

# Matthew M. Peet, curriculum vitae

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CONTACT INFORMATION	Matthew M. Peet Arizona State University School for Engineering of Matter, Transport and Energy P.O. Box 876106 Tempe, AZ 85287-6106	<i>Voice:</i> 1-312-567-3220 <i>Mobile:</i> 1-630-272-4451 <i>E-mail:</i> mpeet@asu.edu <i>WWW:</i> control.asu.edu
NATIONALITY	United States Citizen	
RESEARCH AREA	Computational Aspects of Control	
EDUCATION	<b>Stanford University</b> , Stanford, California USA Ph.D., Aeronautics and Astronautics, March, 2006 <ul style="list-style-type: none"><li>• Dissertation Title: “Stability and Control of Functional Differential Equations”</li><li>• Thesis Advisor: Sanjay Lall</li><li>• Thesis Committee: Geir Dullerud, Stephen Rock, Günter Niemeyer</li></ul> <b>Stanford University</b> , Stanford, California USA M.S., Aeronautics and Astronautics, June, 2001 <b>University of Texas at Austin</b> , Austin, Texas USA Full Scholarship Averaged 8.3 classes/22.5 credits per semester for 4.5 years. B.S., Aerospace Engineering, December, 1999 B.S., Physics, June, 1999 Graduated with honors	
PROFESSIONAL EXPERIENCE	<b>Arizona State University</b> <b>School for Engineering of Matter, Transport and Energy</b> , <i>Assistant Professor of Mechanical and Aerospace Engineering</i>	<b>2012 - present</b>
	<b>Illinois Institute of Technology</b> <b>Department of Mechanical, Materials and Aerospace Engineering</b> , <i>Assistant Professor of Aerospace Engineering</i>	<b>2008 - 2012</b>
	<b>National Institute for Research in Computer Science and Control (INRIA)</b> , Rocquencourt, France Nonlinear Analysis for Biology and Geophysical flows (BANG) <i>Postdoctoral Scholar</i> Description: Postdocs at INRIA have autonomy. However, this second term was focused on collaboration with the BANG group.	<b>2007 - 2008</b> ARC ModLMC
	<b>National Institute for Research in Computer Science and Control (INRIA)</b> , Rocquencourt, France Signals and SYstems in PHysiology & Engineering (SISYPHE) <i>Postdoctoral Scholar</i> Description: Postdocs at INRIA have autonomy. However, this second term was focused on collaboration with the SISYPHE group.	<b>2006 - 2007</b>
	<b>Networked Systems and Controls Laboratory</b> , Stanford, California Stanford University <i>Research Assistant</i>	<b>2002 - 2006</b> Advisor: Sanjay Lall
	<b>SuperNova Acceleration Probe (SNAP) project</b> , Berkeley, California Lawrence Berkeley National Laboratory <i>Research Assistant</i>	<b>2000 - 2001</b>

Description: Development of a lunar gravity-assist trajectory for the Supernova/Acceleration Probe (SNAP). Supervision by Doron Levy.

**Gravity Probe B**, Stanford, California **2000 - 2001**

Stanford University

*Research Assistant*

Description: Design of the GPS III constellation.

**Johnston Space Center**, Clear Lake, Texas **1998 - 1999**

Lockheed Martin Space Operations Corp.

Flight Dynamics Planning and Analysis Group

*Applications Engineer*

Description: Developed flight dynamics software for the International Space Station.

**Applied Research Laboratories**, Austin, Texas **1997 - 1998**

Department of Defense

*Undergraduate Researcher*

Description: Work on analysis of GPS data for ballistic missile testing.

**Fusion Research Center**, Austin, Texas **1996 - 1997**

University of Texas at Austin

*Undergraduate Researcher*

Description: Work on experimental design for Tokamaks.

#### AWARDS AND RECOGNITION

- 2014-present: Member, IEEE Technical Committee on Systems with Uncertainty.
- 2013-present: Member, IEEE Technical Committee on Power Generation Control.
- 2011: NSF CAREER recipient.
- 2006: INRIA (French) Postdoctoral Fellow.
- 2001: Boeing Graduate Fellow.
- 1999: Graduated Cum Laude in both Physics and Aerospace Engineering (203 credit hours), The University of Texas at Austin.

#### GRADUATE STUDENTS ADVISED

<b>Chaitanya Murti</b> , MS thesis student (defended at IIT)	<b>Graduated Spring, 2012</b>
<b>Aditya Gahlawat</b> , PhD student (Chateaubriand Fellow, defended at IIT)	<b>Graduated Fall, 2016</b>
<b>Reza Kamyar</b> , PhD student (defended at ASU)	<b>Graduated Spring, 2016</b>
<b>Evgeney Meyer</b> , PhD candidate (Passed qualifying exam at ASU in 2015)	<b>2013 - present</b>
<b>Hesameddin Mohamaddi</b> , PhD student	<b>2015 - present</b>
<b>Brendon Colbert</b> , PhD student (Dean's Fellow)	<b>starting Fall 2016</b>
<b>Morgan Jones</b> , PhD student	<b>starting Fall 2016</b>
<b>Hooman Mobarakeh</b> , PhD student	<b>starting Fall 2016</b>

#### STUDENT THESES SUPERVISED

- [1] **Reza Kamyar, Ph. D.** *Parallel Optimization of Polynomials for Large-Scale Problems in Stability and Control*. Defended at ASU in January, 2016.
- [2] **Aditya Gahlawat, Ph. D.** *Analysis and Control of Parabolic Partial Differential Equations with Application to Tokamaks using Sum-of-Squares Polynomials*. Defended at IIT in October, 2015.
- [3] **Evgeny Meyer, M. Sc.** *A Convex Approach for Stability Analysis of Partial Differential Equations*. Defended at ASU in June, 2016.
- [4] **Chaitanya Murti, M. Sc.** *Analysis of Zeno Stability in Hybrid Systems Using Sum-of-Squares Programming*. Defended at IIT in December, 2012.

