

## **Dennis S. Bernstein**

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Department of Aerospace Engineering  
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1320 Beal Ave.  
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### **Career Summary**

My professional career includes experience in a Government laboratory (2 years, Lincoln Laboratory), industry (7 years, Harris Corporation) and academia (25 years, University of Michigan). I received tenure upon joining the University of Michigan in 1991, and I was promoted to the rank of Professor in 1997.

My teaching and research interests include all aerospace-related aspects of systems and control technology. I have taught undergraduate aerospace courses on aircraft performance (AE245), flight mechanics and control (AE 345, AE348, AE471), and instrumentation (AE305), as well as graduate-level courses on analytical dynamics (AE540), data analysis and system identification (AE566), optimal control/trajectory optimization (AE575), control of vibration and flow (AE579), and linear multivariable control (AE580). My research interests encompass problems in linear, nonlinear, and adaptive control as well as system identification and data assimilation. This research, supported by the AFOSR, NASA, NSF, ONR, and DOE as well as several industrial organizations, has been reported in more than 250 journal publications and 500 conference papers.

In addition to technical research, I have contributed numerous papers to the *IEEE Control Systems Magazine* on a wide range of topics relevant to control engineering and control education. I was Editor-in-Chief of *IEEE CSM* from August 2003 to December 2011.

To pursue applications-oriented control research, I founded the Noise, Vibration, and Motion Control Laboratory and the Attitude Control Laboratory in the Department of Aerospace Engineering.

## **Education**

M.S.E., Ph.D., Computer, Information and Control Engineering, University of Michigan, Ann Arbor, Michigan, 1979, 1982. Advisor: Elmer G. Gilbert.

Sc.B., Applied Mathematics, Brown University, Providence, Rhode Island, 1977.

## **Professional Experience**

Professor, Department of Aerospace Engineering, University of Michigan, Ann Arbor, Michigan, 1997-present.

Associate Professor, Department of Aerospace Engineering, University of Michigan, Ann Arbor, Michigan, 1991-97.

Staff Engineer, Structural Controls Group, Government Aerospace Systems Division, Harris Corporation, Melbourne, Florida, 1984-91.

Staff Member, Control Systems Engineering Group, MIT Lincoln Laboratory, Lexington, Massachusetts, 1982-84.

## **Research Interests**

Theory: Linear and nonlinear systems, estimation, data assimilation, identification, optimal, robust, nonlinear, and adaptive control.

Applications: Aircraft, spacecraft, structures, vibrations, acoustics, and fluids.

## **Undergraduate Courses Taught**

Introduction to Aircraft and Spacecraft, AERO245.

Measurement and Instrumentation, AERO305.

Flight Mechanics and Control, AERO345, AERO348.

Control Systems, AERO471.

## **Graduate Courses Taught**

Intermediate Dynamics, AERO540.

Data Analysis and System Identification, AERO566.

Optimal Control/Trajectory Optimization, AERO575.

Control of Structures and Fluids, AERO579.

Linear Control Systems, AERO580.

## Dissertations Supervised

Wassim M. Haddad, *Robust Optimal Projection Control-System Synthesis*, 1989. Currently with Georgia Tech in Atlanta, GA.

Y. William Wang, *Fixed-Structure Controller Design for Linear Systems with Performance Constraints*, 1993. Currently with Northrop Grumman in El Segundo, CA.

Yasuo Kishimoto, *Energy Flow Modeling and Control of Interconnected Structures*, 1993. Currently with Japan Defense Forces.

Chih-Jian Wan, *Global Stabilization of Nonlinear Gyroscopic Systems*, 1994. Currently with Chung-Shan Institute of Science and Technology in Taiwan.

Feng Tyan, *Robust Stability and Performance Analysis for Systems with Saturation and Parameter Uncertainty*, 1995. Currently with Tamkang University in Taiwan.

Andrew G. Sparks, *Robustness Analysis and Controller Synthesis Using Stability Multipliers and Scalings*, 1995. Currently with United Technologies Research Center in Hartford, CT.

Robert T. Bupp, *Resetting Virtual Absorbers for Vibration Control: Theory and Applications*, 1996. Currently with Nu-Tek Optics in MD.

