems That Learn On Their Own, Much Like Humans.”
8. **Invited Lectures, International School on Neural Networks**, Erice, Italy, Feb. 25 – March 7, 2002. Title of talk: “Rule Learning, Neural Networks, and Connectionism.”
9. **Plenary Speaker, Artificial Neural Networks in Engineering (ANNIE2001)**, St. Louis, Missouri, November 4-7, 2001. Title of talk: “Connectionism: What’s wrong with it and how do we get out of the mess.”
10. **Distinguished Speaker**, Annual Meeting of the Italian Neural Network Society (**XI Italian Workshop on Neural Nets WIRN VIETRI 2001**), Vietri sul Mare, Italy, May 17-19, 2001. Title of talk: “On Connectionism and Rule Extraction.”
11. **Other Invited Talks** at (a) **University of Florence** at a joint meeting of the AI/neural network research groups from **Universities of Florence, Siena and Pisa**, May 2001; (b) AI/neural network research group at **University of Milan**, May 2001.
12. **Distinguished Speaker, University of Southern California (USC) Workshop** on “Advanced Methods of Physiological System Modeling,” Los Angeles, November 12-15, 1998. Title of talk: “Could there be real-time, instantaneous learning in the brain?”
13. **Debate** on my recent challenge to the ideas of how the brain works and learns. “Oh sure, my method is connectionist too. Who said it’s not?” **ICONIP’02 (International Conference on Neural Information Processing)**, Singapore, Nov 18-22, 2002. Debate against several Governing Board members of the Asia-Pacific Neural Network Council, including three of its past presidents.
14. **Debate** on my recent challenge to the ideas of how the brain works and learns. “Does connectionism permit reading of rules from a network?” **IJCNN2000 (International Joint Conference on Neural Networks)**, Como, Italy, July 24-27, 2000. Debate against the editors of neural network journals and several Governing Board members of the International Neural Network Society (INNS), including three of its past presidents.
15. **Debate** on my recent challenge to the ideas of how the brain works and learns. “Brains Internal Mechanisms – The Need for a New Paradigm.” **IJCNN’99 (International Joint Conference on Neural Networks)**, Washington, D.C., July 10-16, 1999. Debate against seven Governing Board members of the International Neural Network Society (INNS), including three of its past presidents.
16. **Debate** on my recent challenge to the ideas of how the brain works and learns. “Could there be real-time, instantaneous learning in the brain?” **World Conference on Computational Intelligence (WCCI’98)**, Anchorage, Alaska, May 4-9, 1998. Debate against five past presidents of the International Neural Network Society (INNS).

17. **Debate** on my recent challenge to the ideas of classical connectionist learning. “Connectionist Learning: Is it Time to Reconsider the Foundations?” **ICNN’97 (International Conference on Neural Networks)**, Houston, June 7-11, 1997. Debate against four past presidents of the International Neural Network Society (INNS) and seven plenary speakers at the conference.

### **Proceedings (refereed):**

1. **Roy, A.** (2015, July). *Automated online feature selection and learning from high-dimensional Streaming data using an ensemble of Kohonen neurons*. In Neural Networks (IJCNN), 2015 International Joint Conference on (pp. 1-8). IEEE.
2. **Roy, A.** (2015). *A Classification Algorithm for High-dimensional Data*. Procedia Computer Science, 53, 345-355.
3. **Roy, A.**, 2011. A theory of the brain – the brain uses both distributed and localist (symbolic) representation. Proceedings of the IJCNN’2011 (International Joint Conference on Neural Networks), pp. 215-221, San Jose, CA.
4. **Roy, A.**, 2010. “*On NSF ‘open questions,’ and an architecture for autonomous learning,*” Proceedings of WCCI 2010 (IEEE World Conference on Computational Intelligence), pp. 3159-3166, Barcelona, Spain.
5. **Roy, A.**, 2010. “*Is the Connectionist Notion of Subconcepts Flawed?*” Proceedings of WCCI 2010 (IEEE World Conference on Computational Intelligence), pp. 2490-2495, Barcelona, Spain.
6. Seiichi Ozawa, Sho Nakasaka, **Asim Roy**, 2010. “*An Autonomous Incremental Learning Algorithm of Resource Allocating Network for Online Pattern Recognition,*” Proceedings of WCCI 2010 (IEEE World Conference on Computational Intelligence), pp. 706-713, Barcelona, Spain.
7. Toshihisa Tabuchi, Seiichi Ozawa, **Asim Roy**, 2009. An Autonomous Learning Algorithm of Resource Allocating Network. IDEAL 2009: 134-141.
8. Ozawa, S. and **Roy, A.** 2008. “Incremental Learning for Multitask Pattern Recognition Problems.” Proceedings of the ICMLA’08 (The Seventh International Conference on Machine Learning and Applications), pp. 747 – 751, Dec. 11-13, 2008, San Diego, California.
9. Nishikawa, H., Ozawa, S. and **Roy, A.** 2008. “A Neural Network Model for Sequential Multitask Pattern Recognition Problems.” Proceedings of the ICONIP 2008 (15th International Conference on Neural Information Processing), pp. 821 – 828, November 25-28, 2008, Auckland, New Zealand.
10. **Roy, A.** 2003. A theory of the brain: There are parts of the brain that control other parts; the proof is in connectionist algorithms themselves. Proceedings of the IJCNN’2003 (International Joint Conference on Neural Networks), Portland.
11. **Roy, A.** 2003. On Some External Characteristics of Brain-like Learning and Some Logical Flaws of Connectionism. Proceedings of the IJCNN’2003 (International Joint Conference on Neural Networks), Portland.
12. **Roy, A.** 2000. A theory of the brain: There are parts of the brain that control other parts. Proceedings of the IJCNN’2000 (International Joint Conference on Neural Networks), Como, Italy, paper no. 574.
13. **Roy, A.** 1999. Brain’s internal mechanisms – a new paradigm. Proceedings of the IJCNN’99 (International Joint Conference on Neural Networks), Washington, D.C., o. 259.
14. **Roy, A.** & Miranda, R. 1997. Fuzzy Logic, Neural Networks and Brain-like Learning. Proceedings of the International Conference on Neural Networks (ICNN’97), Houston, Vol. I, pp. 522-527.
15. Kroon, L., Sen, A., Deng, H. & **Roy, A.** 1996. The Optimal Cost Chromatic Partition Problem for Trees and Interval Graphs. Proceedings of the 22<sup>nd</sup> International Workshop on Graph-Theoretic Concepts in Computer Science, Cadenabbia, Italy, June 1996.
16. **Roy, A.** 1995. A Neural Network Learning Theory. Proceedings of the WCNN’95 (World Congress on Neural Networks), Washington, Vol. I, pp. 101-104.
17. **Roy, A.** & Miranda, R. 1994. A Neural Network Learning Theory and Modified RBF Net Generation. Proceedings of the WCNN ’94 (World Congress on Neural Networks), San Diego, Vol. III, pp. 470-473.
18. **Roy, A.** & Govil, S. 1993. Generating a Radial Basis Function Net in Polynomial Time for



