Marzia Cescon

Curriculum Vitae

Harvard John A. Paulson School of Engineering and Applied Sciences
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Research interests

My general interests are strongly interdisciplinary and extend to the areas of controls, biomedical systems, decision support systems, biomedical data science, digital health, the Internet of Medical Things and medical device development, bringing engineering approaches to the treatment of human diseases. Specifically, my research focuses on modeling, system identification, machine learning, simulation, monitoring and automation of complex biomedical systems, to improve treatment outcomes, standards of care, operational efficiency and safety with applications mainly to diabetes care, surgical data science and cognitive surgery.

Academic Research Experience

2018–present **Postdoctoral research fellow**, *Harvard John A. Paulson School of Engineering and Applied Sciences, Harvard University*, Cambridge, MA.
Faculty advisor: Prof. Francis Doyle III. Project: Development and translation to human clinical trials of novel control algorithms to improve glucose regulation in people with type 1 diabetes.

2018–present **Adjunct Investigator**, *Sansum Diabetes Research Institute*, Santa Barbara, CA.

2015–2017 **Research fellow**, *The University of Melbourne*, Melbourne, Australia.
Faculty advisor: Prof. Erik Weyer. Project: Development of methods for improving the operation of water distribution networks through automation.

2014–2015 **Research specialist**, *University of California Santa Barbara*, Santa Barbara, CA.
Faculty advisor: Prof. Francis Doyle III. Project: Development of algorithms for the detection and mitigation of actuators and sensors failures in a closed-loop insulin delivery system for people with type 1 diabetes.

2007–2008 **Visiting undergraduate student researcher**, *Lund University*, Lund, Sweden.
Faculty advisors: prof. Anders Robertsson and prof. Rolf Johansson. Project: Modeling and system identification of robot dynamics.

Industry Research Experience

2017 **Lead Technologist and Data Scientist**, *Dianovator AB, start-up in digital diabetes technology and diabetes data analytics, spin-off from the research activities in diabetes control at Lund University*, Malmö, Sweden.

Education

2014 **Ph.D. Automatic Control**, *Lund University*, Lund, Sweden.
Advisor: Prof. Rolf Johansson. Thesis: "Modeling and Prediction in Diabetes Physiology"

2011 **Tech. Lic. Automatic Control**, *Lund University*, Lund, Sweden.
Advisor: Prof. Rolf Johansson. Thesis: "Linear Modeling and Prediction in Diabetes Physiology"

2007-2008 **Erasmus Exchange Student**, *Lund University*, Lund, Sweden.

2008 **M.Sc. Automation Engineering**, *University of Padova*, Padova, Italy.
Advisor: Prof. Giorgio Picci. Thesis: "Subspace-based Model Identification of Parallel Kinematic Manipulator Dynamics"

2005 **B.Sc. Information Engineering**, *University of Padova*, Padova, Italy.

Other training

2018 **Social and Behavioral Research Investigators**, *Collaborative Institutional Training Initiative (CITI Program)*, Harvard University, Cambridge, MA.

2018 **Medical Device Development**, *Harvard Catalyst*, Harvard University, Cambridge, MA.
Education Program Manager: Lisa Riva.

2011 **Teaching and Learning Through English**, *Center for Educational Development (CED)*, Lund University, Lund, Sweden.
Educational developer: Sara Håkansson.

Awards and Grants

Awards

2018 **Diabetes Technology Society Student Research Award**, *Gold prize winner with the work* ***Activity Detection and Activity Level Categorization in Free-Living Subjects with Type 1 Diabetes*** *(as an advisor).*

2017 **The IFAC Foundation Award**, *Nomination for significant advances in the broad area of "sustainable development" of the paper* ***Modeling and Identification of Irrigation Channel Dynamics Affected by Wind***.

2014 **Lund Technical University best PhD dissertation award**, *Nomination.*

2012 **Best paper in session award at the ASME Dynamic Systems and Control Conference – Biochemical Systems**, *Winner with the paper* ***Impulsive predictive control of T1DM glycemia: an in-silico study***.

Grants

2014 **The Foundation Blanceflor Boncompagni Ludovisi, nee Bildt**, *Research Scholarship. Supported my research activities at the University of California, Santa Barbara.*

2007 **The Erasmus Program (EuRopen community Action Scheme for the Mobility of University Students)**, *Undergraduate Student Exchange Scholarship funded by the European Union*, Supported my visit at Lund University as an undergraduate student.

Monographs

[1] ***Marzia Cescon***. *Modeling and Prediction in Diabetes Physiology*. Doctoral Thesis 1099--SE, Department of Automatic Control, Lund University, Sweden, November 2013. **Nominated for best thesis award at Lund University of Technology**.

