



Ali Pakniyat

Curriculum Vitae

Education

2011–2016 **Doctor of Philosophy**, *Department of Electrical and Computer Engineering,*
MCGILL UNIVERSITY, Montreal, Canada, *GPA: 4.0 / 4.*

Thesis: Optimal Control of Deterministic and Stochastic Hybrid Systems: Theory and Applications

Supervisor: Professor Peter E. Caines

2008–2010 **Master of Science**, *School of Mechanical Engineering,*
SHARIF UNIVERSITY OF TECHNOLOGY, Tehran, Iran, *GPA: 18.95 / 20.*

Top Student: Ranked 2nd among 57 students in the program of Applied Mechanics, and 3rd among 130 students in the M.Sc. program of Mechanical Engineering.

Thesis: On the Nonlinear Dynamics and Bifurcations in a New Class of MEMS Gyroscopes with Parametric Resonance

Supervisors: Professor Hassan Salarieh & Professor Aria Alasty

2004–2008 **Bachelor of Science**, *School of Mechanical Engineering,*
SHIRAZ UNIVERSITY, Shiraz, Iran, *GPA: 18.30 / 20.*

Top Student: Ranked 1st among 80 students in the B.Sc. program.

Thesis: Solving Differential Equations using Wavelet Transform

Supervisor: Professor Mohammad Eghtesad

Research Interests

Theoretical Deterministic and Stochastic Optimal Control, Hybrid Systems, Nonlinear Dynamics and Control, Analytical Mechanics, Bifurcation and Chaos, Game and Team Theory, Decentralized Control, Stability Analysis, Harmonic and Parametric Resonance, Variational Analysis, Linearization Theory, Linear and Nonlinear Estimation

Applied Automotive and Transportation Systems, Electric Vehicles, Transmission Design and Control, Robotics, Mechatronics, Micro Electrical-Mechanical Systems (MEMS), Sensors and Actuators

☎ +1 (514) 264 2311

✉ pakniyat@cim.mcgill.ca

🌐 cim.mcgill.ca/~pakniyat

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Teaching Experience

Course Lecturer

McGill University **Probability and Statistics for Engineers,
Control and Robotics Laboratory,** Fall 2016
Winter 2016

Teaching Assistant

McGill University **Nonlinear and Hybrid Control Systems,** Winter 2013
Stochastic Control and Decision Theory, Winter 2014
Control Systems, Fall 2013, 2014, 2015, 2016
Mathematical Foundations of Systems, Fall 2013, 2015
Control and Robotics Laboratory, Winter 2014, 2015
Introduction to Numerical Methods in Electrical Engineering, W2014,2015

Sharif University of Technology **Robust Control,** Fall 2010
Automatic Control, Spring 2010, Fall 2010

Shiraz University **Mechanical Vibrations,** Spring 2008
Dynamics of Machinery, Spring 2008
Machine Design II, Fall 2007
Machine Design I, Spring 2007
Dynamics, Fall 2006

Teacher

Shiraz NODET¹ Center **Mechanics for Physics Olympiad,** Summer 2005, 2006
Calculus for Physics Olympiad, Summer 2005, 2006

Honours and Awards

- 2012-2016 Natural Sciences and Engineering Research Council of Canada (NSERC)
- 2015 GERAD² Doctoral Fellowship
- 2011-2014 McGill Engineering Doctoral Award (MEDA)
- 2011-2014 [McGill] Graduate Excellence Award in Engineering
- 2011-2013 Geoff Hyland Fellowship in Engineering
- 2011-2012 [McGill] Engineering Graduate Recruitment Award
- 2014 [McGill] Graduate Research Enhancement and Travel (GREAT) Award
- 2014 IEEE-CSS³ Travel Award for the 53rd Conference on Decision and Control
- 2010 Sharif University of Technology Top Student Graduation Award
- 2008 Shiraz University Top Student Graduation Award
- 2004-2008 Shiraz University Exceptional Talents Award

¹National Organization for Development of Exceptional Talents (NODET)

²Groupe d'Études et de Recherche en Analyse des Décisions (Group for Study and Research in Decision Analysis)