- Classification. Proceedings of the WCNN'93 (World Congress on Neural Networks), Portland, Vol. III, pp. 536-539.
19. **Roy, A.** & Govil, S. 1992. Generating a Truncated Radial Basis Function Net for Function Approximation Using Linear Programming. Proceedings of the IJCNN '92 (International Joint Conference on Neural Networks), Beijing, Vol. II, pp. 408-412.
  20. **Roy, A.** 1992. On Linear Programming, Neural Network Design, Pattern Classification and Polynomial Time Training. Proceedings of the 11th International Conference on Pattern Recognition, The Hague, Netherlands, Vol. 2, pp. 5-8.
  21. **Roy, A.** & Mukhopadhyay, S. 1992. A Polynomial Time Algorithm for Generating Neural Networks for Classification Problems. Proceedings of the IJCNN '92 (International Joint Conference on Neural Networks), Baltimore, Vol. 1, pp. 147-152.
  22. **Roy, A.** & Mackin, P. 1989. Multicriteria Optimization (Linear and Nonlinear) Using Proxy Value Functions. Proceedings of the International Workshop on Multiple Criteria Decision Support, Helsinki, Finland, Springer Verlag, Lecture Note Series in Economics and Mathematical Systems, pp. 128-134.
  23. Ming Liu, Keats, J.B., & **Roy, A.** 1987. Multiple Criteria Optimization of an Economically-Based Continuous Sampling Plan for Finite Production. Proceedings of the IXth ICPR (International Conference on Pattern Recognition), pp. 2661-2667.
  24. Goul, M., Kuo, C. & **Roy, A.** 1987. Knowledge-Based DSS: Towards Avoiding an Error of the Third Kind. Proceedings of the Twentieth Hawaii International Conference on System Sciences, pp. 755-764.
  25. **Roy, A.** 1986. Have You Used the Reasoning Tool Lately. Proceedings of the IFPS Users Conference.
  26. **Roy, A.** 1981. Decision Support Systems - From Simulation to Optimization. Proceedings of the Fourteenth Hawaii International Conference on System Sciences, Vol. 1.

## **Tutorials / Workshops / Short Courses at International Conferences**

1. **Invited Tutorial**, “Explainable AI (XAI) for Computer Vision – A Review of Existing Methods and a New Method to Decode CNN models,” *International Joint Conference on Neural Networks (IJCNN2025)*, Rome, Italy, June 30-July 5, 2025.
2. **Invited Tutorial**, “Explainable AI (XAI) for Computer Vision – A Review of Existing Methods and a New Method to Extract a Symbolic Model from a CNN model,” *IEEE World Congress on Computational Intelligence (WCCI2024)*, Yokohama, Japan, June 30-July 5, 2024.
3. **Invited Tutorial**, “Explainable AI (XAI) for Computer Vision – A Review of Existing Methods and a New Method to Extract a Symbolic Model from a CNN model,” *International Joint Conference on Neural Networks (IJCNN2023)*, Gold Coast, Australia, June 18-23, 2023.
4. **Invited Tutorial**, “From CNNs to Symbolic Explainable Models to Protection Against Adversarial Attacks,” *IEEE World Congress on Computational Intelligence (WCCI2022)*, Padova, Italy, July 18-23, 2022.
5. **Invited Course** - “Hardware -based (GPU, FPGA based) machine learning that exploits massively parallel computing – An overview of concepts, architectures and neural network algorithm implementation,” *6th International Winter School on Big Data, Institute for Research Development, Training and Advice (IRDTA)*. Ancona, Italy, January 13-17, 2020.
6. **Invited Tutorial**, “Learning Autonomously from Big Data Streams,” *International Joint Conference on Neural Networks (IJCNN2015)*, Killarney, Ireland, July 12-17, 2015.
7. **Invited Tutorial**, “Autonomous Machine Learning,” *World Congress on Computational Intelligence (WCCI 2014)*, Beijing, China, July 4 - 11, 2014.
8. **Invited Tutorial**, “Autonomous Machine Learning,” *International Joint Conference on Neural Networks (IJCNN2013)*, Dallas, TX, August 4 – 9, 2013.
9. **Invited Workshop**, “Autonomous Learning Systems,” *International Joint Conference on Neural Networks (IJCNN2013)*, Dallas, TX, August 4 – 9, 2013.
10. **Invited Workshop**, “Perception and Cognition in the Brain: Integrating Single Cell Recordings, Spiking Neurons, and a Brain Theory,” *International Joint Conference on Neural Networks*

(*IJCNN2013*), Dallas, TX, August 4 – 9, 2013.