#### JOURNAL PUBLICATIONS

**Summary:** I have 13 journal papers published or accepted and 2 journal papers under review. 6 of these have graduate students as first author (Student authors are shown in **bold**). 10 of these are in Automatica or IEEE TAC - the top two journals in control. I have 5 book chapters, one of which has a graduate student author as first author. I have 46 conference papers published or accepted and 4 under review. 31 of these are in the CDC or ACC proceedings. CDC and ACC are the top two

conferences in control and CDC and ACC proceedings are listed by Google metrics as the number 5 and 6 top publications in control overall based on h5-index (including journal publications). Of the conference publications, 21 have a graduate student as first author. The total is 64 published (or to appear) and 4 under review. All papers and many conference presentations can be downloaded from <http://control.asu.edu>

- [1] M. Peet. *SOS Methods for Multi-Delay Systems: A Dual Form of Lyapunov-Krasovskii Functional*. Submitted to IEEE Transactions on Automatic Control.
- [2] **C. Murti** and M. Peet *Using SOS for Analysis of Zeno Stability in Hybrid systems with Non-linearity and Uncertainty*. Submitted to SIAM Journal on Control and Optimization.
- [3] **R. Kamyar** and M. Peet *Optimal Thermostat Programming for Time-of-Use and Demand Charges with Thermal Energy Storage and Optimal Pricing for Regulated Utilities*. To Appear in IEEE Transactions on Power Systems.
- [4] **A. Gahlawat** and M. Peet *A Convex Sum-of-Squares Approach to Analysis, State Feedback and Output Feedback Control of Parabolic PDEs*. IEEE Transactions on Automatic Control. Vol. 62, No. 4, pp. 1636-1651, 2017. Full Paper.
- [5] **R. Kamyar** and M. Peet *Polynomial Optimization with Applications to Stability Analysis and Control - Alternatives to Sum-of-Squares*. Discrete and Continuous Dynamical Systems - Series B. Special Issue on "Computational Methods for Lyapunov Functions". **Survey Paper**. Vol. 20, No. 8, pp. 2383-2417, 2015.
- [6] **R. Kamyar**, M. Peet and Y. Peet *Solving Large-Scale Robust Control Problems by Exploiting the Parallel Structure of Polya's Theorem*. IEEE Transactions on Automatic Control. Vol. 58, No. 8, Aug., 2013. Full Paper.
- [7] A. Seuret and M. Peet. *Stability analysis of sampled-data systems using Sum of Squares*. IEEE Transactions on Automatic Control. Vol. 58, No. 6, June, 2013.
- [8] M. Peet and A. Papachristodoulou *A Converse Sum of Squares Lyapunov Result with a Degree Bound*. IEEE Transactions on Automatic Control. Vol 57, No. 9, Sept., 2012. Full Paper.
- [9] **Y. Zhang**, M. Peet and K. Gu. *Reducing the Complexity of the Sum-of-Squares Test for Stability of Delayed Linear Systems*. IEEE Transactions on Automatic Control. Vol 56, No. 1, 2011.
- [10] M. M. Peet and P.-A. Bliman. *On the Conservatism of the Sum-of-Squares Method for Analysis of Time-Delayed Systems*. Automatica. Vol 49, No. 11, Nov. 2011.
- [11] M. M. Peet. *Exponentially Stable Nonlinear Systems have Polynomial Lyapunov Functions on Bounded Regions*. IEEE Transactions on Automatic Control, Vol. 54, No. 5, May 2009. Full Paper.
- [12] A. Papachristodoulou, M. Peet and S. Lall *Analysis of Polynomial Systems with Time Delays via the Sum of Squares Decomposition*. IEEE Transactions on Automatic Control. Vol. 54, No. 5, May 2009. Full Paper.
- [13] M. M. Peet, P. Kim, S.-I. Niculescu, and D. Levy *New Computational Tools for Modeling Chronic Myelogenous Leukemia* Mathematical Modeling of Natural Phenomena, Vol. 4, No. 2, 2009. Full Paper.
- [14] M. M. Peet, A. Papachristodoulou and S. Lall. *Positive Forms and Stability of Linear Time-Delay Systems*. SIAM Journal on Control and Optimization. Vol. 47, No. 6, pp. 3237-3258, 2009. Full Paper.
- [15] M. Peet and S. Lall. *Global Stability Analysis of a Nonlinear Model of Internet Congestion*

*Control with Delay*. IEEE Transactions on Automatic Control. Vol. 52, No. 3, March 2007.

BOOK CHAPTERS

[16] G. Miao and M. Peet and K. Gu. *State-Feedback Controller Synthesis in the Differential-Difference Framework using SOS*. Invited Submission for chapter in “Delays and Interconnections: Methodology, Algorithms and Applications”, Springer.

[17] M. M. Peet and A. Seuret. *Global Stability Analysis of Nonlinear Sampled-Data Systems Using Convex Methods*. in “Delay Systems: From Theory to Numerics and Applications”, vol. 1 of Advances in Delays and Dynamics. Springer, 2013.

[18] **Y. Zhang**, M. Peet and K. Gu. Chapter *Accelerating Convergence of Sum-of-Square Stability Analysis of Coupled Differential-Difference Equations*. In “Time Delay Systems - Methods, Applications and New Trends” Springer Lecture Notes in Control and Information Science. Vol. 423. January 2012.

[19] M. M. Peet, C. Bonnet, and H. Ozbay. Chapter *SOS Methods for Stability Analysis of Neutral Differential Systems*. Springer Lecture Notes in Control and Information Science, vol. 388. October, 2009.

[20] A. Papachristodoulou and M. Peet. Chapter *SOS Methods for Nonlinear Delayed Models in Biology and Networking*. Springer Lecture Notes in Control and Information Science, vol. 388. October, 2009.