³Institute of Electrical and Electronics Engineers - Control Systems Society

- 2008 Finalist⁴ in the Iranian Mechanical Engineering Olympiad
- 2008 Ranked in the top 0.7%⁵ in the nationwide university entrance exam for master's degree in Mechanical Engineering
- 2004 Ranked in the top 0.07%⁶ in the nationwide entrance exam for bachelor's degree
- 2004 NODET Exceptional Talents Award
- 2002 Semi-Finalist⁷ in four National Olympiad Competitions: Physics, Mathematics, Computer, and Chemistry Olympiads
- 2001 Semi-Finalist in the Iranian Physics Olympiad
- 1997 Semi-Finalist in the Iranian Elementary-School Mathematics Olympiad

Publications

Journal Papers

- [J6] **A. Pakniyat**, P. E. Caines, "On the Relation between the Minimum Principle and Dynamic Programming for Classical and Hybrid Systems", *under review for the IEEE Transactions on Automatic Control* (submission numbers: TAC-15-1673, TAC-16-1245, available on cim.mcgill.ca/~pakniyat).
- [J5] **A. Pakniyat**, P. E. Caines, "Hybrid Optimal Control of an Electric Vehicle with a Dual-Planetary Transmission", *accepted for publication in Nonlinear Analysis: Hybrid Systems* (DOI: 10.1016/j.nahs.2016.08.004).
- [J4] R. Modirnia, **A. Pakniyat**, and B. Boulet, "Application of Hybrid Optimal Control and Closed-Loop Hybrid Control to Manage Temperature-Dependant Parameters in Thermoforming", *submitted to the IEEE Transactions on Control System Technology* (submission number: TCST-2015-1011).
- [J3] M. S. Rahimi Mousavi, **A. Pakniyat**, T. Wang, and B. Boulet, "Seamless Dual Brake Transmission for Electric Vehicles: Design, Control and Experiment", *Mechanism and Machine Theory*, Volume 94, 2015, pp. 96–118.
- [J2] **A. Pakniyat**, H. Salarieh, "A Parametric Study on Design of a Microrate-Gyroscope with Parametric Resonance", *Measurement*, Volume 46, Issue 8, 2013, pp. 2661–2671.
- [J1] **A. Pakniyat**, H. Salarieh, A. Alasty, "Stability Analysis of a New Class of MEMS Gyroscopes with Parametric Resonance", *Acta Mechanica*, Volume 223, Issue 6, 2012, pp. 1169–1185.

Conference Papers

- [C13] **A. Pakniyat**, P. E. Caines, "On the Stochastic Minimum Principle for Hybrid Systems", *accepted for the 55th IEEE Conference on Decision and Control*, Las Vegas, NV, USA, 2016 (submission number: CDC-16-1629).
- [C12] **A. Pakniyat**, P. E. Caines, "On the Minimum Principle and Dynamic Programming for Hybrid Systems with Low Dimensional Switching Manifolds", *Proceedings of the 54th IEEE Conference on Decision and Control*, Osaka, Japan, 2015, pp. 2567–2573.

⁴Ranked 15th in the final stage (nationwide) and 1st in the regional stage

⁵Ranked 62nd among more than 10 000 applicants

⁶Ranked 206th among more than 300 000 applicants

⁷Among the top 200 (nationwide)