11. **Invited Tutorial**, “Autonomous Machine Learning,” *International Joint Conference on Neural Networks (IJCNN2011)*, San Jose, CA, July 31 – Aug 5, 2011.
12. **Invited Workshop**, “Problems and Challenges Mapping Spiking Neurons to Cognition and Behavior,” *International Joint Conference on Neural Networks (IJCNN2011)*, San Jose, CA, July 31 – Aug 5, 2011.
13. **Invited Tutorial**, “Autonomous Machine Learning,” *The Ninth International Conference on Machine Learning and Applications (ICMLA’10)*, Washington, DC, Dec 12-14, 2010.
14. **Invited Tutorial**, “Autonomous Machine Learning,” *The 2009 International Conference on Data Mining (DMIN’09)*, Las Vegas, NV, July 13 – 16, 2009.
15. **Invited Tutorial**, “Autonomous Machine Learning,” *International Joint Conference on Neural Networks (IJCNN2009)*, Atlanta, GA, June 14-19, 2009.
16. **Workshop on “Autonomous Machine Learning,” ANNIE 2008: Artificial Neural Networks in Engineering**, St. Louis, Missouri, November 9-12, 2008.
17. **Invited Tutorial**, “Autonomous Learning: New Connectionist Algorithms,” Summer School on Neural Networks (NN2004), Porto, Portugal, 12-16 July, 2004.
18. **Invited Tutorial**, “Autonomous Learning: New Connectionist Algorithms,” *International Joint Conference on Neural Networks (IJCNN2003)*, Portland, July 20-24, 2003.
19. **Invited Tutorial**, “Autonomous Learning: New Connectionist Algorithms,” *International Conference on Neural Information Processing (ICONIP’02)*, Singapore, Nov 18-22, 2002.
20. **Invited Tutorial**, “Autonomous Learning: New Connectionist Algorithms,” *International Joint Conference on Neural Networks (IJCNN’99)*, Washington, D. C., July 10-16, 1999.
21. **Invited Tutorial**, “Autonomous Learning: New Connectionist Algorithms,” *ANNIE’98 (Artificial Neural Networks in Engineering)*, St. Louis, Missouri, November 1 - 4, 1998.
22. **Invited Tutorial**, “Autonomous Learning: New Connectionist Algorithms,” *World Conference on Computational Intelligence (WCCI’98)*, Anchorage, Alaska, May 4-9, 1998.
23. **Invited Tutorial**, “Brain-like Learning: Some Controversies and LP Models,” *INFORMS National Meeting*, Dallas, October 26-29, 1997.
24. **Invited Tutorial**, “Autonomous Learning Algorithms for Autonomous Robots,” *Conference on Computational Intelligence in Robotics and Automation (CIRA’97)*, in conjunction with the 8th *International Conference on Advanced Robotics (ICAR’97)*, July 5 - 11, 1997.
25. **Short Course**, “A Neural Network Learning Theory and Some Robust Polynomial Time Algorithms,” *World Congress on Neural Networks (WCNN’96)*, San Diego, September 15-18, 1996.
26. **Invited Tutorial**, “Neural Networks, Brain-like Learning and Linear Programming,” *INFORMS National Meeting*, Washington, D. C., May 5-8, 1996.
27. **Invited Tutorial**, “Neural Networks and Mathematical Programming,” *Fifth INFORMS CSTS Conference on Computer Science and Operations Research: Recent Advances*, Dallas, Jan 8-10, 1996.
28. **Invited Tutorial**, “Neural Networks, Brain-like Learning and Linear Programming,” *DSI (Decision Sciences Institute) Annual Meeting*, Boston, Nov 20-22, 1995.
29. **Invited Tutorial**, “Using Linear Programming to Train Neural Networks,” *INFORMS International Conference*, Singapore, June 25-28, 1995.
30. **Invited Tutorial**, “A Neural Network Learning Theory and Some Algorithms,” *ANNIE’94 (Artificial Neural Networks in Engineering)*, St. Louis, Missouri, November 13-16, 1994.
31. **Invited Tutorial**, “Neural Networks and Mathematical Programming,” *TIMS XXXII International Conference*, Anchorage, Alaska, June 12-15, 1994.

## **Invited Articles**

1. **Roy, A.** (2011). *Discovery of concept cells in human brains - Could it change our science?* **Natural Intelligence**, Vol. 1, No. 1, pp. 23 – 29. (<http://www.inns.org/natural-intelligence-magazine/>)
2. **Roy, A.** (2003). *Neural Networks: How do we make a widely used technology out of it?* **IEEE Neural Network Society Newsletter**, Vol. 1, No. 2, pp. 8 – 12.
3. **Roy, A.** (2003). *Summary of Panel discussions at IJCNN'2002 and ICONIP'02-SEAL'02-FSKD'02 on connectionist learning. "Oh sure, my method is connectionist too. Who said it's not?"* **INNS/ENNS/JNNS Neural Networks Society Newsletters**, Vol. 1, No. 2, July, pp. 2 - 3.
4. **Roy, A.** (2001). *Summary of Panel discussion at IJCNN'2000 on connectionist learning. "Does Connectionism Permit Reading of Rules from a Network?"* **INNS/ENNS/JNNS Newsletter**, appearing with **Neural Networks**, Vol.14, No. 1, pp.1-4.
5. **Roy, A.** (1999). *A Science in Trouble.* **INFORMS Computing Society Newsletter**, 19, 2.
6. **Roy, A.** (1998). *Summary of Panel discussion at ICNN'97 on connectionist learning. "Connectionist Learning: Is it Time to Reconsider the Foundations?"* **INNS/ENNS/JNNS Newsletter**, appearing with **Neural Networks**, Vol.11, No. 2.

## **Professional Papers**

1. **Technical Report**. Mackin, P. and **Roy, A.** 1992. Multicriteria Optimization Using Proxy Value Function. Department of Decision and Information Systems, Arizona State University.
2. **Technical Report**. **Roy, A.** 1990. Unequal Division of Gains in Mergers and Acquisitions. Department of Decision and Information Systems, Arizona State University.
3. **Technical Report**. **Roy, A.** 1986. The Alternating Basis Algorithm for Assignment Problems: Some Properties. Department of Decision and Information Systems, Arizona State University.
4. **Financial Case Report Series**. **Roy, A.** 1981. Selecting Products and Quantities: Making An Optimal Decision. Execucom Systems Corporation, Austin, Texas.
5. **Technical Report**. **Roy, A.** & Dean, B.V. 1979. Evaluation of R & D Project Costs. No. 451, Department of Operations Research, Case Western Reserve University.

