Dennis S. Bernstein

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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, and several industrial organizations, has been reported in more than 200 journal publications and 450 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. 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. I have obtained internal, NSF, and DoD funding to acquire laboratory equipment.

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 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 Wright-Patterson AFB in Dayton, OH.

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 United Technologies Research Center, 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 Bosch in Palo Alto, 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 Western Digital in San Jose, 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, *Persistency, 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 Whirlpool in Benton Harbor, MI.

Alexey V. Morozov, *Data Assimilation and Driver Estimation for Space Weather Models Using Ensemble Filters*, 2013. Currently with InvenSense in San Jose, 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 Medtronics in Northridge, CA.

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

Research Activities

Author or coauthor of more than 200 journal papers and 400 conference papers.

Author of *Matrix Mathematics: Theory, Facts, and Formulas with Application to Linear Systems Theory*, Princeton University Press, 2005. Second edition, July 2009. Third edition in preparation.

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

Co-Director of the Attitude 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, and K. U. Leuven.

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

Departmental and College Service

Casebook Committee, 2013-2015.
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

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, 1982-2013.

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*, 1989-04.
Associate Editor, *IEEE Transactions on Automatic Control*, 1990-92.

Recognition

IEEE CSS Distinguished Member Award, 2007.
Honorary Doctorate, University of Glasgow, 2006.
Plenary speaker, 1ST 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

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