James C. Akers, *Time Domain Identification Using ARMARKOV-Toeplitz Models*, 1997. Currently with NASA Glenn in Cleveland, OH.

Ravinder Venugopal, *Modeling and Adaptive Control of Acoustic Vibrations*, 1997. Currently with Opal-RT in Montreal, Canada.

R. Scott Erwin, *Robust Fixed-Structure Controller Synthesis Using the Delta Operator: Theory and Experiment*, 1997. Currently with Air Force Research Laboratory in Albuquerque, NM.

Sanjay P. Bhat, *Finite-Time Stability and Finite-Time Stabilization*, 1997. Currently with TATA in Bangalore, India.

Kai-Yew Lum, *Control of the Rigid Body and Dynamics with Symmetry*, 1997. Currently with National Chi Nan University in Taiwan.

Jeongho Hong, *Experimental Implementation of Fixed-Gain and Adaptive Control*, 1998. Currently with LMS in South Korea.

Scot L. Osburn, *Robust Analysis of Sampled Data Controllers*, 2000. Currently with Aerospace Corporation in El Segundo, CA.

Tobin H. van Pelt, *Nonlinear Identification with Hammerstein/Nonlinear Feedback Models*, 2000. Currently with i3D in Ann Arbor, MI.

Jasim Ahmed, *Adaptive Control of Multibody Systems with Unknown Mass Distribution*, 2000. Currently with Bosch in Palo Alto, CA.

Harshad Sane, *Control of Linear and Nonlinear Hammerstein Systems*, 2001. Currently with Sikorsky in Hartford, CT.

Seth L. Lacy, *System Identification*, 2002. Currently with Air Force Research Laboratory in Albuquerque, NM.

Alex Roup, *Adaptive Stabilization and Disturbance Rejection for Continuous-Time Systems*, 2002. Currently with VCT, Inc., Reston, VA.

JinHyoung Oh, *Modeling, Identification, and Control of Rate-Independent and Rate-Dependent Hysteresis*, 2004. Currently with Tesla Motors.

Suhail Akhtar, *Trailing Horizon Adaptive Disturbance Rejection*, 2005. Currently Chair of Department of Avionics Engineering, Air University in Islamabad, Pakistan.

Jesse B. Hoagg, *Advances in Adaptive Stabilization, Command Following, and Disturbance Rejection*, 2006. Currently with University of Kentucky in Lexington, KY.

Harish Palanthandalam-Madapusi, *Nonlinear System Identification with Applications to Space Weather Prediction*, 2007. Joint supervision with Aaron Ridley. Currently with IIT Gandhinagar in India.

Jaganath Chandrasekar, *Reduced-Complexity Algorithms for Data Assimilation of Large-Scale Systems*, 2007. Joint supervision with Aaron Ridley. Currently with Levant in Woburn, MA.

Nalin A. Chaturvedi, *Global Dynamics and Stabilization of Rigid Body Attitude Systems*, 2007. Joint supervision with N. Harris McClamroch. Currently with Apple in Cupertino, CA.

In Sung Kim, *Large Scale Data Assimilation with Application to the Ionosphere-Thermosphere*, 2008. Joint supervision with Aaron Ridley. Currently with KARI in South Korea.

Mario A. Santillo, *Adaptive Control Based on Retrospective Cost Optimization*, 2009. Currently with Ford in Dearborn, MI.

Adam Brzezinski, *Output-Only Techniques for Fault Detection*, 2011. Currently with Joby Aviation in Santa Cruz, CA.

Anthony M. D'Amato, *Adaptive Input Reconstruction with Application to Model Refinement, State Estimation, and Adaptive Control*, 2012. Currently with Ford in Dearborn, MI.

Matthew S. Holzel, *Persistence, Consistency, and Polynomial Matrix Models in Least-Squares Identification*, 2012. Currently with University of Bremen, Germany.

Bojana Drincic, *Mechanical Models of Friction That Exhibit Hysteresis, Stick-Slip, and the Stribeck Effect*, 2012. Currently with Areva-Wind in Germany.

Dogan Sumer, *Extensions of Retrospective Cost Adaptive Control: Nonsquare Plants, and Robustness Modifications*, 2013. Currently with Ford in Dearborn, MI.

Alexey V. Morozov, *Data Assimilation and Driver Estimation for Space Weather Models Using Ensemble Filters*, 2013. Currently with Apple in Cupertino, CA.