## **Papers Presented at Professional Meetings:**

1. IEEE World Congress on Computational Intelligence (**WCCI2024**), Yokohama, Japan, June 30-July 5, 2024. "AI and Regulation."
2. Military Operations Research Society (**MORS**), **MORS 2022 EMERGING TECHNIQUES FORUM**, Alexandria, VA, USA, 27-29 September 2022. "From CNNs to Symbolic Explainable Models to Protection Against Adversarial Attacks to Automated Video Processing."
3. Military Operations Research Society (**MORS**), **MORS 2021 EMERGING TECHNIQUES FORUM**, Alexandria, VA, USA, 7-9 December 2021. "Explainable AI (XAI) for Computer Vision – A New Method to Extract a Symbolic Model."
4. International Joint Conference on Neural Networks (**IJCNN2015**), Killarney, Ireland, July 12-17, 2015. "Automated online feature selection and learning from high-dimensional streaming data using an ensemble of Kohonen neurons."
5. INNS Conference on Big Data, San Francisco, August 8-10, 2015. "A Classification Algorithm for High-dimensional Data."
6. **IJCNN 2011** (International Joint Conference on Neural Networks), San Jose, CA, July 31 –

Aug 5, 2011. "A theory of the brain – the brain uses both distributed and localist (symbolic) representation."

7. **WCCI 2010** (IEEE World Conference on Computational Intelligence), July 18-23, 2010, Barcelona, Spain. "On NSF open questions, and an architecture for autonomous learning."
8. **WCCI 2010** (IEEE World Conference on Computational Intelligence), July 18-23, 2010, Barcelona, Spain. "Is the Connectionist Notion of Subconcepts Flawed?"
9. **INFORMS** Annual Meeting 2008, Washington, DC, Oct. 11-15, 2008. "An Interactive Search Method Based on User Preferences."
10. **IJCNN'2000** (International Joint Conference on Neural Networks), Como, Italy, July 24-27, 2000. "A theory of the brain: There are parts of the brain that control other parts." Invited Talk in Special Session on "From subsymbolic neural network representations to symbols."
11. **BMSR** Workshop on "Advanced Methods of Physiological System Modeling," University of Southern California, November 13-14, 1998. "Could there be real-time, instantaneous learning in the brain?" Invited talk.
12. University of Arizona, Tucson, May, 1997. "Connectionist Learning: Is it Time to Reconsider the Foundations?"
13. University of Texas at Austin, December, 1996. "Computational Models of Brain-like Learning."
14. Advanced Workshop on "Biological and Artificial Neural Networks: A Search for Synergy," University of Southern California, September 20-21, 1996. "Brain-like Learning: Some Ideas."
15. **WCNN '94**, San Diego, June 1994, "A Neural Network Learning Theory and Modified RBF Net Generation."
16. Medical and Biological Engineering Workshops, College of Medicine, University of Arizona, January and April, 1994. "Neural Networks and Medical Diagnosis."
17. **ORSA/TIMS** Joint National Meeting, Phoenix, November 1-3, 1993. Invited Paper. "Neural Networks and Linear Programming."
18. **WCNN '93**, Portland, July 1993. "Generating a Radial Basis Function Net in Polynomial Time for Classification."
19. **ORSA/TIMS** Joint National Meeting, Chicago, May 16-19, 1993. Invited Paper. "A New Algorithm for Generating Radial Basis Function (RBF) Nets for Function Approximation."
20. **IJCNN '92**, Beijing, China, November 3-6, 1992. "Generating a Truncated Radial Basis Function Net for Function Approximation Using Linear Programming."
21. **IJCNN '92**, Baltimore, June 7-11, 1992. Invited paper in Special Session on Mathematics and Neural Networks. "A Polynomial Time Algorithm for Generating Neural Network for Classification Problems."
22. **ORSA/TIMS** Joint National Meeting, Orlando, April 26-29, 1992. Invited paper. "A Method for Generating and Training Neural Networks Using Linear Programming."
23. **ORSA/TIMS** Joint National Meeting, Nashville, May 13-15, 1991. Chair, invited session on Spreadsheet Optimization. "Linear and Nonlinear Optimization in a Spreadsheet."
24. Stanford University, Stanford, April 1991, Parallel Distributed Processing (PDP) Group, "Generating Neural Networks Using Linear Programming."
25. IX<sup>th</sup> International Multi Criteria Decision Making (**MCDM**) Conference, Fairfax, Virginia, August 1990. "Multicriteria Optimization: An Algorithm and Some Results."
26. **ESIGMA** Meeting (European Summer Institute Group on Multicriteria Analysis), Athens, Greece, June 24, 1990. Invited talk. "Multicriteria Optimization Using Proxy Value Functions."
27. University of Colorado, Boulder, April, 1990. Invited talk on "Pattern Classification Using Linear Programming."
28. **ORSA/TIMS** Joint National Meeting, New York, October 16-18, 1989. "Towards a Model Recognition Theory."
29. International Workshop on Multiple Criteria Decision Support, Helsinki, Finland, August 7-11, 1989. (Organized by **IIASA**). Invited paper. "Nonlinear Multiple Criteria Optimization Using Proxy Value Functions."
30. Lawrence Livermore National Laboratory, August 2, 1989. Invited talk. "Pattern Recognition Using Linear Programming."