CONFERENCE  
TUTORIALS

M. M. Peet. *Using SOS for Analysis and Control of Delayed and Infinite-Dimensional Systems*. IEEE Multi-Conference on Systems and Control. Kyoto, Japan, Sept. 2010;

M. M. Peet and U. Munz *Using SOS for analysis of Networked Control Systems*. IFAC World Congress, Seoul, Korea. July 6 - 11, 2008.

CSI-INDEXED  
PEER-REVIEWED  
CONFERENCE  
PAPERS

Presenting author indicated by \*.

[21] **M. Jones** and M. Peet *Solving Dynamic Programming with Supremum Terms in the Objective and Application to Optimal Battery Scheduling for Electricity Consumers Subject to Demand Charges* Submitted to the IEEE Conference on Decision and Control. Melbourne, Australia. December 12-15, 2017.

[22] **H. Mohammadi** and M. Peet *Estimating the Region of Attraction Using Polynomial Optimization: a Converse Lyapunov Result* Submitted to the IEEE Conference on Decision and Control. Melbourne, Australia. December 12-15, 2017.

[23] **H. Mohammadi** and M. Peet *Combining SOS and Moment Relaxations with Branch and Bound to Extract Solutions to Global Polynomial Optimization Problems* Submitted to the IEEE Conference on Decision and Control. Melbourne, Australia. December 12-15, 2017.

[24] M. Peet *A Convex Reformulation of the Controller Synthesis Problem for Infinite-Dimensional Systems using Linear Operator Inequalities (LOIs) with Application to MIMO Multi-Delay Systems* Submitted to the IEEE Conference on Decision and Control. Melbourne, Australia. December 12-15, 2017.

[25] **G. Miao and M. Peet\*** and **K. Gu** and M. Peet *Inversion of Separable Kernel Operators in Coupled Differential-Functional Equations and Application to Controller Synthesis* To appear at the IFAC World Congress. Toulouse, France. July 9-14, 2017.

[26] M. Peet *A Convex Reformulation of the Controller Synthesis Problem for MIMO Single-Delay Systems with Implementation in SOS* Proceedings of the American Control Conference. Seattle, WA. May 22-26, 2017.

- [27] **R. Kamyar** and M. Peet *A Multi-objective Approach to Optimal Energy Storage for Residential Customers in The Presence of Demand Charges* Proceedings of the IEEE Conference on Decision and Control. Las Vegas, NV. December 12-14, 2016.
- [28] **A. Gahlawat\*** and M. Peet *Optimal State-Feedback Boundary Control of Parabolic PDEs Using SOS Polynomials* Proceedings of the American Control Conference. Boston, MA. June, 2016.
- [29] **A. Gahlawat\*** and M. Peet *Stability analysis of parabolic linear PDEs with two spatial dimensions using Lyapunov method and SOS* Proceedings of the 54th IEEE Conference on Decision and Control. **Invited Session**. Osaka, Japan. December 15-17, 2015.
- [30] **E. Meyer\*** and M. Peet *Output Feedback Control of Inhomogeneous Parabolic PDEs with Point Actuation and Point Measurement using SOS and Semi-Separable Kernels* Proceedings of the 54th IEEE Conference on Decision and Control. **Invited Session**. Osaka, Japan. December 15-17, 2015.
- [31] **R. Kamyar\*** and M. Peet *The effect of distributed thermal storage on optimal pricing and optimal thermostat programming in a regulated smart grid* Proceedings of the American Control Conference. Chicago, IL. July 1-3, 2015.
- [32] **R. Kamyar\*** and M. Peet *Constructing Piecewise Polynomial Lyapunov Functions Over Arbitrary Convex Polytopes Using Handelman's Basis* Proceedings of the 53rd IEEE Conference on Decision and Control. Los Angeles, CA. December 15-17, 2014.
- [33] M. Peet\* *LMI Parameterization of Lyapunov Functions for Infinite-Dimensional Systems: A Toolbox*. Proceedings of the the American Control Conference. **Invited Session**. Portland, OR. June, 2014.
- [34] **R. Kamyar** and M. Peet\* *Decentralized Polyas Algorithm for Stability Analysis of Large-scale Nonlinear Systems*. 52nd IEEE Conference on Decision and Control. Florence, IT. December 10-13, 2013.
- [35] **B. Li** and M. M. Peet\*. *Stability Analysis of State-Dependent Delay Systems using Sum-of-Squares*. AIAA Conference on Guidance, Navigation and Control. **Invited Session**. Boston, MA. Aug. 19-22, 2013.
- [36] **C. Murti\*** and M. Peet. *A Sum-of-Squares Approach to the Analysis of Zeno Behavior in Hybrid Dynamical Systems*. European Control Conference. Zurich, CZ. July 17-19, 2013.
- [37] M. Peet\*. *Full-State Feedback of Delayed Systems using SOS: A New Theory of Duality*. 11th IFAC Workshop on Time-Delay Systems. Grenoble, France. Feb. 4-6, 2013.
- [38] **R. Kamyar\*** and M. Peet. *Decentralized Computation for Robust Stability of Large-scale Systems with Parameters on the Hypercube*. 51st IEEE Conference on Decision and Control, Maui, HI. Dec. 10-13, 2012.
- [39] **A. Gahlawat\***, E. Witrant, M. Peet and M. Alamir. *Bootstrap Current Optimization in Tokamaks Using Sum-of-Squares Polynomials*. 51st IEEE Conference on Decision and Control, Maui, HI. Dec. 10-13, 2012.
- [40] **R. Kamyar** and M. Peet\*. *Solving Large-Scale Robust Control Problems by Exploiting the Parallel Structure of Polyas Theorem*. Proceedings of the American Control Conference. Montreal, Canada. June 27 - 29, 2012.
- [41] **A. Gahlawat\*** and M. Peet. *Designing Observer-Based Controllers for PDE systems: A Heat-Conducting Rod With Point Observation and Boundary Control*. 50th IEEE Conference on Decision and Control, Orlando, FL. Dec. 12-15, 2011.

