

## BIOGRAPHICAL SKETCH

**Dr. Asok Ray**, Fellow IEEE, Fellow ASME, Fellow WIF  
Distinguished Professor of Mechanical Engineering  
and Mathematics  
Pennsylvania State University

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### A. EDUCATION

Calcutta University, India	Electrical Engineering	BS, 1966
Calcutta University, India	Electrical Engineering	MS, 1970
Northeastern University, Boston, MA	Computer Science	MS, 1972
Northeastern University, Boston, MA	Mechanical Engineering	PhD, 1976
Northeastern University, Boston, MA	Mathematics	MS, 1978

### B. ACADEMIC/PROFESSIONAL APPOINTMENTS

**Pennsylvania State University**, University Park, PA, 1985 – present  
Distinguished Professor of Mechanical Engineering and Mathematics, 2014-present  
Distinguished Professor of Mechanical Engineering, 2003-2013  
Professor of Mechanical Engineering, 1990-2002  
Associate Professor of Mechanical Engineering, 1985-1990  
Graduate Faculty of Electrical Engineering, 1991-present  
Graduate Faculty of Nuclear Engineering, 2013-present

**GTE Strategic Systems**, Westborough, MA, 1984 – 1985  
Manager and Senior Scientist, Network Systems Analysis Department

**The Charles Stark Draper Laboratory**, Cambridge, MA, 1980-1984  
Senior Research Scientist

**Carnegie-Mellon University**, Pittsburgh, PA, 1978 -1980  
Assistant Professor of Mechanical Engineering

**The MITRE Corporation**, Bedford, MA, 1975-1978  
Member of Technical Staff

### C. RESEARCH AND PROFESSIONAL EXPERIENCE

The major research activities of Dr. Ray are in the areas of Machine Learning, Signal Processing, Information Theory, and Instrumentation & Control. Dr. Ray's recent contributions are in the fields of fault/anomaly detection and statistical pattern recognition for robust and resilient control of safety-critical systems (e.g., aircraft and nuclear plants). The innovative concepts, initiated by Dr. Ray, have been experimentally validated in laboratory environments such as the MIT nuclear reactor, MITR-II.

From 2001 to 2007, Dr. Ray was the Principal Investigator of a Multidisciplinary University Research Initiative (MURI) grant. This MURI grant was awarded to Pennsylvania State University and collaborators (Duke, Carnegie Mellon, and Louisiana Tech) by the Army Research Office (ARO) in the area of Mathematics of Failures to conduct theoretical and experimental research on characterization and mitigation of anomalous behavior in complex dynamical systems. Dr. Ray was also one of the grantees in the DARPA Information Exploitation Office (IXO) Program on Command & Control - Mixed Initiative Control of Automa-Teams (MICA). These technologies have been transferred to industry through several SBIR and STTR projects for field applications in Department of Defense (DoD) sites (e.g., NAVAIR and NAVSEA) and NASA sites (e.g., NASA Glenn Research Center and NASA Marshall Space Flight Center). Dr. Ray also had been the Principal Investigator of a four-year (2009-2012) multidisciplinary multi-University research project in the field of Science of Autonomy funded by the Office of Naval Research (ONR), where the research activities focused on: (i) Sensor-network-based Autonomous Perception & Intelligent Decision-making, and (ii) Scalable & Robust Distributed Collaboration, based on the fundamental principles of Information Theory, Statistical Mechanics, and Automata Theory. Currently, Dr. Ray is the Principal Investigator of a five-year research grant from Air Force Office of Scientific Research (AFOSR) in the field of Dynamic Data-driven Application Systems (DDDAS), which deals with prognostic health monitoring (PHM) and real-time active control of both tactical and transport aircraft.

## D. PUBLICATIONS

Dr. Ray has authored or co-authored over *six hundred* research publications including over *three hundred* scholarly articles in refereed journals and research monographs. A list of archive publications is available at <http://www.mne.psu.edu/Ray/publications.html>.