- [C11] **A. Pakniyat**, P. E. Caines, "Time Optimal Hybrid Minimum Principle and the Gear Changing Problem for Electric Vehicles", *Proceedings of the 5th IFAC Conference on Analysis and Design of Hybrid Systems*, Atlanta, GA, USA, 2015, pp. 187–192.
- [C10] **A. Pakniyat**, P. E. Caines, "On the Relation between the Hybrid Minimum Principle and Hybrid Dynamic Programming: a Linear Quadratic Example", *Proceedings of the 5th IFAC Conference on Analysis and Design of Hybrid Systems*, Atlanta, GA, USA, 2015, pp. 169–174.
- [C9] M. S. Rahimi Mousavi, **A. Pakniyat**, M. K. Helwa, and B. Boulet, "Observer-Based Backstepping Controller Design for Gear Shift Control of a Seamless Clutchless Two-Speed Transmission for Electric Vehicles", *Proceedings of the IEEE Vehicle Power and Propulsion Conference*, Montreal, QC, Canada, 2015.
- [C8] **A. Pakniyat**, P. E. Caines, "On the Relation between the Minimum Principle and Dynamic Programming for Hybrid Systems", *Proceedings of the 53rd IEEE Conference on Decision and Control*, Los Angeles, CA, USA, 2014, pp. 19–24.
- [C7] **A. Pakniyat**, P. E. Caines, "The Gear Selection Problem for Electric Vehicles: an Optimal Control Formulation", *Proceedings of the 13th International Conference on Control, Automation, Robotics and Vision*, Marina Bay Sands, Singapore, 2014, pp. 1261–1266.
- [C6] M. S. Rahimi Mousavi, **A. Pakniyat**, and B. Boulet, "Dynamic Modelling and Controller Design for a Seamless Two-Speed Transmission for Electric Vehicles", *Proceedings of the 2014 IEEE Conference on Control Applications*, Antibes, France, 2014, pp. 635–640.
- [C5] **A. Pakniyat**, P. E. Caines, "On the Minimum Principle and Dynamic Programming for Hybrid Systems", *Proceedings of the 19th IFAC World Congress*, Cape Town, South Africa, 2014, pp. 9629–9634.
- [C4] **A. Pakniyat**, P. E. Caines, "The Hybrid Minimum Principle in the Presence of Switching Costs", *Proceedings of the 52nd IEEE Conference on Decision and Control*, CDC 2013, Florence, Italy, 2013, pp. 3831–3836.
- [C3] **A. Pakniyat**, H. Salarieh, G. Vossoughi, A. Alasty, "A Modification on Performance of MEMS Gyroscopes by Parametro-Harmonic Excitation", *Proceedings of the 10th ASME Biennial Conference on Engineering Systems Design and Analysis* (Volume 5), Istanbul, Turkey, 2010, pp. 433–441.
- [C2] **A. Pakniyat**, H. Salarieh, A. Alasty, "Stability Analysis of a Novel MEMS Gyroscope Actuated by Parametric Resonance Using Floquet Theory", *Proceedings of the 3rd Conference on Nano-Structures*, Kish Island, Iran, 2010, pp. 1219–1221.
- [C1] **A. Pakniyat**, M. Eghtesad, "Solving Differential Equations using Wavelet Transform" (in Persian), *Proceedings of the 17th Annual International Conference on Mechanical Engineering*, Tehran, Iran, 2009.

Technical Presentations

2016-07-21	IEEE MTL – Concordia University Seminars,	Montreal, Canada
2016-05-11	The 7th Biannual Meeting on System and Control Theory,	Kingston, Canada
2015-12-16	IEEE Conference on Decision and Control,	Osaka, Japan

2015-11-20	CIM – GERAD Informal Systems Seminar (ISS),	Montreal, Canada
2015-10-15	CIM – REPARTI Research Showcase,	Montreal, Canada
2015-10-06	IFAC Conference on Analysis and Design of Hybrid Systems,	Atlanta, USA
2015-07-29	CIM – GERAD Informal Systems Seminar (ISS),	Montreal, Canada
2014-12-15	IEEE Conference on Decision and Control,	Los Angeles, USA
2014-09-23	CIM Research Showcase,	Montreal, Canada
2014-05-05	The 6th Biannual Meeting on System and Control Theory,	Waterloo, Canada
2013-12-11	IEEE Conference on Decision and Control,	Florence, Italy
2012-02-03	CIM Informal Systems Seminar (ISS),	Montreal, Canada
2010-10-20	CEDRA Sharif University of Technology,	Tehran, Iran
2010-07-12	ASME Conference on Engineering Systems Design & Analysis,	Istanbul, Turkey
2010-03-10	Conference on Nanostructures,	Kish Island, Iran
2009-05-20	ISME Conference on Mechanical Engineering,	Tehran, Iran
2008-09-25	CECMME Shiraz University,	Shiraz, Iran

Scientific Community Memberships

Current:

IEEE – CSS	Institute of Electrical and Electronics Engineers - Control Systems Society
SIAM	Society for Industrial and Applied Mathematics
CIM	Centre for Intelligent Machines - McGill University
GERAD	Groupe d'Études et de Recherche en Analyse des Décisions (Group for Study and Research in Decision Analysis)
REPARTI	Regroupement pour l'étude des Environnements PARTagés Intelligents (Centre for the Study of Distributed Intelligent Shared Environments)