[2] ***Marzia Cescon***. *Linear Modeling and Prediction in Diabetes Physiology*. Licentiate Thesis 3250--SE, Department of Automatic Control, Lund University, Sweden, June 2011.

[3] ***Marzia Cescon***. *Subspace-based Identification of a Parallel Kinematic Manipulator Dynamics*. Master's Thesis 5814--SE, Department of Automatic Control, Lund University, Sweden, May 2008.

Journal Publications

[1] ***Marzia Cescon***, D. DeSalvo, T.T. Ly, D.M. Maahs, L.H. Messer, B.A. Buckingham, F.J. Doyle III, and E. Dassau. Early detection of infusion set failure during pump therapy in type 1 diabetes. *Journal of Diabetes Science and Technology*, 10:1268–1276, 2016.

[2] ***Marzia Cescon***, Rolf Johansson, and Eric Renard. Subspace-based linear multi-step predictors in type 1 diabetes mellitus. *Biomedical Signal Processing and Control*, 22:99–110, 2015.

[3] ***Marzia Cescon***, Rolf Johansson, Eric Renard, and Alberto Maran. Identification of individualized empirical models of carbohydrate and insulin effects on T1DM blood glucose dynamics.

International Journal of Control. Special Issue on Applications of Continuous-Time Model Identification and Estimation, 87(7):1438–1453, 2014.

Manuscripts Under Review

[1] ***Marzia Cescon***, S. Deshpande, F.J. Doyle, and E. Dassau. Iterative learning control with sparse measurements for long-acting insulin injections in people with type 1 diabetes. In *Proc. American Control Conference (ACC2019)*, Philadelphia, PA, July 2019.

Book Chapters

[1] ***Marzia Cescon***, Rolf Johansson, and Renard Eric. *Predicting Glycemia in Type 1 Diabetes Mellitus with Subspace-based Linear Multi-step Predictors*, chapter in Prediction Methods for Blood Glucose Concentration: Design, Use and Evaluation. H. Kirchsteiger, J.B. Jorgensen, E. Renard, L. del Re (Eds.), Springer, 2016.

[2] ***Marzia Cescon*** and Rolf Johansson. *Subspace-based multi-step predictors for predictive control*, chapter in Control-oriented modelling and identification: theory and practice. Lovera, M. (Ed), The institution of engineering and technology (IET), 2015.

[3] ***Marzia Cescon*** and Rolf Johansson. *Linear Modeling and Prediction in Diabetes Physiology*, chapter in Data-driven Modeling for Diagnosis and Treatment of Diabetes. Marmarelis, V. and Mitsis, G. (Eds.), Springer, 2014.

Peer-reviewed Conference Proceedings

[1] ***Marzia Cescon*** and Erik Weyer. Modeling and identification of irrigation channel dynamics affected by wind. **Nominated for the IFAC foundation award**. In *Proc. 20th IFAC World Congress (IFAC2017)*, pages 5386 – 5391, Toulouse, France, 2017.

[2] ***Marzia Cescon*** and Erik Weyer. Control of irrigation channels affected by wind stress. In *Proc. IEEE 56th Annual Conference on Decision and Control (CDC2017)*, pages 3425–3430, Melbourne, Australia, 2017.

[3] Aivar Sootla and ***Marzia Cescon***. Modelling type 1 diabetes mellitus blood glucose dynamics as a monotone system. In *Proc. 22nd International Symposium on Mathematical Theory of Networks and Systems (MTNS2016)*, Minneapolis, MN, USA, 2016.

[4] ***Marzia Cescon*** and Erik Weyer. Characterization of the wind impact on the Torrumbarry irrigation district and its implications for control. **Selected for oral presentation**. In *Proc. Australian Control Conference (AuCC2016)*, pages 294–298, Newcastle, NSW, 2016.

[5] Rolf Johansson, ***Marzia Cescon***, and Fredrik Ståhl. Continuous-time model identification using non-uniformly sampled data. In *11th IEEE AFRICON 2013 Conference*, pages 1–6, Mauritius, 2013.

[6] ***Marzia Cescon***, Rolf Johansson, and Eric Renard. Low-complexity MISO models of T1DM glucose metabolism. In *9th Asian Control Conference (ASCC2013)*, pages 1–6, Istanbul, Turkey, 2013.

[7] ***Marzia Cescon***, Rolf Johansson, and Eric Renard. Individualized empirical models of carbohydrate and insulin effects on T1DM blood glucose dynamics. In *7th IEEE Multi-Conference on Systems and Control (MSC2013)*, pages 258–263, Hyderabad, India, 2013.

[8] ***Marzia Cescon***, Meike Stemmann, and Rolf Johansson. Impulsive predictive control of T1DM glycemia: an in-silico study. **Best paper in session award winner**. In *ASME 5th Annual Dynamic Systems and Control Conference (DSCC2012)*, pages 319–326, Fort Lauderdale, FL, USA, 2012.