31. **ORSA/TIMS** Joint National Meeting, Denver, Oct. 23-26, 1988. "Multi-Criteria Applications in Quality Control."
32. **ORSA/TIMS** Joint National Meeting, Washington, D.C., April 25-27, 1988. "Unequal Division of Gains in Mergers and Acquisitions: A Theory."
33. **ORSA/TIMS** Joint National Meeting, St. Louis, Oct. 26-28, 1987. "Solving Nonlinear Programming Problems in Lotus 1-2-3" and "Multiple Criteria Optimization and Expert Systems" (both invited papers).
34. **ORSA/TIMS** Joint National Meeting, New Orleans, May 4-6, 1987. "Optimal Acquisition Fraction and a Theory for Partial Acquisitions."
35. **ORSA/TIMS** Joint National Meeting, Miami, October 27-29, 1986. Invited Paper. "A Unified, Interactive Approach to Multiple Criteria Optimization."
36. **ORSA/TIMS** Joint National Meeting, Los Angeles, April 14-16, 1986. "An Interactive Approach to Nonlinear Multiple Criteria Optimization" with Jyrki Wallenius.
37. **ORSA/TIMS** Joint National Meeting, Atlanta, November 4-6, 1985. "An Interactive Multiple Criteria Method for Nonlinear Problems," and on "Optimization with a Spreadsheet" (invited paper).
38. Twelfth International Symposium on Mathematical Programming, Boston, August 5-9, 1985. "The Zionts-Wallenius Multiple Criteria Method Revisited."
39. **ORSA/TIMS** Joint National Meeting, Dallas, November 26-28, 1984. Invited Paper. "Computational Experience on an Extension of the Alternating Basis Algorithm for Assignment Problems."
40. Tenth Triennial Conference on Operations Research (**IFORS**), Washington, D.C., August 6-10, 1984. "Evaluating Partial Acquisition Strategies".
41. **ORSA/TIMS** Joint National Meeting, San Francisco, May 14-16, 1984. "An Improved Alternating Basis Algorithm for the Assignment Problem".
42. **ORSA/TIMS** Joint National Meeting, Orlando, November 7-9, 1983. "Leveraging Mergers with Synergistic Effects for Higher Rates of Return".
43. **ORSA/TIMS** Joint National Meeting, Chicago, April 25-27, 1983. "On Detection of Linear and Nonlinear Optimization Problems".
44. **ORSA/TIMS** Joint National Meeting, San Diego, October, 1982. "Experiments with a Nonlinear Mixed Integer Program".
45. **ORSA/TIMS** Joint National Meeting, Houston, October, 1981. "Optimization within Decision Support Systems at Prime Computers - Two Applications." Organized and chaired invited sessions on "Interactive Optimization" and "Corporate Planning".
46. Ninth Triennial Conference on Operational Research (**IFORS**), Hamburg, Germany, July, 1981. "Ponderosa Industrial Does Product Selection Using IFPS/OPTIMUM".
47. Fourth European Congress on Operations Research, Cambridge, England, July 22-25, 1980. "Optimization and Planning Languages".
48. School of Management, University of California, Los Angeles, January, 1980. Invited talk on "Decision Support Systems and Optimization".
49. **ORSA/TIMS** Joint National Meeting, Milwaukee, October, 1979. "Optimizing Planning Models with IFPS".
50. Tenth International Symposium on Mathematical Programming, Montreal, August, 1979. "Introducing a Nonlinear Optimizer into a Financial Planning Language."

## **National/International Professional Service**

### **General Chair/ Program Chair**

1. **General Chairman**, *ORSA/TIMS Joint National Meeting*, Phoenix, Nov. 1-3, 1993.
2. **Program Chair**, *ORSA/TIMS Joint National Meeting*, Las Vegas, May, 1990.
3. **General Chair**, *INNS Conference on Big Data*, San Francisco, August 8-10, 2015.
4. **Conference Chair**, *International Joint Conference on Neural Networks (IJCNN)*

- 2020), Glasgow, UK, 2020.
5. **Executive Committee**, *International Joint Conference on Neural Networks (IJCNN 2015)*, Killarney, Ireland, July 12-17, 2015.
  6. **Program Co-Chair**, 2023 IEEE Autonomous and Trusted Vehicles Conference (ATC 2023), Portsmouth, UK, August 28-31, 2023.
  7. **Poster/Demo Co-Chair**, IEEE Smart World Congress (SWC 2023), Portsmouth, UK, August 28-31, 2023.
  8. **Technical Program Co-Chair**, *International Joint Conference on Neural Networks (IJCNN 2015)*, Killarney, Ireland, July 12-17, 2015.
  9. **Program Co-Chair**, *INNS Conference on Big Data*, Thessaloniki, Greece, October 23-25, 2016.
  10. **Program Co-Chair**, *INNS Conference on Big Data*, Bali, Indonesia, April 17-19, 2018.
  11. **IJCNN Technical Program Co-Chair**, *International Joint Conference on Neural Networks (IJCNN 2018)*, Rio De Janeiro, Brazil, July 8 -13, 2018
  12. **Tutorials Chair**, *International Joint Conference on Neural Networks (IJCNN 2017)*, Anchorage, Alaska, May 14-19, 2017.
  13. **Publications Co-Chair**, *Thirteenth International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD 2017)*, Guilin, China, July 29-31, 2017.
  14. **Honorary Board Member**, *INNS Conference on Big Data and Deep Learning (INNS-BDDL)*, Sestri Levante, Genoa, Italy, April 16-18, 2019.
  15. **Poster/Demo Co-Chair**, 2023 IEEE Smart World Congress, Portsmouth, UK, 2022 –
  16. **Workshop Co-Chair**, “AI, Law, and Regulation,” *International Joint Conference on Neural Networks (IJCNN2025)*, Rome, Italy, June 30-July 5, 2025.
  17. **Organizing Committee, “AI, Ethics, and Regulation” Co-Chair**, *International Joint Conference on Neural Networks (IJCNN2025)*, Rome, Italy, June 30-July 5, 2025.

ORSA/TIMS = Operations Research Society of America/The Institute of Management Sciences  
 ORSA and TIMS combined in early nineties to form the new society **INFORMS** (Institute for Operations Research and Management Sciences).

### **Governing Boards/Advisory Boards/Section Chairs**

1. **Member, Executive Committee**, *International Neural Network Society (INNS)*, 2018-2020.
2. **Vice-President, Industrial Relations**, *International Neural Network Society (INNS)*, 2019 - 2021.
3. **Vice-President, Virtual Technical Events**, *International Neural Network Society (INNS)*, 2019 - 2021.
4. **Member, Board of Governors**, *International Neural Network Society*, 2012 - 2021.
5. **Founder and Chair**, INNS Section on **Explainable AI (XAI)**, *International Neural Network Society (INNS)*, 2021 – present.
6. **Founder and Chair**, INNS Section on **AI, Law, and Regulation (ALR)**, *International Neural Network Society (INNS)*, 2024 – present.
7. **Founder and Chair**, INNS Section on **Autonomous Machine Learning (AML)**, *International Neural Network Society (INNS)*, 2009 – present.
8. **Founder and Chair**, INNS Section on **Big Data Analytics**, *International Neural Network Society (INNS)*, Chair till August 2015.

