Ioana Nașcu

Personal Data

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Research Interests

- Advanced process control: model based predictive control, multiparametric model based predictive control, adaptive model based predictive control, advanced estimation techniques, robust control.
- Hybrid systems, nonlinear systems, event based control, studies under uncertainties, AI and machine learning control.
- Control of Drug delivery systems focused on volatile and intravenous anaesthesia including hypnosis, muscle relaxation and analgesia; personalized healthcare; tissue engineering.
- Control of wastewater treatment plants, advanced model based control, hierarchical control.
- Model based control, hierarchical control and optimization for continuous pharmaceutical processes; integrating Industry 4.0 concepts into pharmaceutical processes (Pharma 4.0).

Education

Jan 2012 Jun 2016	Imperial College London, London, UK Department of Chemical Engineering Centre of Process System Engineering PhD in Chemical Engineering **PhD Thesis Title**: "Advanced Multiparametric Optimization and Control Studies for Anaesthesia" **PhD Thesis Advisor**: Prof. Stratos Pistikopoulos **Research area**:Model Predictive Control, Multiparametric Model Predictive Control, Simultaneous Multiparametric Model Predictive Control and Estimation, Hybrid Systems, Chemical Processes, Drug Delivery Systems, Biological Processes, Wastewater Treatment Systems, Biomedical Systems
Jan 2011 Jun 2011 Sept 2009 Jun 2011	Ghent University, Ghent, Belgium Department of Electrical Engineering, Systems and Automation Technical University of Cluj Napoca, Cluj Napoca, Romania Department of Automation, Faculty of Automation and Computer Science Master Degree in Control Engineering GPA: 9.93/10, first class honors, valedictorian **Master Thesis Title**: "Advanced Control in Biomedical Field" **Master Thesis Advisor**: Prof. R. De Keyser **Research area**: Model Based Predictive Control, Adaptive control, Robust control, Nonlinear systems, Drug Delivery Systems, Biomedical Systems
Jun 2009 Sept 2005	Technical University of Cluj Napoca, Cluj Napoca, Romania Department of Automation, Faculty of Automation and Computer Science Diploma in Control Engineering GPA: 9.74/10, first class honors, valedictorian **Dissertation Title**: "Drug Dosing Control during Anaesthesia for Patients Undergoing Surgery" **Research area**: System theory, System Identification, Continuous plant control, Robot control systems, Power plant control, Optimization techniques, Control Instrumentation, Industrial informatics

Professional Experience - Industrial Research

Mar 2017 – *Mar 2019*

Eli Lilly and Company– Small Molecule Design and Development

Postdoctoral Research Associate

Research area: Control Strategies for Pharmaceutical Processes

Overall Research Objective: Developing an advanced model predictive controller for a semi-continuous evaporation process designed to work with different APIs/solvent mixtures.

- High fidelity model development (in collaboration with Texas A&M)
- Classical PID control, Model Based Predictive Control, Multiparametric Model Based Predictive Control
- Study the effect of thermodynamics on control performances
- Workflow for the thermodynamic characterization of new APIs in a wide set of solvent mixtures using lean experimental resources
- Coordinating and working with team members on the experiment set-up, collecting data for the process model validation
- Implementing and testing the designed controllers on the real process

Professional Experience - Academic Research

Sept 2023 – current

Technical University of Cluj Napoca, Department of Automation

Faculty of Automation and Computer Science

Associate Professor

Research area: Advanced Control Strategies with application to Biomedical, Biological and Pharmaceutical Systems

- High fidelity model development
- Process analysis
- Advanced control strategies for biomedical and biological processes
- Advanced control strategies for wastewater treatment plants
- Robust control strategies
- Advanced control strategies for pharmaceutical processes

Feb 2021 – Sept 2023

Technical University of Cluj Napoca, Department of Automation

Faculty of Automation and Computer Science

Assistant Professor

Research area: Advanced Control Strategies with application to Biomedical, Biological and Pharmaceutical Systems

- High fidelity model development
- Process analysis including sensitivity analysis and RGA
- Advanced control strategies for biomedical and biological processes
- Advanced control strategies for perfusion bioreactors with applications in tissue engineering
- Robust control strategies
- Advanced control strategies for pharmaceutical processes