- [42] M. Peet\*, P. Kim and P. Lee. *Biological Circuit Models of Immune Regulatory Response: A Decentralized Control System*. 50th IEEE Conference on Decision and Control, Orlando, FL. Dec. 12-15, 2011.
- [43] A. Seuret\* and M. Peet. *SOS for Sampled-Data Systems*. Proceedings of the IFAC World Congress. **Invited Session**. Milan, Italy. Aug. 28-Sept. 2, 2011.
- [44] **A. Gahlawat\***, M. Peet and E. Witrant. *Control and Verification of the Safety-Factor Profile in Tokamaks Using Sum-of-Squares Polynomials*. Proceedings of the IFAC World Congress. **Invited Session**. Milan, Italy. Aug. 28-Sept. 2, 2011.
- [45] M. M. Peet\* *A Converse Sum-of-Squares Lyapunov Result: An Existence Proof Based on the Picard Iteration*. 49th IEEE Conference on Decision and Control, Atlanta, GA. Dec. 15-17, 2010.
- [46] **Y. Zhang\***, M. Peet and K. Gu. *Reducing the Computational Cost of the Sum-of-Squares Stability Test for Time-Delayed Systems*. Proceedings of the American Control Conference. Baltimore, MD. June 30 - July 2, 2010.
- [47] M. M. Peet\* and Y. V. Peet. *A Parallel-Computing Solution for Optimization of Polynomials*. Proceedings of the American Control Conference. Baltimore, MD. June 30 - July 2, 2010.
- [48] M. M. Peet\* *A Bound on the Continuity of Solutions and Converse Lyapunov Functions*. 48th IEEE Conference on Decision and Control, Shanghai, China. Dec. 16-18, 2009.
- [49] M. M. Peet\* and A. Papachristodoulou *Using Polynomial Semi-Separable Kernels to Construct Infinite-Dimensional Lyapunov Functions*. Proceedings of the IEEE Conference on Decision and Control. **Invited Session**. Cancun, Mexico. December 9-11, 2008.
- [50] A. Papachristodoulou and M. M. Peet\*. *Global Stability Analysis of Primal Internet Congestion Control Schemes with Heterogeneous Delays*. IFAC World Congress, Seoul, Korea. July 6 - 11, 2008.
- [51] M. M. Peet\* and P.-A. Bliman. *Polynomial Lyapunov Functions for Exponential Stability of Nonlinear Systems on Bounded Regions*. IFAC World Congress, Seoul, Korea. July 6 - 11, 2008.
- [52] A. Papachristodoulou\*, M. M. Peet and S.-I. Niculescu. *Stability Analysis of Linear Systems with Time-Varying Delays: Delay Uncertainty and Quenching*. 46th IEEE Conference on Decision and Control, New Orleans, LA. December 12-14, 2007. pp. 2117-2122
- [53] M. M. Peet\* and A. Papachristodoulou. *Positivity of Kernel Functions for Systems with Communication Delay*. 46th IEEE Conference on Decision and Control, New Orleans, LA. December 12-14, 2007. pp. 2815-2820
- [54] M. Peet\*, A. Papachristodoulou and S. Lall. *Positive Forms and Stability of Linear Time-Delay Systems*. Proceedings of the 45th IEEE Conference on Decision and Control, pp. 187-193 December 2006. **(Best Paper in Session)**
- [55] A. Papachristodoulou\* and M. M. Peet. *On the Analysis of Systems Described by Classes of Partial Differential Equations*. Proceedings of the 45th IEEE Conference on Decision and Control, pp. 747-752, December 2006.
- [56] A. Papachristodoulou\*, M. Peet and S. Lall. *Constructing Lyapunov-Krasovskii Functionals for Linear Time Delay Systems*. Proceedings of the American Control Conference, pp. 2845-2850, June 2005.
- [57] M. Peet\* and S. Lall. *On Global Stability of Internet Congestion Control*. Proceedings of the 43rd IEEE Conference on Decision and Control, pp. 1035-1041, December 2004.

*Relaxations with Branch and Bound to Extract Solutions to Global Polynomial Optimization Problems* SIAM Conference on Optimization. 2017.

[59] **R. Kamyar** and M. M. Peet. *A Multi-objective Approach to Optimal Battery Storage in The Presence of Demand Charges*. 4th International High Performance Buildings Conference. West Lafayette, IN. July 11-14, 2016. **Invited Session**.

[60] **A. Gahlawat** and M. M. Peet\*. *Optimal Boundary Control and Estimation of Parabolic PDEs Using Sum-of-Squares (SOS) Polynomials*. SIAM Conference on Control Theory and Applications. Paris, France. July 8-10, 2015. **Invited Session**.

[61] **E. Meyer\*** and M. M. Peet. *Stability Analysis of PDEs with Two Spatial Dimensions Using Lyapunov Methods and SOS*. SIAM Conference on Dynamical Systems. Snowbird, Utah. May 17-21, 2015. **Invited Session**.

[62] M. M. Peet\*. *A Control Framework for Immunology: Change Detection using Differential Control*. SIAM Conference on Dynamical Systems. Snowbird, Utah. May 26, 2011. **Invited Session**.

[63] **Y. Zhang\***, M. Peet and K. Gu. *Accelerating Convergence of Sum-of-Square Formulation for Lyapunov-Krasovskii Stability Analysis of Coupled Differential-Difference Equations*. 9th IFAC Workshop on Time-Delay Systems. **Invited Session**. Prague, Czech Republic. June 7 - 9, 2010.

[64] M. M. Peet\* and A. Papachristodoulou. *Inverses of Positive Linear Operators and State Feedback Design for Time-Delay Systems*. 8th IFAC Workshop on Time-Delay Systems. Sinaia, Romania. **Invited Session**. Sept. 1-3, 2009.