Past:

CEDRA	Center of Excellence in Design, Robotics, and Automation - Sharif University of Technology
CECMME	Center of Excellence for Computational Methods in Mechanical Engineering - Shiraz University

Professional Training Certifications

2016	<i>Meeting on How to Organize an IEEE Event,</i>	IEEE-POCO ⁸
2016	<i>Aerospace Summer School,</i>	Concordia University
2016	<i>Meeting on System and Control Theory,</i>	Queen's University
2015	<i>Workshop on Dynamic Games in Management Science,</i>	GERAD – HEC Montréal
2015	<i>Workshop on Mathematical Cybernetics: Hybrid, Stochastic and Decentralized Systems,</i>	Carlton University
2014	<i>Symposium on Advanced Electric Vehicle Drivetrains,</i>	McGill University – IEEE
2014	<i>Meeting on System and Control Theory,</i>	University of Waterloo

⁸IEEE Panel of Conference Organizers

- 2014 *Workshop on Basic Business Skills for Non-Business Graduate Students*, McGill Univ.
 2011 *Graduate Teaching Workshop*, McGill University
 2010 *Workshop on Invention: Technology Development and Commercialization*,
 University of Southern California – Sharif University of Technology

Computer skills

Programming & Analysis: MATLAB including Toolboxes and Simulink, Maple, C++, LabVIEW, ADAMS, and AutoCAD

Industrial: DAQ, Microcontrollers, and PLCs

Typesetting & Web Design: L^AT_EX, Microsoft Office, and HTML

Review Services

Journals: Automatica
 SIAM Journal on Control and Optimization (SICON)
 Nonlinear Dynamics (NODY) - Springer

Conferences: IEEE Conference on Decision and Control (CDC)
 ACM Conference on Hybrid Systems: Computation and Control (HSCC)
 IEEE European Control Conference (ECC)
 Iranian Society of Mechanical Engineers (ISME) International Conference

Volunteer Activities

- 2012–2016 Coordinator of Informal Systems Seminars (ISS) - McGill University
 2014–2016 Debate Mediator in CafeDebate - CaféLitt Montreal
 2013–2016 Active Member of Omid Group - Hope for Children with Cancer
 2012–2015 Active Member of the Buddy Program - McGill International Student Services
 2011–2014 Active Member of McGill Iranian Students Association (MISA)
 2013–2014 Organizing Member of McGill Post-Graduate Students' Society Orientation
 2013 Organizing Member of McGill International Students Society Orientation
 2009 Organizing Member of Sharif Mechanics Industrial Festival
 2006–2008 Organizing Member of University Open Day - Shiraz University

References

Peter E. Caines

Professor,
Department of Electrical and Computer Engineering, McGill University
✉ peterc@cim.mcgill.ca
☎ (+1) 514 398 7129

Aditya Mahajan

Associate Professor,
Department of Electrical and Computer Engineering, McGill University
✉ aditya.mahajan@mcgill.ca
☎ (+1) 514 398 8088

Aria Alasty

Professor,
School of Mechanical Engineering, Sharif University of Technology
✉ aalasti@sharif.edu
☎ (+98) 21 6616 5504

Mohammad Eghtesad

Professor,
School of Mechanical Engineering, Shiraz University
✉ eghtesad@shirazu.ac.ir
☎ (+98) 71 3613 3148

Benoit Boulet

Associate Professor,
Department of Electrical and Computer Engineering, McGill University
✉ benoit.boulet@mcgill.ca
☎ (+1) 514 398 1478

Hassan Salarieh

Associate Professor,
School of Mechanical Engineering, Sharif University of Technology
✉ salarieh@sharif.edu
☎ (+98) 21 6616 5538

Gholamreza Vossoughi

Professor,
School of Mechanical Engineering, Sharif University of Technology
✉ vossough@sharif.edu
☎ (+98) 21 6616 5578

Mehrdad Farid

Professor,
School of Mechanical Engineering, Shiraz University
✉ farid@shirazu.ac.ir
☎ (+98) 71 3613 3013