Sept 2022 – Sept 2023

Purdue University

Davidson School of Chemical Engineering

Visiting Scholar

Research area: Advanced Control of Pharmaceutical Manufacturing Processes

- High fidelity model development
- Developing a Digital Twin for Continuous Pharmaceutical Manufacturing
- Developing of Advanced control strategies for pharmaceutical processes
- Developing multivariable hierarchic control
- Robust control strategies
- Implementing the developed control strategies on the Continuous Pharmaceutical Manufacturing Pilot Plant

Sept 2019 – Sept 2022

University of Surrey, Department of Chemical and Process Engineering

Associate Lecturer

Research area: Advanced Control Strategies with applications to Biomedical and Biological Systems

Overall Research Objective: Developing high fidelity models and advanced control strategies for perfusion

- High fidelity model development
- Coordinating and working with different departments on the study of bioreactors in 3D Cell Culture and Tissue Engineering
- Classical PID Control, Model Based Predictive Control
- Robust control strategies
- Validating the the process model with the experiment setup
- Implementing and testing the designed controllers on the real process

Aug 2021 | Ghent University - Faculty of Engineering and Architecture
Department of Electrical energy, Metals, Mechanical Constructions and Systems
Research lab on Dynamical Systems and Control
Visiting Researcher
Research area: An Adaptive Multi-drug Infusion Control system for general Anesthesia in major Surgery

- Identify multivariable models and minimize the large uncertainties in patient response
- Design multivariable optimal predictive control methodologies
- Maximize performance of the closed loop

Sept 2019 – Feb 2021 | Technical University of Cluj Napoca, Department of Automation
Faculty of Automation and Computer Science
Associate Lecturer
Research area: Advanced Control Strategies

- High fidelity model development
- Incorporate AI with Model predictive control strategies
- Robust control strategies
- Teaching the Continuous Process Control Course

Apr 2019 – *Sept 2022* | Key Laboratory of Advanced Control and Optimization for Chemical Processes, East China University of Science and Technology
Postdoctoral Research Associate
Research area: Advanced Control Strategies with applications to Biomedical and Biological Systems and the petrochemical industry
Overall Research Objective: Developing advanced model predictive control strategies and advanced estimation techniques

- Process Modeling of Biomedical and Biological systems
- Coordinating and working with different departments on the study of biomedical and biological systems as well as petrochemical processes
- Development of PID and advanced model predictive control strategies
- Robust control strategies

Jul 2016 – *Mar 2019* | Texas A&M Energy Institute and Artie McFerrin Department of Chemical Engineering
Postdoctoral Research Associate
Research area: Advanced Control Strategies with applications to Biomedical and Biological Systems
Overall Research Objective: Developing advanced explicit model predictive controllers for Drug Delivery Systems. Developing model based predictive controllers and multiparametric model based predictive controllers for wastewater treatment systems.

- High fidelity model development
- Advanced Estimation techniques
- Model Based Predictive Control and Multiparametric Model Predictive Control
- Hybrid control
- Robust control strategies
- Advanced process optimization and studies under uncertainties

Jan 2012 – Jun 2016 | Imperial College London, Department of Chemical Engineering,
Centre of Process System Engineering
Research Assistant
Research area: Advanced Multiparametric Optimization and Control Strategies for Biomedical and Biological Systems
Overall Research Objective: Developing advanced control strategies for Drug Delivery Systems such as the volatile and intravenous anaesthesia process. Developing advanced control strategies for wastewater treatment systems.

- Process Modeling and Parameters Estimation
- Model Based Predictive Control and Multiparametric Model Predictive Control
- Simultaneous Multiparametric Model Predictive Control and Estimation
- Hybrid control
- Robust control strategies
- Advanced process optimization and studies under uncertainties

Professional Experience - Teaching

Delivery of tutorials & lectures, supervision & assistance with the course project, preparation, invigilation and correction of exam papers, office hours for student assistance/guidance

Sept 2023 – Current

Technical University of Cluj Napoca, Department of Automation
Faculty of Automation and Computer Science
Associate Professor
Course: Continuous Process Control

- Dynamics and Control of Boilers/ Steam Generators
- Dynamics and Control of Heat Exchangers
- Dynamics and Control of Chemical Reactors
- Dynamics and Control of Wastewater Treatment Processes