9. **Chair, Membership**, INNS Section on **Big Data Analytics**, *International Neural Network Society* (INNS), 2015 – present.
10. **International Advisory Board**, International Neural Network Society (INNS)-India, 2011 – 2016.
11. **Advisory Board Member**, Genome India International, a society of scientists and scholars in genome research, 2005 - 2010.
12. **Scientific Advisory Boards (Neuroscience, Robotics/AI)**, Lifeboat Foundation (a think tank), 2008 – present.
13. **Member, Task Force on Autonomous Learning**, Neural Network Technical Committee (TC) of *IEEE Computational Intelligence Society* (CIS), 2013- 2022.
14. **Member - IEEE NNTC Mind & Brain Task Force**, 2015-present.

### **Conference Program Committees**

1. **Special Session Co-Chair**, “Explainable AI,” *International Joint Conference on Neural Networks (IJCNN2025)*, Rome, Italy, June 30-July 5, 2025.
2. **Special Session Co-Chair**, “AI, Law, and Regulation,” *International Joint Conference on Neural Networks (IJCNN2025)*, Rome, Italy, June 30-July 5, 2025.
3. **IJCNN Program Committee Member**, *International Joint Conference on Neural Networks (IJCNN 2024)*, Yokohama, Japan, June 30 – July 5, 2024
4. **Organizer, Special Session**, “AI, Law, and Regulation,” *International Joint Conference on Neural Networks (IJCNN 2024)*, Yokohama, Japan, June 30 – July 5, 2024
5. **Industry Liaison Co-Chair**, *IEEE World Congress on Computational Intelligence (WCCI 2024)*, Yokohama, Japan, June 30 – July 5, 2024
6. **Technical Program Committee Member**, *IEEE World Congress on Computational Intelligence (WCCI 2024)*, Yokohama, Japan, June 30 – July 5, 2024
7. **Program Committee Member**, 2022 International Conference on Machine Learning, Control, and Robotics (**MLCR 2022**), Suzhou, China, December 16-17, 2022.
8. **IJCNN Program Committee Member**, *International Joint Conference on Neural Networks (IJCNN 2019)*, Budapest, Hungary, July 14 -19, 2019
9. **Program Committee Member**, *International Joint Conference on Neural Networks (IJCNN 2017)*, Anchorage, Alaska, May 14-19, 2017.
10. **Tutorials Chair**, *International Joint Conference on Neural Networks (IJCNN 2017)*, Anchorage, Alaska, May 14-19, 2017.
11. **Organizer, Special Session**, Mind, Brain, and Cognitive Algorithms, *International Joint Conference on Neural Networks (IJCNN 2017)*, Anchorage, Alaska, May 14-19, 2017.
12. **Chair, Panel Discussion, Cutting edge research on neural networks**, *International Joint Conference on Neural Networks (IJCNN 2017)*, Anchorage, Alaska, May 14-19, 2017.
13. **Program Committee**, IWINAC 2017 Special Session on Machine Learning Methods applied to Big Data Analysis, Processing and Visualization (**MLBDAPV**)
14. **Technical Program Committee**, *Thirteenth International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD 2017)*, Guilin, China, July 29-31, 2017.
15. **Technical Program Committee**, *Twelfth International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD 2016)*, Changsha, China, August 13-15, 2016.
16. **Organizer of Special Sessions at WCCI 2016** on Big Data, *World Congress on Computational Intelligence (WCCI’2016)*, Vancouver, Canada, July 25-29, 2016.

17. **Program Committee**, *Eleventh International Conference on Natural Computation (ICNC'15)* and the *Twelfth International Conference on Fuzzy Systems and Knowledge Discovery (FSKD'15)*, Zhangjiajie, China, August 15-17, 2015.
18. **Steering Committee**, *Eleventh International Conference on Natural Computation (ICNC'15)* and the *Twelfth International Conference on Fuzzy Systems and Knowledge Discovery (FSKD'15)*, Zhangjiajie, China, August 15-17, 2015.
19. **Program Committee**, *2<sup>nd</sup> International Workshop on Advances in Learning from/with Multiple Learners (ALML 2015)*, Killarney, Ireland, July 16-17, 2015.
20. **Program Committee**, *Tenth International Conference on Natural Computation (ICNC'14)* and the *Tenth International Conference on Fuzzy Systems and Knowledge Discovery (FSKD'14)*, Xiamen, China, August 19-21, 2014.
21. **Program Committee**, *International Joint Conference on Neural Networks (IJCNN'2014)*, Beijing, China, July 6 – 11, 2014.
19. **Program Committee**, *International Joint Conference on Neural Networks (IJCNN'2013)*, Dallas, TX, August 4-9, 2013.
20. **Program Committee**, *Ninth International Conference on Natural Computation (ICNC'13)* and the *Tenth International Conference on Fuzzy Systems and Knowledge Discovery (FSKD'13)*, Shenyang, China, July 23-25, 2013.
21. **International Advisory Board**, *The 3rd International Conference on Data Mining and Intelligent Information Technology Applications (ICMIA2011)*, October 24 - 26, 2011, Venetian, Macau
22. **Program Committee**, *International Joint Conference on Neural Networks (IJCNN'2011)*, San Jose, CA, July 31-August 5, 2011.
23. **Program Committee**, *Seventh International Conference on Natural Computation (ICNC'11)* and the *Eight International Conference on Fuzzy Systems and Knowledge Discovery (FSKD'11)*, Shanghai, China, July 26-28, 2011.
24. **Technical Program Committee**, *7th International Conference on Computational Intelligence, Robotics and Autonomous Systems (CIRAS 2010)*, 15-17 September 2010, Bangalore, India
25. **Advisory Council Member**, *INFORMS Conference on O.R. Practice*, Phoenix, Arizona, April 26-28, 2009.
26. **Invited Cluster Chair**, *Cluster - Multi Criteria Decision Making, INFORMS Annual Meeting*, San Diego, California, Oct. 11-14, 2009.
27. **Organizing Committee**, *Artificial Neural Networks in Engineering (ANNIE 2008)*, St. Louis, Missouri, November 9-12, 2008.
28. **Program Committee**, *Fourth International Conference on Natural Computation (ICNC'08)* and the *Fifth International Conference on Fuzzy Systems and Knowledge Discovery (FSKD'08)*, Jinan, China, August 25 - 27, 2008.
29. **International Advisory Board**, *International Congress on Pervasive Computing and Management (ICPCM)*, New Delhi, India, Dec 12-14, 2008.
30. **Organizing Committee**, *Artificial Neural Networks in Engineering (ANNIE 2007)*, St. Louis, Missouri, November 11-14, 2007.
31. **Program Committee**, *2nd International Conference on Natural Computation (ICNC'07)* and the *3rd International Conference on Fuzzy Systems and Knowledge Discovery (FSKD'07)*, Haikou, China, August 24 - 27, 2007.
32. **Program Committee**, *11<sup>th</sup> Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD'07)*, Nanjing, China, May 22 - 25, 2007.
33. **Program Committee**, *International Joint Conference on Neural Networks (IJCNN'2007)*, Orlando, Florida, August 12-17, 2007.
34. **Organizing Committee**, *Artificial Neural Networks in Engineering (ANNIE 2006)*, St. Louis, Missouri, November 5-8, 2006.
35. **Program Committee**, *2nd International Conference on Natural Computation (ICNC'06)* and the *3rd International Conference on Fuzzy Systems and Knowledge Discovery*