[65] M. M. Peet\*, H. Özbay and C. Bonnet *SOS Methods for Delay-Dependent Stability of Neutral Differential Systems*. Mathematical Theory of Networks and Systems, Blacksburg, VA. July 28 - Aug. 1, 2008.

[66] M. M. Peet\* and P.-A. Bliman. *The Weierstrass Approximation Theorem on Linear Varieties: Polynomial Lyapunov Functionals for Delayed Systems*. Mathematical Theory of Networks and Systems, Blacksburg, VA. July 28 - Aug. 1, 2008.

[67] M. M. Peet\*, P. S. Kim, S.-I. Niculescu, D. Levy, and A. Papachristodoulou. *Model Analysis of Chronic Myelogenous Leukemia with Treatment Options using Structure and Computation: Sensitivity to Nonlinearity and Delay*. European Conference on Mathematical and Theoretical Biology, Edinburgh, Scotland. June 29 - July 4, 2008.

[68] M. M. Peet\*. *Exponentially Stable Nonlinear Systems have Polynomial Lyapunov Functions on Bounded Regions*. 45th Annual Allerton Conference on Communication, Control and Computing. Monticello, IL. Sept. 26-28, 2007.

[69] C. Bonnet and M. M. Peet\*. *Using the Positivstellensatz for Stability Analysis of Neutral Delay Systems in the Frequency Domain*. 7th IFAC Workshop on Time-Delay Systems. Nantes, France. Sept. 17-19, 2007.

[70] M. M. Peet\* and P.-A. Bliman. *An Extension of the Weierstrass Theorem to Linear Varieties: Application to Delayed Systems*. 7th IFAC Workshop on Time-Delay Systems. Nantes, France. Sept. 17-19, 2007.

[71] M. M. Peet\* and C. Bonnet. *Stability and Computation of Roots in Delayed Systems of Neutral Type*. IFAC Workshop on Control of Distributed Parameter Systems. Namur, Belgium. June 22-27, 2007.

[72] M. M. Peet\*. *On Positive Quadratic Forms and Stability of Linear Systems*. Conférence de la SMAI sur l'optimisation et la décision. April, 2007.

[73] M. Peet\* and S. Lall. *Constructing Lyapunov Functions for Delay-Differential Equations using Semidefinite Programming*. Proceedings of the 6th IFAC Symposium on Nonlinear Control Systems (NOLCOS), pp. 381-381, August 2004.

INVITED SEMINARS **Summary:** I have given 43 invited seminars. Of these 16 seminars are since joining ASU. For those seminars for which I retain records, I have indicated the supporting/sponsoring seminar venue or series.

1. The University of New Mexico (Mech. Eng. Dept. Seminar), Albuquerque, NM. December, 2016;
2. The University of Arizona (Aerospace and Mech. Eng. Dept. Seminar), Tuscon, AZ. September, 2014;
3. ARPA-E workshop on "The Grid of The Future: From Vertical to Flat." Washington, D.C. July 31, 2014.
4. LAAS, Toulouse, France. July, 2014;
5. The University of Nantes, Nantes, France. July, 2014;
6. Katholieke Universiteit Leuven (NATW Seminar Series), Leuven, Belgium. July, 2014;
7. The University of Campinas (Electrical Eng. Dep. Seminar), Campinas, Brasil. March, 2014;
8. The University of California at Los Angeles (Control Seminar Series), Los Angeles, CA. January, 2014;
9. Los Alamos National Laboratory (Systems Biology Group), Los Alamos, NM. August, 2013;
10. Los Alamos National Laboratory (Power Systems Group), Los Alamos, NM. August, 2013;
11. Workshop on "Lyapunov Functions and Computational Methods" Reykjavik University, Reykjavik, Iceland. July, 2013;
12. The University of Michigan (Aerospace Engineering Dept. Seminar), Ann Arbor, MI. February, 2013;
13. New York University (Polytechnic Engineering Dept. Seminar), New York, NY. December, 2012;
14. Otto-von-Guericke University Magdeburg (Systems and Controls Seminar Series), Magdeburg, Germany. November, 2012;
15. Institute Joseph Fourier, Grenoble, France. November, 2012;
16. The University of Oxford, Oxford, UK. November, 2012;
17. The University of Texas at El Paso. El Paso, TX. March, 2012.
18. Arizona State University. Tempe, AZ. February, 2012.
19. City of Hope Medical Center. Beckman Research Institute. Duarte, CA. February, 2012.
20. Georgia Institute of Technology. Atlanta, GA. February, 2012.
21. Illinois Institute of Technology (MMAE Dept. Seminar) . Chicago, IL. January, 2012.
22. Argonne National Laboratory (LANS Seminar Series). Lemont, IL. January, 2012.
23. Texas A&M University (Symposium on Dynamical Systems with Time-Variability, Delay, or Discontinuities). College Station, TX. March, 2011.
24. Lehigh University (Mechanical Engineering Dept. Seminar Series). Bethlehem, PA. February, 2011.
25. The University of California. Berkeley, CA. February, 2011.
26. Stanford University. Stanford, CA. January, 2011.
27. University of Notre Dame. South Bend, IN. Oct. 14, 2010.
28. University of Oxford. Oxford, UK. June 16, 2010.
29. University of Grenoble. Grenoble, France. June 11, 2010.
30. University of Minnesota. Minneapolis-St. Paul, MN. April 19, 2010.
31. University of Utah. Salt Lake City, UT. March 31, 2010.
32. Stanford University. Stanford, CA. May, 2009.
33. The University of Southern Illinois. Edwardsville, IL. February, 2009.
34. University of Illinois at Urbana-Champaign. Champaign, IL. October, 2008.
35. LAAS, Groupe de Travail EDP - GDR MACS. Toulouse, France. June, 2008.