Feb 2021 – Sept 2023

Technical University of Cluj Napoca, Department of Automation
Faculty of Automation and Computer Science
Assistant Professor
Course: Electrical and Electronic Control Equipment

- Sensors, transducers, transmitters
- Programmable Logic Controllers (PLC)
- Distributed Control Systems (DCS) Treatment Processes

Course: Continuous Process Control

- Dynamics and Control of Boilers/ Steam Generators
- Dynamics and Control of Heat Exchangers
- Dynamics and Control of Chemical Reactors
- Dynamics and Control of Wastewater Treatment Processes

Sept 2020 – Jan 2021

Technical University of Cluj Napoca, Department of Automation
Faculty of Automation and Computer Science
Associate Lecturer
Course: Continuous Process Control

- Dynamics and Control of Boilers/ Steam Generators
- Dynamics and Control of Heat Exchangers
- Dynamics and Control of Chemical Reactors
- Dynamics and Control of Wastewater Treatment Processes

Oct 2019

University of Surrey, Department of Chemical and Process Engineering
Key Laboratory of Advanced Control and Optimization for Chemical Processes, East China University of Science and Technology
Associate Lecturer
Course: Advanced Process Control

- Introduction to systems theory and control engineering
- Introduction to system modeling
- Analysis of linear continuous systems
- Controller design
- Control systems in state space
- Model predictive control

May 2015 – Mar 2017

Texas A&M Energy Institute and Artie McFerrin Department of Chemical Engineering
Teaching Assistant
Course: Advanced Process Optimization I & II

- Multiparametric Linear and Quadratic Programming
- Multiparametric Non-Linear Programming
- Multiparametric Mixed-Integer Quadratic and Non-Linear Programming
- Parametric Global Optimization
- Model Predictive Control via Multi-Parametric Programming

Jan 2012 – May 2015

Imperial College London, Chemical Engineering Department
Teaching Assistant
Course: Advanced Process Optimization (3rd, 4th year UG and MSc students)
Course: Numerical Methods (3rd, 4th year UG and MSc students)

- Linear Systems
- Nonlinear Systems
- Mixed Integer Linear Programming

Sept 2009 – June 2011 | Technical University of Cluj Napoca, Department of Automation
Faculty of Automation and Computer Science
Teaching Assistant
Course: Process Instrumentation

- Sensors, transducers, transmitters
- Programable Logic Controllers (PLC)
- Distributed Control Systems (DCS)

Course: Continuous Process Control

- Dynamics and Control of Boilers/ Steam Generators
- Dynamics and Control of Heat Exchangers
- Dynamics and Control of Chemical Reactors
- Dynamics and Control of Wastewater Treatment Processes

Jan 2016 | Texas A&M Energy Institute and Artie McFerrin Department of Chemical Engineering
Seminar: Advanced Multiparametric Optimization and Control Studies for Anaesthesia

Jul 2014 | CAPEC-PROCESS Research Centre, DTU, Copenhagen, Denmark
Course: Advanced Process Optimization
Delivery of tutorials, coordination & correction of the course project and student evaluation

Professional Experience - Other

Sept 2021 | 11th IFAC Symposium on Biological and Medical Systems
Plenary Talk - Invited Speaker
Title: Towards Industry 4.0 and Continuous Pharmaceutical Manufacturing

Sept 2021 | distinguished lecturer in the series of Specialised Courses as part of Doctoral Schools at Ghent University, Belgium
Department of Electromechanics, Systems and Metals Engineering, research lab on Dynamical Systems and Control
course is part of the series: Multivariable Control for Industrial and Manufacturing Processes, with the specialised core topic on Pharmaceutical Processes.
The course is supported by the CESPE – centre for excellence in sustainable pharmaceutical engineering, at the Ghent University, Belgium and affiliated pharmaceutical industries.