Asad Ali, *Retrospective Cost Adaptive Unknown Input Observers with Application to State and Driver Estimation in the Ionosphere-Thermosphere*, 2013. Currently with Sensor Platforms in San Jose, CA.

Jin Yan, *Retrospective Cost Adaptive Control of Hammerstein Systems*, 2013. Currently with Intuitive Surgical in Sunnyvale, CA.

Gerardo E. Cruz, *Retrospective Cost-based Adaptive Spacecraft Attitude Control*. Currently with NASA Goddard in Greenbelt, MD.

Khaled Aljanaideh, *Time-Domain Analysis of Sensor-to-Sensor Transmissibility Operators with Application to Sensor Fault Detection*. Currently with University of Jordan.

Yousaf Rahman, *Intercalated Injection, Target Model Construction and  $H_2$  Performance of Retrospective Cost Adaptive Control*. Currently with Ford in Dearborn, MI.

Frant Sobolic, *Retrospective Cost Adaptive Control with Concurrent Closed-Loop Identification*. Currently with Raytheon Missile Systems in Tucson, AZ.

Ming-Jui Yu, *Retrospective Cost Methods for Combined State and Parameter Estimation*. Currently with Cymer, Inc., San Diego, CA.

Antai Xie, *Retrospective Cost Retrospective Cost Adaptive Control for Feedback and Feedforward Noise Control*. Currently with Aurora Flight Sciences, Inc., Manassas, VA.

Ahmad Ansari, *Input and State Estimation for Discrete-Time Linear Systems with Application to Target Tracking and Fault Detection*. Currently with Joby Aviation in Santa Cruz, CA.

## **Research Activities**

Author or coauthor of more than 250 journal papers and 500 conference papers.

Author of *Matrix Mathematics: Theory, Facts, and Formulas with Application to Linear Systems Theory*, Princeton University Press, 2005. Second edition, 2009. Revised and expanded edition, 2018 entitled *Scalar, Vector, and Matrix Mathematics: Theory, Facts, and Formulas*

Director of the Noise, Vibration, and Motion Control Laboratory in the Department of Aerospace Engineering at the University of Michigan.

Ph.D. committee member and advisor for students at Florida Institute of Technology, University of New Mexico, MIT, Virginia Tech, K. U. Leuven, and METU.

Advisor for UROP students, 1993-97, 2007-2008.

### **Departmental and College Service**

Teaching Coordination Committee, 2018-2019.  
Casebook Committees, 2013-2016.  
Search Committee, 2013-2014.  
Casebook Committee, 2012-2013.  
Search Committee, 2012-2013.  
Nominating Committee, 2011.  
Search Committee, 2010.  
Discipline Committee, 2007-2011.  
Search Committee, 2007-2008.  
Safety Committee, 2004-2006.  
Website Committee, 2005-2008.  
Library Committee, 2004.  
Curriculum Committee, 2003.  
Search Committee, 2001-02.  
Graduate Committee, 1997-02.  
Search Committee, 1996.  
Seminar Committee, 1994-96.

### **Professional Activities**

AACC Editor at Large, 2018.  
Member, IEEE Control Systems Society Board of Governors, 2003-2011.  
Visiting Scholar, AFRL Albuquerque, July 2004, August 2005, June-July 2008.  
Part-time Visiting Professor, University of Glasgow, 2000-03.  
Member of Conference Editorial Board, 1997.  
Part-time Visiting Professor, University of Leeds, 1995-97.  
NSF Review Panel Member, 1994, 1997.  
NASA Review Committee Member, MIT Space Engineering Research Center, 1993.  
Publications Chairman, Conference on Decision and Control, San Antonio, TX, 1993.  
Adjunct Professor, Florida Institute of Technology, Melbourne, FL, 1990-91.  
Part-time Visiting Engineer, MIT, 1989-90.  
Member of IEEE, 1982-2018.  
Member of MAA, 2010-2018.