36. State University of Campinas. Campinas, Brasil. June, 2008.
37. Katholieke Universiteit Leuven. Leuven, Belgium. May, 2008.
38. Illinois Institute of Technology. Chicago, IL. March, 2008.
39. ARC ModLMC. Workshop “Haematopoiesis and its Disorders. Modeling, Experimental and Clinical Approaches.” Paris, France, March 21, 2008.
40. State University of Campinas, Brasil. March, 2007.
41. Réunion EDP-MOSAR Paris. March, 2007.
42. INRIA - Rocquencourt. Rocquencourt, France. November 2006.
43. Seagull Technology. May, 2005.

#### CONFERENCE PRESENTATIONS

**Summary:** I have personally given 38 conference/workshop presentations. Of these, 5 conference/workshop talks are since joining ASU. The rest of the conference presentations were given by students.

1. SIAM Conference on Optimization. Vancouver, BC. Polynomial Optimization. CP21.3 May 24, 2017.;
2. American Control Conference. Seattle, Wa. Present Paper WeA11.2. May 26, 2017.;
3. American Control Conference. Portland, OR. Present Paper WeA11.2. June 4, 2014.;
4. IEEE Conference on Decision and Control. Present Paper: ThC18.1, December 2013.
5. AIAA Conference on Guidance, Navigation and Control. Boston, MA. August, 2013;
6. IFAC Workshop on Time-Delay Systems. Present Paper. Grenoble, France. February, 2013.
7. American Control Conference. Montreal, Canada. Present Paper FrB20.4. June 29, 2012.;
8. IEEE Conference on Decision and Control. Present Paper: TuB02.3, December 2011.
9. IEEE Conference on Decision and Control. Present Paper: ThA17.3, December 2011.
10. IFAC World Congress. Present Paper. Milan, Italy. September, 2011.
11. IEEE Conference on Decision and Control. Present Paper: FrA20.5, December 2010.
12. American Control Conference. Baltimore, MD. Present Paper FrA05.2. July 2, 2010.
13. American Control Conference. Baltimore, MD. Present Paper FrA09.6. July 2, 2010.
14. IFAC Worskhop on Time-Delay Systems. Present Paper. June 8, 2010.
15. IEEE Conference on Decision and Control. Present Paper: ThA01.4, December 2009.
16. 8th IFAC Workshop on Time-Delay Systems. Present Paper. Sinaia, Romania. Sept., 2009.
17. IEEE Conference on Decision and Control. Present Paper: TuB07.3, December 2008.
18. Conference on Mathematical Theory of Networks and Systems. Paper Presentation: RSA1gGeo.2 . Blacksburg, Virginia. July, 2008.
19. Conference on Mathematical Theory of Networks and Systems. Paper Presentation: RSDelay2.1 . Blacksburg, Virginia. July, 2008.
20. IFAC World Congress. Pre-conference Workshop: WS7, Seoul, South Korea. July, 2008.
21. IFAC World Congress. Present Paper: MoB02.2, Seoul, South Korea. July, 2008.
22. IFAC World Congress. Present Paper: MoC14.5, Seoul, South Korea. July, 2008.
23. European Conference on Mathematical and Theoretical Biology. Edinburgh, U.K., June 29th - July 4th, 2008.
24. ICNPAA 2008: Mathematical Problems in Engineering, Aerospace and Science. Genoa, Italy. June, 2008.
25. IEEE Conference on Decision and Control. Present Paper: WePI27.12, December 2007.
26. IEEE Conference on Decision and Control. Present Paper: ThPI23.18, December 2007.
27. 45th Annual Allerton Conference on Communication, Control and Computing. Monticello, IL. Sept. 26-28, 2007.
28. 7th IFAC Workshop on Time-Delay Systems. Present Paper 55. Nantes, France. Sept. 17-19, 2007.
29. 7th IFAC Workshop on Time-Delay Systems. Present Paper 67. Nantes, France. Sept. 17-19, 2007.

30. IFAC Workshop on Control of Distributed Parameter Systems. Namur, Belgium. June 22-27, 2007.
31. Conférence de la SMAI sur l'optimisation et la décision. April, 2007.
32. Réunion EDP-MOSAR Paris. March, 2007.
33. IEEE Conference on Decision and Control. Present Paper: WeA06.1, December 2006.
34. IEEE Conference on Decision and Control. Present Paper: WeA06.4, December 2006.
35. American Control Conference. Present Paper: ThB18.6, June 2005.
36. Stanford Aerospace Affiliates. April, 2005.
37. IEEE Conference on Decision and Control. Present Paper: TuC03.6, December 2004.
38. IFAC Symposium on Nonlinear Control Systems(NOLCOS). August 2004.
39. Stanford Aerospace Affiliates. April, 2004.
40. GPS III Conference. June, 2001.

#### FUNDED RESEARCH PROJECTS

**Summary:** I am PI on 8 sponsored projects (7 as sole PI) and co-PI on one project, of which my share totals \$1,503,575, including 3 out of 3 as sole-PI from NSF, one of which is a CAREER award. The NSF projects total \$917,473. The other projects are worth \$586,102.