2015 – *Current* | Reviewer - Journal of Process Control
Reviewer - Computers and Chemical Engineering

Oct 2016 | IEEE International Conference on Systems, Man, and Cybernetics
Session Chair
Session: Workshop Women in Engineering

May 2016 | IEEE-TTTC International Conference on Automation, Quality and Testing, Robotics
Session Chair
Session: Modeling and control of chemical processes

Professional Experience - Research Projects

Jan 2012 – Jun 2014 | MOBILE (Modelling, Control and Optimization of Biomedical Systems) ERC Project
Research Assistant

- Develop models and model based control and optimization methods and tools for drug delivery systems
- Participation and presentation of research results
- Preparation of technical reports & financial statements

Jan 2014 – Jun 2016 | OPTICO (Model Based Optimization and Control for Process Intensification in Chemical and Biopharmaceutical Processes) European Project
Research Assistant
- Research activities executed in collaboration with 13 international, industrial and academic partners
- Participation and presentation of research results in bi-annual partner meetings
- Preparation of technical reports & financial statements

Jan 2014 – Jun 2016 | ESE (Energy System Engineering) Marie Curie Actions
Project coordinator and Research Assistant
- Research activities executed in collaboration with 3 European Academic Groups (Imperial College London – UK, University of Pannonia – Hungary and Aristotle University of Thessaloniki, Greece) and 3 university groups from China (Tsinghua University and Fudan University) and South Korea (Yonsei University)
- Secondment to Yonsei University, South Korea as Researcher
- Secondment to Yonsei University, South Korea as Experienced
- Preparation of technical reports & financial statements

Feb 2017 – Feb 2019 | Industrial grant - Eli Lilly & Company
High Fidelity Dynamic Modeling for Real Time State Estimation and Control of a Continuous Manufacturing Process for Pharmaceutical Drug Product, Industrial Partnership
Project leader

Mai 2022 – Mai 2023 | Research-development-innovation contract
Advanced control system for optimizing the operation of aeration bioreactors
Project leader

Jul 2022 – Jul 2024 | Research-Development-Innovation Contract
Advanced control system for optimizing the operation of aeration bioreactors
Project manager

Mai 2023 – Mai 2025 | Romanian Academy of Scientists Research Project Competition AOSR-teams
Development of advanced control and optimization strategies for processes in the pharmaceutical industry by integrating digital twin and machine learning concepts
Project Leader

Jan 2025 – Dec 2026 | Tinere Echipe (TE)-grant
Digitalizarea protocolului chirurgical bazat pe evenimente pentru identificarea sistemului si control robust in anestezia generala, NR 56TE/2025
Project Member

SOFTWARE AND PROGRAMMING SKILLS

Intermediate Knowledge: gPROMS, GAMS, Python, COMSOL, LabView, AutoCAD, Java, PHP, C++
Advanced Knowledge: Matlab, CX Programmer - Omron PLC, Simatic S7 – Siemens PLC

AWARDS AND AFFILIATIONS

Erasmus Scholarship, 2011, 6 months, Host institution: Gent University, Belgium

The Armen H. Zemanian Best Paper Award for the year 2016 for the best paper published in 2016 in Circuits, Systems, and Signal Processing journal (237 papers) in the area of Circuits and Systems

The M.N.S. Swamy Best Paper Award for the best paper published in 2015 and 2016 in Circuits, Systems, and Signal Processing journal (440 papers) in the area of Circuits and Systems.

Member, American Institute of Chemical Engineers (AIChE)

Member, Institute of Electrical and Electronics Engineers (IEEE)

PUBLICATIONS

Books

1. Ioana Nascu, Ioan Nascu. Continous Process Control I (in Roumanian), UTPress, 2025, ISBN 978-606-737-787-3.
2. Pistikopoulos, E. N., I. Nascu and E. Velliou (2018). Modelling Optimization and Control of Biomedical Systems, John Wiley & Sons Ltd.
3. Ioan Nașcu, Ioana Nașcu, Ruben Crișan, Silviu Folea, Automation equipment and systems (in Romanian) , U.T. PRESS, Cluj Napoca, 2015. ISBN 978-606-737-099-7

4. Ruben Crișan, Ioana Nașcu, Continuous process control systems (in Roumanian) , U.T. PRESS, Cluj Napoca, 2013, ISBN 978-973-662-794-1
5. Papathanasiou, M. M., M. Onel, I. Nascu and E. N. Pistikopoulos. Computational tools in the assistance of personalized healthcare. Quantitative Systems Pharmacology. ISBN 978-0444639646. DOI 10.1016/b978-0-444-63964-6.00006-4 Elsevier, book chapter