### Fifteen Recent Publications

- S. Xiong, Y. Fu and A. Ray, "Bayesian Nonparametric Regression Modeling of Panel Data for Sequential Classification," *IEEE Transactions on Neural Networks and Learning Systems*, doi: 10.1109/TNNLS.2017.2752005
- S. Xiong, S. Mondal and A. Ray, "Detection of Thermoacoustic Instabilities via Nonparametric Bayesian Markov Modeling of Time Series Data," *ASME Journal of Dyn Sys, Meas, and Control*, doi: 10.1115/1.4037288.
- Y. Li, D.K. Jha, A. Ray and T.A. Wettergren, "Information-theoretic Performance Analysis of Sensor Networks via Markov Modeling of Time Series Data," *IEEE Transactions on Cybernetics*, doi: 10.1109/TCYB.2017.2717974
- N. Virani, D.K. Jha, Z. Yuan, I. Sekhawat and A. Ray, "Imitation of Demonstrations using Bayesian Filtering with Nonparametric Data-driven Models," *ASME Journal of Dyn Sys, Meas, and Control* 140(1) 030906(1-9) Mar2018.
- M. Hauser and A. Ray, "Principles of Riemannian Geometry in Neural Networks," *Neural Information Processing Systems (NIPS)*, Long Beach, CA, Dec 2017.
- P. Chattopadhyay, S. Mondal, C. Bhattacharya, A. Mukhopadhyay and A. Ray, "Dynamic Data-Driven Design of Lean Premixed Combustors for Thermoacoustically Stable Operations," *ASME Journal of Machine Design (Special Issue on Data-Driven Design (D3))*, 139 (11) 111419 (1-10), Nov 2017.
- S. Sarkar, S.R. Chakravarthy, V. Ramanan and A. Ray, "Dynamic Data-driven Prediction of Instability in a Swirl-stabilized Combustor," *International Journal of Spray and Combustion Dynamics*, 8(4) 235-253, Dec 2016.
- Y. Li and A. Ray, "Unsupervised Symbolization of Signal Time Series for Extraction of the Embedded Information," *Entropy*, 19 (4) 148 (1-20), April 2017.
- S. Sarkar, A. Ray, A. Mukhopadhyay and S. Sen, "Dynamic Data-driven Prediction of Lean Blowout in a Swirl-stabilized Combustor," *International Journal of Spray and Combustion Dynamics*, 7 (3) 209-242, Sep 2015.
- K. Mukherjee and A. Ray, "State Splitting & Merging in Probabilistic Finite State Automata for Signal Representation and Analysis," *Signal Processing*, 104 (2014) 105-119.
- A. Ray, S. Phoha and S. Sarkar, "Behavior Prediction for Decision & Control in Cognitive Autonomous Systems," *New Mathematics and Natural Computation: Special Issue on Engineering of the Mind, Cognitive Science and Robotics* 9 (3) 263-271 Nov 2013.
- Y. Wen, A. Ray and S. Phoha, "Hilbert Space Formulation of Symbolic Systems for Signal Representation and Analysis," *Signal Processing* 93 (9) 2594-2611 Sep 2013.
- Y. Wen, K. Mukherjee and A. Ray, "Adaptive Pattern Classification for Symbolic Dynamic Systems," *Signal Processing* 93 (1) 252-260 Jan 2013.
- S. Sarkar, K. Mukherjee, S. Sarkar and A. Ray, "Symbolic Dynamic Analysis of Transient Time Series for Fault Detection in Gas Turbine Engines," *ASME Journal of Dyn Sys, Meas, and Control* 135 (1) 24503 (1-6), Jan 2013.
- X. Jin, S. Gupta, K. Mukherjee and A. Ray, "Wavelet-based Feature Extraction Using Probabilistic Finite State Automata for Pattern Classification," *Pattern Recognition* 44 (7) 1343-1356 July 2011.

## E. HONORS AND AWARDS

- **Outstanding Faculty** Award, Penn State Mechanical Engineering Department, 1993
- **ASME Fellow** Award for research in Control Theory and Mechanics of Materials, 1994
- **Outstanding Research** Award, Penn State College of Engineering, 1995
- National Academy of Engineering **Senior Research Fellowship** Award, 1998-1999
- **IEEE Fellow** Award for research in Aerospace and Electromechanical Systems, 2002
- **Premier Research** Award, Penn State College of Engineering, 2003
- **Distinguished Professorship** Award, Pennsylvania State University, 2003
- World Innovation Foundation (**WIF**) **Fellow** Award for research in failure diagnosis, 2005
- ASME DSCD Henry M. Paynter **Outstanding Investigator** Award, 2012