- **Sponsor: ONR** *Octopus-Inspired Autonomous Arms for Soft Robotics with Adaptive Motions*; Role: Co-PI; Amount: \$2,000,000.00; My Share: \$344,523; Dates: 1/1/17 - 12/31/20; Status: **SELECTED FOR FUNDING**;
- **Sponsor: SRP (Arizona Power Company)** *The Effect of Dynamic Variability in Renewable Generation on Resource Planning and Reserve Activation*; Role: Sole PI; Amount: \$62,891; Dates: 9/1/15 - 8/31/16; Status: **FUNDED**;
- **NSF CMMI-1538374** *Stability Analysis of Large-Scale Nonlinear Systems using Parallel Computation* Program: Control Systems; Role: Sole PI; Amount: \$280,000; Dates: 09/1/2015 - 08/31/2018; Status: **FUNDED**.
- **Sponsor: SRP (Arizona Power Company)** *Quantifying the Benefits and Optimal Use of Battery Storage for SRP and Solar Customers with Demand Charges*; Role: Sole PI; Amount: \$88,388; Dates: 9/1/15 - 8/31/16; Status: **FUNDED**;
- **NSF CAREER CMMI-1301851** *A New Computational Framework for Control of Complex Systems* Program: Control Systems; Role: Sole PI; Amount: \$400,000; Dates: 01/1/2012 - 12/31/2016; Status: **FUNDED**.
- **NSF CMMI-1100376** *Solving Large Sum-of-Squares Optimization Problems in Control by Exploiting the Parallel Structure of Polyá's Algorithm* Role: Sole PI; Amount: \$237,473; Dates: 9/1/2011-8/31/2015; Status: **FUNDED**.
- **French Consulate (Chateaubriand Program)** *Output and State Feedback Stabilization of Distributed Parameter Systems using Sum of Squares Polynomials and its Application to Nuclear Fusion* Role: Sole PI; Amount: expensed (6 mo./year tuition + \$2400/mo stipend + travel expenses); Dates: 09/1/2011 - 8/31/2013; Status: **FUNDED**.
- **IIT International Undergraduate Student Research Program** *Computational Control of the Vibration Equation*. Role: Sole PI; Amount: \$1,500; Dates: 06/01/2011 - 08/14/2011; Status: **FUNDED**.
- **Brasilian and French Governments (FAPESP and ANR)**, *Parameter-dependent semidefinite programming in robust control. Application to analysis of dynamical system interaction networks*. Role: Co-PI; Amount/Duration: 20,000 euro / 2006-2008 Status: **FUNDED**

#### SOFTWARE CREATED

**Note:** All software is available for download here.

*SOSCode*, S. Lall, M. Peet, and T. Wang. A self-contained Matlab toolbox for the efficient construction of sum-of-squares programming problems.

*DelayTools/Linear*, M. Peet. A set of Matlab functions and files for the analysis on n-dimensional linear systems with m discrete delays. Separate files handle the deterministic and generalized uncertainty cases separately. Available for download from: <http://control.asu.edu/software>

*DelayTools/Nonlinear*, M. Peet. A set of Matlab functions and files for the analysis on n-dimensional nonlinear polynomial systems with m discrete delays. Separate files handle the deterministic and generalized uncertainty cases separately. Available for download from:  
<http://control.asu.edu/software>

*DelayTools/Complex*, M. Peet. A number of matlab toolbox functions for analysis of transfer functions in the frequency domain using SOS and positivstellensatz techniques. Scripts test quasipolynomial transfer functions for both delay-independent and delay-dependent  $H_\infty$  stability and delay-independent exponential stability. The delay-dependent test is based on the paper by Zhang et al. Available for download from: <http://control.asu.edu/software>

## COURSES TAUGHT

I have taught 7 distinct classes, including the ASU classes MAE 318 (lower division), AAE 462, MAE 507, MAE 598 and AAE 101 and the IIT classes MMAE 441, MMAE 443, and MMAE 543. MMAE 443 is similar in substance to MAE 318, and I have taught these two a combined 9 times. MMAE 519/543 is similar in substance to MAE 507, and I have taught these two a combined 5 times. **My undergraduate teaching evaluation score averages 4.2.** If embedded links do not work, all Lecture Notes are available at [http://control.asu.edu/class\\_frame.htm](http://control.asu.edu/class_frame.htm).

**MAE 598: LMI Methods in Robust and Optimal Control** 3 credit hours. Graduate. Average class size: 15. An advanced graduate course which surveys the use of optimization in variety of sub-fields of control. The selection of sub-fields is based on student preference as measured via anonymous survey. In Fall, 2016 we covered: Controllability and Observability; LQR; LQG; Kalman Filtering; Optimal  $H_\infty$  Output-Feedback Controller Synthesis; Optimal  $H_2$  Output-Feedback Controller Synthesis; Robust Control;  $\mu$ -analysis; D-K iteration; Nonlinear Stability; Sum-of-Squares; Nonlinear Controller Synthesis; and Hybrid Systems. Click Here for Online Lecture Notes Texts: LMIs in Control Systems: Analysis, Design and Applications by Duan and Yu.

**PAUT54A1: MiniCourse on LMI and SOS Methods in Control** A 16.5 hour advanced course on the basics of modern optimal control theory, with an emphasis on convex optimization and Linear Matrix Inequalities. Mathematical Analysis; Linear Systems Theory; H-infinity and H-2 optimal control using LMI formulations; Nonlinear Systems; Converse Lyapunov Theory; Sum-of-Squares; Semi-algebraic Geometry; Optimization and Duality. Texts: None. Click Here for Online Lecture Notes Taught: Spring, 2013 at the University of Grenoble; Spring, 2014 at the University of Campinas.

**MAE 462: Space Vehicle Dynamics and Control** 3 credit hours. Undergraduate, Upper-Division. Average class size: 70. A upper-division undergraduate class on orbital mechanics and attitude dynamics. Orbital Invariants; Elliptic, Parabolic and Hyperbolic Orbits; Conversion to/from Orbital Elements; Hohman Transfer; Bi-elliptic Transfer; Lambert's Problem; The rocket equation; Effect of drag; Effect of non-spherical Earth; Special Orbits; Interplanetary mission planning; Attitude Control Systems; Euler's equations; Stability of Torgue-free motion. Click Here for Online Lecture Notes Original slides with illustrations, movies, and embedded multimedia. Texts: Prussing/Conway. Taught: Spring, 2013.

**MAE 507: Fundamentals of Control and Optimization** 3 credit hours. Graduate. Average class size: 15. An advanced graduate course on the fundamentals of computational control. No prerequisite. Closely follows the text by Dullerud and Paganini. feedback control; vector spaces; convexity; singular value decomposition; LMIs; state-space systems; controllability and observability; linear analysis and frequency-domain spaces; the Lyapunov equation; full-state feedback; output feedback; optimal control. Click Here for Online Lecture Notes Texts: A Course in Robust Control Theory: A Convex Approach by Dullerud and Paganini.