- (FSKD'06), Xian, China, September 24 – 27, 2006.
36. **Organizing Committee**, *Artificial Neural Networks in Engineering (Annie2005)*, St. Louis, Missouri, November 7-9, 2005.
  37. **Program Committee**, *International Conference on Natural Computation (ICNC'05)*, Hunan, China, September 24 – 26, 2005.
  38. **Program Committee**, *Workshop on Neural-Symbolic Learning and Reasoning (IJCAI 2005)*, Edinburgh, Scotland, July 30 – August 5, 2005.
  39. **Advisory/Program Committee**, *Workshop on Biologically-Inspired Models and Hardware (BIMH2005)*, Montreal, Canada, August 5, 2005.
  40. **Organizing Committee**, *Artificial Neural Networks in Engineering (Annie2004)*, St. Louis, Missouri, November 7-10, 2004.
  41. **Advisor**, *International Behavioral & Medical Biometrics Conference*, Las Vegas, Nevada, October 2004.
  42. **Program Committee**, *Summer School on Neural Networks (NN2004)*, Porto, Portugal, 12-16 July, 2004.
  43. **International Program Committee**, *2<sup>nd</sup> International Conference on Computational Intelligence, Robotics and Autonomous Systems (CIRAS 2003)*, Singapore, December 15-18, 2003.
  44. **Organizing Committee**, *Artificial Neural Networks in Engineering (Annie2003)*, St. Louis, Missouri, November 1-4, 2003.
  45. **Program Committee**, *VII BRAZILIAN SYMPOSIUM ON NEURAL NETWORKS (SBRN'2002)*, Recife, Brazil, November 11-14, 2002.
  46. **Organizing Committee**, *International School on Neural Nets*. Erice, Italy, Feb 25– March 7, 2002.
  47. **Program Committee**, *International Joint Conference on Neural Networks (IJCNN'2002)*, Honolulu, Hawaii, May 12-17 2002.
  48. **Organizing Committee**, *Artificial Neural Networks in Engineering (Annie2002)*, St. Louis, Missouri, November 10-13, 2002.
  49. **Organizing Committee**, *International Conference on Neural Information Processing (ICONIP2)*, Singapore, November 18-22, 2002.
  50. **Scientific Board**, *6th Online World Conference on Soft Computing in Industrial Applications (WSC6)*, September, 2001.
  51. **Organizing Committee**, *Artificial Neural Networks in Engineering (Annie2001)*, St. Louis, Missouri, November 4-7, 2001.
  52. **Program Committee**, *International Joint Conference on Neural Networks (IJCNN'2000)*, Como, Italy, July 24-27, 2000.
  53. **Program Committee**, *Seventh INFORMS Computer Society Conference On Computer Science and Operations Research: Recent Advances*, Cancun, Mexico, January 5-7, 2000.
  54. **Organizing Committee**, *Artificial Neural Networks in Engineering (Annie2000)*, St. Louis, Missouri, November 5-8, 2000.
  55. **Program Committee**, *International Joint Conference on Neural Networks (IJCNN'2000)*, Como, Italy, July 24-27, 2000.
  56. **Organizing Committee**, *International Joint Conference on Neural Networks (IJCNN'99)*, Washington, D.C., July 11-15, 1999.
  57. **Technical Program Committee**, *International Joint Conference on Neural Networks (IJCNN'99)*, Washington, D.C., July 11-15, 1999.
  58. **International Scientific Committee**, *4th On-line World Conference on Soft Computing in Engineering Design and Manufacturing (WSC4)*, Sept 21-30, 1999.
  59. **Program Committee**, *International Workshop on Soft Computing in Industry '99(IWSCI'99)*, Muroran, Hokkaido, Japan, June 16-18, 1999.
  60. **International Scientific Committee**, *3rd On-line World Conference on Soft Computing in Engineering Design and Manufacturing (WSC3)*, June 21-30, 1998.