[9] ***Marzia Cescon*** and Eric Renard. Adaptive subspace-based prediction of T1DM glycemia. In *Proc. 50th IEEE Conference on Decision and Control and European Control Conference (CDC-ECC2011)*, pages 5164–5169, Orlando, FL, 2011.

[10] ***Marzia Cescon*** and Rolf Johansson. On data-driven multistep subspace-based linear predictors. In *Proc. 18th IFAC World Congress (IFAC2011)*, pages 11447–11452, Milano, Italy, 2011.

[11] ***Marzia Cescon*** and Rolf Johansson. Multi-step-ahead multivariate predictors: a comparative analysis. In *Proc. 49th IEEE Conference on Decision and Control (CDC2010)*, pages 2837–2842, Atlanta, USA, 2010.

[12] ***Marzia Cescon***, Fredrik Ståhl, Mona Landin-Olsson, and Rolf Johansson. Subspace-based model identification of diabetic blood glucose dynamics. In *Proc. 15th IFAC Symposium on System Identification (SYSID2009)*, pages 233–238, Saint-Malo, France, 2009.

[13] ***Marzia Cescon*** and Rolf Johansson. Glycemic trend prediction using empirical model identification. In *Proc. 48th IEEE Conference on Decision and Control (CDC2009)*, pages 3501–3506, Shanghai, P.R.China, 2009.

[14] ***Marzia Cescon***, Isolde Dressler, Rolf Johansson, and Anders Robertsson. Subspace-based identification of compliance dynamics of parallel kinematic manipulator. In *Proc. 2009 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM2009)*, pages 1028–1033, Singapore, 2009.

Peer-reviewed Abstracts

[1] Divya Choudhary, ***Marzia Cescon***, J.E. Pinsker, V. Dadlani, K. Kumari, C. Reid, C. Andre, M.M. Church, Y.C. Kudva, F.J. Doyle, and E. Dassau. Activity detection and activity level categorization in free-living subjects with type 1 diabetes. **Diabetes Technology Society Student Research Award Gold Prize Winner and Selected for oral presentation**. In *Proc. 18th Diabetes Technology Meeting (DTM2018)*, Bethesda, MD, 2018.

[2] ***Marzia Cescon***, E. Dassau, D. DeSalvo, T.T. Ly, D.M. Maahs, L.H. Messer, B.A. Buckingham, and F.J. Doyle III. Early detection of infusion set failure during pump therapy in type 1 diabetes. In *Proc. 75th American Diabetes Association Scientific Sessions (ADA2015)*, Boston, MA, USA, 2015.

[3] ***Marzia Cescon*** and Rolf Johansson. Meal and insulin effects on blood glucose dynamic modeling. In *13th Diabetes Technology Meeting (DTM2013)*, San Francisco, CA, USA, 2013.

[4] ***Marzia Cescon***, Rolf Johansson, Eric Renard, and Jerome Place. Modeling the impact of a standardized breakfast on T1DM fasting blood glucose. In *12th Diabetes Technology Meeting (DTM2012)*, Bethesda, MD, USA, 2012.

[5] ***Marzia Cescon***, Rolf Johansson, and Eric Renard. Personalized short-term blood glucose prediction in T1DM. In *Proc. 5th International Conference on Advanced Technologies and Treatments for Diabetes (ATTD2012)*, Barcelona, Spain, 2012.

[6] ***Marzia Cescon*** and Rolf Johansson. Patient-specific glucose metabolism models for model predictive control of T1DM glycemia. In *Proc. 5th International Conference on Advanced Technologies and Treatments for Diabetes (ATTD2012)*, Barcelona, Spain, 2012.

[7] Fredrik Ståhl, ***Marzia Cescon***, Rolf Johansson, and Eric Renard. Infinite horizon prediction of postprandial breakfast plasma glucose excursion. In *Proc. 9th Diabetes Technology Meeting (DTM2009)*, San Francisco, CA, 2009.

[8] ***Marzia Cescon***, Fredrik Ståhl, Rolf Johansson, and Mona Landin-Olsson. Short-term diabetes blood glucose prediction based on blood glucose measurements. In *Proc. 2nd International Conference on Advanced Technologies and Treatments for Diabetes (ATTD2009)*, Athens, Greece, 2009.

Invited Talks

Jan 2019 **Decision Support Systems for Insulin Therapy in Type 1 Diabetes**, *Lund University*, Lund, Sweden.

Jan 2019 **Decision Support Systems for Insulin Therapy in Type 1 Diabetes**, *Danish Technical University*, Lyngby, Denmark.

Dec 2018 **Dynamics and Control for Decision Support Systems in Type 1 Diabetes**, *The University of Houston*, Houston, USA.