### **Journal Activities**

Editor-in-Chief, *IEEE Control Systems Magazine*, 2003-2011.  
Associate Editor, *IEEE Control Systems Magazine*, 2000-03.  
Associate Editor, *Systems and Control Letters*, 1997-2010.  
Associate Editor, *Int. Journal on Adaptive Control and Signal Proc.*, 2004-2011.  
Associate Editor, *Int. Journal on Robust and Nonlinear Control*, 1989-2004.  
Associate Editor, *IEEE Transactions on Automatic Control*, 1990-1992.

## Recognition

IEEE CSS Distinguished Member Award, 2007.  
Honorary Doctorate, University of Glasgow, 2006.  
Plenary speaker, 1<sup>ST</sup> ISCAA Conference, Harbin, China, February 2006.  
Plenary speaker, IEEE Conf. Decision and Control, Orlando, FL, December 2001.  
IEEE Fellow, 2000.  
Plenary speaker, IEEE Conf. Control and Its Applications, Hartford, CT, October 1997.  
Aerospace Engineering Department Research Award, 1993.  
Best Presentation of Session Award (9), American Control Conference.

## Invited Lectures

Utah State University, Space Dynamics Laboratory, 2019  
China Lake, 2018  
BYU, 2018.  
NASA Armstrong, 2016  
WPAFB, 2015  
AFRL Albuquerque, 2015  
ACGSC Meeting, Cleveland, 2014  
CalTech, 2014  
JPL, 2014  
Aerospace Corp., 2014  
NASA Dryden, 2014  
Bosch, 2013  
ACGSC Meeting, Annapolis, 2013  
McGill University, 2013  
AFRL Albuquerque, 2012  
University of Kentucky, 2012  
ACGSC Meeting, Salt Lake City, 2012  
Brigham Young University, 2012  
Penn State University, 2012  
NASA Dryden, 2011  
AFRL Albuquerque, 2011  
NASA Langley, 2010  
University of California San Diego, 2009  
University of Florida, 2009  
Georgia Tech, 2009  
Sandia Laboratories, 2008  
NASA Langley, 2008  
K. Universiteit Leuven, 2007  
Michigan State University, 2006  
Imperial College, 2006  
ISSCAA, Harbin China, 2006  
Beijing University of Aeronautics and Astronautics, 2006  
AFRL Albuquerque, 2005  
University of New Mexico, 2005  
Boeing SVS, 2005  
USC, 2005  
U. Patras, 2005

K. U. Leuven, 2005  
AFRL Albuquerque, 2004  
Boston University, 2004  
AFRL Albuquerque, 2003  
University of Glasgow, 2003  
Honeywell Tech Center, 2003  
AFRL Albuquerque, 2002  
JPL, 2002  
NASA Dryden, 2002  
Aerospace Corporation, 2002  
Honeywell Corporation, 2002  
University of Illinois, 2002  
Ford, 2002  
University of Glasgow, 2002  
University of Strathclyde, 2002  
NASA Goddard, 2002  
Aerospace Corporation, 2001  
Boeing, 2001  
JPL, 2001  
Philips Corporation, 2001  
Technical University of Delft, 2001  
University of Glasgow, 2000  
University of Patras, 2000  
Honeywell Business Aviation, 1999  
Ford, 1999  
University of Maryland, 1999  
Wright-Patterson AFB, 1999  
Hughes, 1998  
Virginia Tech, 1998  
Aerospace Corporation, 1998  
USC, 1998  
JPL, 1998  
Hughes, 1998  
Ford, 1998  
Virginia Tech, 1998  
University of Virginia, 1998  
NASA Langley, 1998  
Notre Dame University, 1998  
Aerospace Corporation, 1998  
TRW, 1998  
Hughes, 1998  
Rockwell, 1998  
JPL, 1998  
CalTech, 1998  
Stanford University, 1997  
Honeywell Technology Center, 1997  
Lord Corporation, 1997  
Phillips Laboratory, 1997  
Duke University, 1997  
North Carolina State University, 1997  
Cornell University, 1996



University of Leeds, 1995  
Michigan State University, 1995  
University of California at Santa Barbara, 1994  
Washington University, 1991  
University of Michigan, 1990  
University of Florida, 1990  
Air Force Academy, 1989  
MIT, 1989  
Sandia Laboratories, 1988  
University of Warwick, 1988  
Florida Institute of Technology, 1987  
University of Michigan, 1987  
West Virginia University, 1986  
Princeton University, 1984  
MIT, 1983  
Purdue University, 1982