**MAE 318: Systems Analysis and Control (w/ Lab)** 5 credit hours. Undergraduate, Lower-Division. Average class size: 90. A lower-division course on dynamical systems analysis and controller design. Linearization; Laplace and Fourier Transform; Transfer Functions; Block Diagrams; Routh-Hurwitz criterion; Performance Specifications; P, PD, and PID control; Root Locus; Lead-Lag Compensators; Bode Plots; Nyquist Criterion. There is a 1 credit lab component. Click Here for Online Lecture Notes. Text: Franklin, Powell and Emami;

**AAE 101: Introduction to ASU** 1 credit hour. Undergraduate, Freshman. Average class size:

22. An introductory course for Freshman on Ethics; Career preparation and Jobs in Aerospace Engineering; Test-Taking and Study Strategies; Professional Standards and Practices. Taught Fall, 2014; Fall, 2015.

**MMAE 441: Spacecraft and Aircraft Dynamics (IIT)** 3 credit hours. Undergraduate, Upper-Division. Average class size: 40. A senior-level undergraduate class on the basics of flight dynamics and orbital mechanics. Kinematics and dynamics of particles, systems of particles, and rigid bodies; translating and rotating reference frames; Euler angles; aircraft longitudinal and lateral stability; aircraft nonlinear and linearized equations of motion; Spacecraft orbital mechanics; two-body problem; classical orbital elements; orbital maneuvers; interplanetary trajectories. Taught in Fall, 2008 and Fall, 2010. Click Here for Online Lecture Notes (Aircraft Dynamics Only). Texts: Etkin/Reid, Vallado.

**MMAE 519/543: Modern Control Systems (IIT)** 3 credit hours. Graduate Level. Average class size: 13. Similar in content to MAE 507, but without Robust Control and less material on optimization.

**MMAE 443: Systems Analysis and Control (IIT)** 3 credit hours. Undergraduate, Upper-Division. Average class size: 60. Similar in Content to MAE 318, but without lab component.

#### SERVICE

- Funding Evaluation Panels: United States National Science Foundation; Icelandic Research Fund; Romanian Joint Applied Research Projects - PCCA (2012, 2013, 2016); South African National Research Foundation.
- IEEE Technical Committee on Power Generation Control
- IEEE Technical Committee on Systems with Uncertainty
- International Program Committee: IEEE Multi-Conference on Systems and Control. Hyderabad, India, 2012; IEEE Multi-Conference on Systems and Control. Denver, CO, 2011;
- International Program Committee: 3rd International Conference on Control and Optimization with Industrial Applications. Bilkent University, Turkey, 2011.
- International Program Committee: Seventh International Conference on Mathematical Problems in Engineering, Aerospace and Sciences. Genoa, Italy, 2008;
- Organized Workshops: Workshop on Time-Delay Systems at IFAC World Conference, 2008; Workshop on Uncertain Systems at the IEEE Multi-Conference on Systems and Controls, 2010;
- Organizer and Chair: Invited Session on “Computational Methods for Nonlinear and Time-Delay Systems” at Seventh International Conference on Mathematical Problems in Engineering, Aerospace and Sciences. Genoa, Italy, 2008;
- Chair: “Distributed Parameter Systems I” at the 2016 American Control Conference. Co-Chair: “Distributed Parameter Systems II” at 54th IEEE Conference on Decision and Control, 2015. Chair: “Delay Systems 2”, at the Mathematical Theory of Networks and Systems. Blacksburg, VA, 2008. Co-Chair, “Time Delay Uncertain Systems”, at the 45th IEEE Conference on Decision and Control, 2006. Chair, “Constructing Lyapunov Functions”, at the 53rd IEEE Conference on Decision and Control, 2014.
- Reviewer for 36 journals with 200+ reviews (Journal and # of reviews): ACM SIGCOMM Computer Communication Review (3); AIAA Journal on Guidance, Control and Dynamics (2); American Control Conference 2010, 2011, 2012, 2013, 2014 (8); AMS Math Reviews (3); ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (1); ASME Journal of Dynamic Systems, Measurements and Control (3); Automatica (54); Celestial Mechanics and Dynamical Astronomy (2); Control Engineering Practice (1); Conference on Control and Optimization with Industrial Applications(1); Discrete and Continuous Dynamical Systems - Series B (2); European Control Conference 2013 (1); European Journal of Control (1); IEEE/CSS Conference on Decision and Control 2006, 2008, 2009, 2011, 2012, 2013, 2014, 2015 (29); IEEE Multi-Conference on Systems and Control (2); IEEE Transactions on Automatic Control (33); IEEE Transactions on Automation Science and Engineering (1); IEEE Transactions on Circuits and Systems - I (7); IEEE Transactions on Control of Network Systems (2); IET Control Theory and Applications (2); IFAC Workshop on Time-Delay Systems 2006, 2010, 2012 (8); IMA Journal on Mathematics Control Information (7); IFAC World Congress 2008, 2001 (5); International Conference on Systems and Computer Science 2012 (1); International Journal of Control (3); International Journal of Robust and Nonlinear Control (3); Journal of Mathematical Analysis and Applications (3); Journal of the Franklin Institute (2); Journal of Systems Science and

- Systems Engineering (1); Kybernetika (1); Linear Algebra and Its Applications (1); Mathematical Biosciences (2); International Symposium on Mathematical Theory of Networks and Systems 2014 (1); Southwest Symposium on Systems and Control 2010 (1); Systems and Controls Letters (3); POPL 2013: ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (1).
- Member: IEEE, AIAA, SIAM, SMAI
  - Internal Service: Computing Committee (2008-2010). Undergraduate Research (2010-2011) Computing Coordinator (2010-2011). Undergraduate Studies Committee (2010-2011). Dynamics and Controls Curriculum Committee (2012-2016).