Feb 2018 **Modeling and control of irrigation networks affected by wind stress - The australian experience**, *Technical University of Berlin*, Berlin, Germany.

Mar 2015 **Modeling and prediction in diabetes physiology**, *The University of Melbourne*, Melbourne, Australia.

Dec 2015 **Modeling and prediction in diabetes physiology**, *Medtronic Technical Forum Meeting*, Northridge, Los Angeles, CA, USA.

Jun 2014 **Subspace-based glucose prediction algorithms**, *Workshop: Design, use and evaluation of prediction methods for blood glucose concentration, Johannes Kepler University*, Linz, Austria.

Nov 2013 **Modeling and prediction in diabetes physiology**, *Caltech*, Pasadena, USA.

May 2012 **Linear modeling and prediction in diabetes physiology**, *Linkoping University*, Linkoping, Sweden.

2009 **Parallel kinematic manipulator dynamics**, *Wissenschaftskolloquium, Hochschule Heilbronn*, Kuenzeslau, Germany.

Teaching and Advising Experience

Teaching and laboratory assistant

2008–2013 **Teaching assistant**, *Lund University*, Responsabilities included weekly exercise sessions, student tutoring, projects supervision, exam preparation and grading.

- Predictive Control. *Course Instructor: Prof. R. Johansson*
- System Identification. *Course Instructor: Prof. R. Johansson*
- Control Theory. *Course Instructor: Prof. P. Hagander*
- Foundations of Automatic Control. *Course Instructor: Prof. T. Hägglund*

2008–2013 **Laboratory assistant**, *Lund University*, Set-up the equipment and held laboratory sessions.

- Predictive Control. *Course Instructor: Prof. R. Johansson*
- System Identification. *Course Instructor: Prof. R. Johansson*
- Foundations of Automatic Control. *Course Instructor: Prof. T. Hägglund*
- Process Control. *Course Instructor: Prof. C. Jönsson*
- Market Driven Systems. *Course Instructor: Prof. C. Jönsson*

Lecturer

2015 **Guest Lecturer**, *The University of Melbourne*, Gave lectures on digital filters.

- Signal Processing. *Course instructor: Prof. E. Weyer*

2012 **Visiting Lecturer**, *Zhejiang University in Hangzhou, China*, Co-responsible of the course with prof. Kristian Soltesz (Lund University).

- Foundations of Automatic control.

Advisor

2018 – present **Supervisor of undergraduate students**, Harvard University.
Supervised one Harvard College student and one visitor working in the group of prof. Doyle. In particular, I supervised summer intern Divya Choudhary who was awarded the Gold Prize of the Diabetes Technology Society 2018 Student Research Award.

2009 **Supervisor of Master Thesis**, Lund University.
Supervised Julia Herget toward her master of engineering thesis entitled "Predictive control of insulin in diabetic patients".

Professional service and other activities

ongoing **Independent Expert**, *Finpiemonte Spa for the European Union*.
Evaluator and reviewer for projects in the Information and Communication Technology area, specifically Internet-of-Things and Big Data, pertaining research and development to be carried out by Italian institutions and industries.

ongoing **Reviewer**.
IEEE Transactions on Automatic Control; IEEE Transactions on Control System Technology; IEEE Transactions on Automation Science and Engineering; IEEE Transactions on Biomedical Engineering; Automatica; International Journal of Control; International Journal of Adaptive Control and Signal Processing; Biomedical Signal Processing and Control; Medical and Biological Engineering and Computing; Mathematical Biosciences; International Journal of Adaptive control and Signal Processing; Journal of Applied Mathematics; Journal of Biomedical and Health Informatics; Journal of Computer Methods and Programs in Biomedicine as well as several international conferences in systems, controls and engineering in medicine and biology.

2018 **Proposer of two invited sessions**, *2019 American Control Conference*, Philadelphia, PA, Topic: Design and evaluation of automated insulin delivery and decision support systems for diabetes suitable and accessible to a larger population of patients.
Twelve contributed papers from as many research group were submitted to the sessions (currently under review)

2018 **Invited Mentor**, *2018 Grand Hack*, MIT Hacking Medicine, Massachussets Institute of Technology, Cambridge, MA, USA.
One of the largest health hackathons in the world

2017 **Deputy member**, *Yang Xu Doctoral defense committee*, Lund University, Lund, Sweden.

2013 **Student representative**, *Graduate student hiring committee*, Lund University, Lund, Sweden.
Attended presentations, interviewed candidates, provided feedback on candidates

2012 **Co-organizer**, *Department kick-off meeting*, Lund University, Lund, Sweden.
Planned the annual kick-off meeting for faculty, students and staff of the department of Automatic Control. Duties included location and catering arrangement, program and activities arrangement and being co-chair of the information sessions for the day

References

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