Important Publications

1. Nascu, Ioana, N. A. Diangelakis, Yan-Shu Huang and Zoltan K. Nagy. 2025. 'Advanced Optimisation and Control Strategies for a Rotary Tablet Press in Pharmaceutical Industry', Computers & Chemical Engineering, draft
2. Nașcu, I., Diangelakis, N. A., Muñoz, S. G. and Pistikopoulos, E. N. (2023) 'Advanced model predictive control strategies for evaporation processes in the pharmaceutical industries', Computers & Chemical Engineering, 173, 108212.
3. Nașcu, Ioana, Daniel Sebastia-Saez, Tao Chen, Ioan Nascu, and Wenli Du. 2022. Global Sensitivity Analysis for a Perfusion Bioreactor based on CFD Modelling, Computers & Chemical Engineering, Volume 163, July 2022, https://doi.org/10.1016/j.compchemeng.2022.107829
4. Ghita, Mihaela, Isabela Birs, Dana Copot, Ioana Nascu, and Clara-Mihaela Ionescu. 2022. 'Impedance Spectroscopy Sensing Material Properties for Self-Tuning Ratio Control in Pharmaceutical Industry', Applied Sciences, 12: 509.
5.Jinquan Zheng , Wenli Du , Ioana Nascu , Yuanming Zhu , Weimin Zhong. "An interval type-2 fuzzy controller based on data driven parameters extraction for cement calciner process", IEEE ACCESS, 2020. 8: p. 61775-61789, 2020, doi: 10.1109/ACCESS.2020.2983476
6.Jingjing Guo, Wenli Du, Ioana Nascu, "Adaptive modeling of fixed bed reactor with multi-cycle and multi-mode characteristics based on transfer learning and just-in-time learning", Industrial & Engineering Chemistry Research, 2020. 59(14): p. 6629-6637.
7.Nașcu, I., Oberdieck, R., & Pistikopoulos, E. N. (2017). Explicit hybrid model predictive control strategies for intravenous anaesthesia. Special issue of Computers and Chemical Engineering, vol. 106, pp. 814-825. doi:10.1016/j.compchemeng.2017.01.033
8. Nașcu, I., & Pistikopoulos, E. N. (2017). Modeling, estimation and control of the anaesthesia process. Special issue in Computers and Chemical Engineering in honor of Prof. Rafiq Gani, vol. 107, pp. 318-332. doi:10.1016/j.compchemeng.2017.02.016
9. Nascu, I.; Pistikopoulos, E. N. A Multiparametric Model-Based Optimization & Control Approach to Anaesthesia. The Canadian Journal of Chemical Engineering 2016, vol. 94 (11), pp. 2125-2137.
10. Nascu, I., A. Krieger, C. M. Ionescu and E. N. Pistikopoulos (2015). "Advanced Model-Based Control Studies for the Induction and Maintenance of Intravenous Anaesthesia." IEEE Transactions on Biomedical Engineering, vol. 62(3):pp. 832-841
11. Pistikopoulos, E. N., N. A. Diangelakis, R. Oberdieck, M. M. Papathanasiou, I. Nascu and M. Sun (2015). "PAROC-An integrated framework and software platform for the optimisation and advanced model-based control of process systems." Chemical Engineering Science., vol. 136, pp. 115-138
12. Oberdieck, R.; Diangelakis, N. A.; Papathanasiou, M. M.; Nascu, I.; Pistikopoulos, E. N. "POP - Parametric Optimization Toolbox". Industrial & Engineering Chemistry Research 2016, vol. 55 (33), pp. 8979-8991.
13. Oberdieck, R., N. A. Diangelakis, I. Nascu, M. M. Papathanasiou, M. Sun, S. Avraamidou and E. N. Pistikopoulos (2016). "On multi-parametric programming and its applications in process systems engineering." Chemical Engineering Research and Design vol. 116: pp. 61-82.
14. Harja, G., I. Nascu, C. Muresan and I. Nascu (2016). "Improvements in Dissolved Oxygen Control of an Activated Sludge Wastewater Treatment Process." Circuits, Systems and Signal Processing vol. 35(6): pp. 2259-2281
15. Ionescu, C. M., I. Nascu and R. De Keyser (2013). "Lessons learned from closed loops in engineering: towards a multivariable approach regulating depth of anaesthesia." Journal of Clinical Monitoring and Computing: vol. 28(6), pp. 537-546

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