61. **Program Committee**, *International Joint Conference on Neural Networks (IJCNN'98)*, Anchorage, Alaska, May 5-9, 1998.
62. **Program Committee**, *Sixth INFORMS CSTS Conference on Computer Science and Operations Research: Recent Advances*, Monterey, CA, Jan 8-10, 1998.
63. **Technical Program Committee**, *International Conference on Neural Networks (ICNN'97)*, Houston, June 9-12, 1997. **Area Chair** for "Supervised and Unsupervised Learning." Conference jointly sponsored by IEEE Neural Network Council and International Neural Network Society (INNS).
64. **Program Committee**, *International Conference on Operations and Quantitative Management (ICOQM)*, Jaipur, India, January 5-8, 1997.
65. **Program Committee**, *Fifth INFORMS CSTS Conference on Computer Science and Operations Research: Recent Advances*, Dallas, Texas, January 8-10, 1996.

## **Other National/International Professional Service**

1. **Panelist**, **National Science Foundation (NSF)**, Electrical, Communications and Cyber Systems (ECCS), Alexandria, Virginia, 2021.
2. **International Advisory Committee (IAC)**, **Post-Graduate Education Program on NN for AI**, KAIST, South Korea, 2017 – present.
3. **Chair**, **IEEE Neural Network Society**, **Phoenix Chapter**, 2005 – 2006.
4. **Chair**, **Special Interest Group on Mathematics and Theory**, International Neural Network Society, 1998 - 2001.
5. **INFORMS Liaison** to International Neural Network Society (INNS), 1997 - 2001.
6. **Judge**, **1990 Edelman Prize Competition** of the TIMS' College for the Practice of Management Sciences, *ORSA/TIMS Joint National Meeting*, Las Vegas, May, 1990.
7. **INFORMS Task Force on Job Placement Services**, 1995-96.
8. **ORSA Student Affairs Committee**, 1994-95.
9. **Chair**, **ORSA/TIMS Job Placement Service Committee**, 1994-95.
10. **ORSA/TIMS Job Placement Service Committee**, 1993-94.
11. **ORSA Prize Site-Visit Committee**, 1992-93. Visited San Miguel Corporation in Manila, Philippines.
12. **Cluster Chair**, "Computational Intelligence," *INFORMS National Meeting*, San Antonio, Fall, 2000.
13. **Cluster Chair**, "Machine Learning and Computational Intelligence," *INFORMS-KORMS Seoul 2000 International Meeting*, Seoul, South Korea, June, 2000.
14. **Cluster Chair**, "Computational Intelligence," *Seventh INFORMS Computer Society Conference on Computer Science and Operations Research: Recent Advances*, Cancun, Mexico, January 5 - 7, 2000.
15. **Cluster Chair**, "Machine Intelligence," *IFORS'99, 15th World Conference on Operational Research, Triennial Meeting of the International Federation of Operational Research Societies – IFORS*, Beijing, China, August 16 - 20, 1999.
16. **Cluster Chair**, "Computational Intelligence," *Sixth INFORMS CSTS Conference on Computer Science and Operations Research: Recent Advances*, Monterey, California, January 8-10, 1998.
17. **Cluster Chair**, "Machine Learning," *INFORMS National Meeting*, Dallas, Fall, 1997.
18. **Cluster Chair**, "Neural Networks," *INFORMS National Meeting*, Washington, D.C., Spring, 1996.
19. **Cluster Chair**, "Neural Networks," *INFORMS International Meeting*, Singapore, June 1995.
20. **Cluster Chair**, "Neural Networks and Mathematical Programming", *TIMS XXXII International Conference*, Anchorage, Alaska, June 12-15, 1994.

## **Professional Society Memberships:**

International Neural Network Society (INNS) – Senior Member

## **Editorial Service**

1. **Editorial Board Member**, *Neural Networks*, journal of the *International Neural Network Society (INNS)*, 2013 – 2021.
2. **Senior Editor**, *Big Data Analytics*, BioMed Central, 2015 – 2020.
3. **Senior Editor**, *Cognitive Computation*, Springer, 2015 – present.
4. **Guest Editor-in-Chief**, *Cognitive Computation*, *Special Topic “What AI and Neuroscience can Learn from Each Other,”* 2021 – 2024.
5. **Guest Editor-in-Chief**, *Frontiers in Psychology*, *Special Topic “Representation in the Brain,”* 2016 – 2018.
6. **Guest Editor**, *Cognitive Systems Research*, *Special Issue “Mental Models and Cognitive Algorithms,”* 2016 – 2017.
7. **Guest Editor-in-Chief**, *Special Issue of Neural Networks on Autonomous Learning*, 2013-14.
8. **Guest Editor-in-Chief**, *Neural Networks Special Issue on Big Data*, 2014-15.
9. **Co-Editor**, *Procedia Computer Science*, 53, *Proceedings of the INNS Conference on Big Data 2015 Program*, San Francisco, CA, USA 8-10 August 2015.
10. **Letters Editor**, *IEEE Transactions on Neural Networks*, 2000 - 2004.
11. **Associate Editor**, *IEEE Transactions on Neural Networks*, 1996 - 1999.
12. **Editorial Board Member**, *Neural Information Processing – Letters and Reviews*, 2003 – 2020.
13. **Member, Review Board**, *Applied Intelligence*, Kluwer Academic Publishers, 1996 - 2006.
14. **Guest Associate Editor**, *Operations Research*, 1998.
15. **Member, Editorial Board**, *The International Journal of Computational Intelligence and Organizations*, Lawrence Erlbaum and Associates, 1995 - 1997.

## **Honors and Awards:**

1. Inductee - ASU’s Chapter of the *National Academy of Inventors*, 2019
2. Listed in *Who's Who in America*, 2000 - 2015.
3. Listed in *Who's Who in American Education*, 2003 - 2007.
4. Listed in *Who's Who in the World*, 1987 – 2008.
5. Listed in *Who's Who of Emerging Leaders in America*, 1990 - 2000.
6. Listed in *Who's Who in the West*, 1985 - 96.
7. Listed in *Who's Who in Finance and Industry*, 1987 - 2000.
8. Listed in *Men of Achievement*, 1988/89, 1996/97.
9. Listed in *International Man of the Year*, 1996/97.
10. Member, *Scholars Round Table*, 1996-2000.
11. Honorary Member, *International Biographical Center Advisory Council*, 1997 -
12. *Merit Scholar*, Calcutta University, 1966-67.