

Ivan Markovsky's Curriculum Vitae

Catalan Institution for Research and Advanced Studies (ICREA)
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Biographical sketch

I am an [ICREA professor](#) at the [Int. Centre for Numerical Methods in Engineering](#), Barcelona. My Ph.D. is in electrical engineering from the [Katholieke Universiteit Leuven](#). From 2006 to 2012 I was a lecturer at the [School of Electronics and Computer Science](#) of the University of Southampton and from 2012 to 2022 an associate professor at the [Vrije Universiteit Brussel](#). My expertise is in structured low-rank approximation, system identification, and data-driven control, topics on which I've published 110 peer-reviewed papers, 11 book chapters, and 2 monographs. I am an associate editor of the [Int. Journal of Control](#). In 2011, I was awarded an [ERC starting grant](#).



Education

- 02/2005 PhD in electrical engineering, [Katholieke Universiteit Leuven](#), Belgium
Thesis title: *Exact and approximate modeling in the behavioral setting*
Supervisors: [Sabine Van Huffel](#), [Bart De Moor](#), and [Jan C. Willems](#)
- BS (06/1997) and MS (06/1998) in control engineering, [Technical University of Sofia](#), Bulgaria

Positions

- 01/2023–present research professor, [Int. Centre for Numerical Methods in Engineering](#)
- 10/2022–12/2022 visiting professor, [Institut für Automatik \(IfA\), ETH-Zurich](#)
- 10/2012–09/2022 research professor, [Vrije Universiteit Brussel](#), Belgium
- 01/2007–09/2012 lecturer, [University of Southampton](#), UK
- 03/2005–12/2006 postdoctoral researcher, [Katholieke Universiteit Leuven](#), Belgium
- 11/2000–02/2005 PhD researcher, [Katholieke Universiteit Leuven](#), Belgium
- 08/1998–12/1999 research assistant, [University of Notre Dame](#), USA

Research interests

My main research interests are computational methods for system theory, identification, and control:

- [structured low-rank approximation and completion](#)
- system identification in the behavioral setting
- data-driven signal processing and control

Research record

- 2 monographs published by Springer and SIAM
- 11 book chapters published by Kluwer, Springer, CRC, IET
- 68 journal papers
- 51 refereed conference papers

Recent teaching activities

My vision for education is to base teaching on *student-centered activities*, involving discussions, problem solving, and project work. An example of a course build on these principles is described in

I. Markovskiy. [Dynamical systems and control mindstorms](#). In proc. of the *20th Mediterranean Conference on Control and Automation*, pages 54–59, Barcelona, Spain, 2012.

Master and PhD courses:

- 11/2022 “[Behavioral approach to systems theory](#)”, given at the *Graduate School in Systems, Optimization, Control and Networks*, Leuven, Belgium
- 2021–22 “[System identification](#)”, 2nd year master course, taught at the Vrije Universiteit Brussel
- 2018–22 “[Nonlinear system identification](#)”, 2nd year master course, also taught at the VUB
- 06/2017 and 06/2019 “[System identification in the behavioral setting](#)”, given at the *Workshop on System Identification*, Brussels, Belgium
- 03/2014 PhD course on “[Low-rank approximation and its applications](#)”, given at the *Graduate school in systems, optimization, control and networks*, Leuven, Belgium

Supervision of PhD students

- 2022– [Leander Hemelhof](#), [Jia Wang](#), and [Andras Sasfi](#), “Data-driven control” (co-supervisor)
- 2017–2020, [A. Fazzi](#), “Matrix nearness problems with applications” (co-supervisor)
- 2016–2020, G. Quintana Carapia, “Data-driven dynamic measurement”
- 2013–2016, [S. Rhode](#), “Robust and regularized system identification” (co-supervisor)
- 2008–2012, M. Przedwojski, “Analysis of synchronization errors” (co-supervisor)
- 2007–2011, F. Le, “Identification of electrically stimulated muscle after stroke”

Organization of scientific meetings

- 08/2020 co-organizer data-driven control session, *24th Symposium MTNS*, Cambridge
- 12/2019 organizer low-rank approximation session, *58th IEEE Conf. Decision and Control*, Nice
- 03/2019 organizing committee, *38th Benelux Meeting on Systems and Control*, Lommel
- 08/2017 co-organizer tensor decompositions session, *SIAM Appl. Algebraic Geometry*, Atlanta
- 03/2017 organizing committee, *36th Benelux Meeting on Systems and Control*, Spa

- 03/2015 organizing committee, [34th Benelux Meeting on Systems and Control](#), Lommel
- 07/2014 co-organizer of low-rank approximation sessions, [21st Symposium MTNS](#), Groningen
- 09/2013 organizer of [low-rank approximation](#) session, [Dolomites Research Week](#), Canazei
- 08/2006 co-organizer, [4th Int. Workshop on Total Least Squares and EIV Modeling](#), Leuven

Academic service and advisory role

- 01/2007–present associate editor of the [International Journal of Control](#)
- 01/2019–2022 [BE-MATHS-IN](#) representative for the VUB
- 01/2015–12/2017 associate editor of the [SIAM Journal on Matrix Analysis and Applications](#)
- 07/2013 editorial board member of the [ROKS Workshop](#)
- 07/2012 scientific committee of the [IFAC Symp. on System Identification](#)

Funding ID

acronym	my role	agency	number	period	amount, EUR
SeLMA	PI	FWO	30468160	01/2018–12/2021	540K
VOLTERRA	PI	FWO	G090117N	01/2017–12/2020	192K
DECOUPL	PI	FWO	G028015N	01/2015–12/2018	252K
SLRA	PI	ERC	ERC-StG 258581	01/2011–12/2015	782K

Recent invited plenary presentations

- 06/2021 “A matrix completion approach to data-driven control”, [Applications of Low Rank Matrix Completion](#), Fields Institute, Canada
- 10/2019 “Sparsity in system identification and data-driven control”, [OptML: Optimization and Machine Learning](#), Southampton
- 04/2019 “A low-rank matrix completion approach to data-driven signal processing”, IfA-IDSC Control Seminar Series, ETH Zurich
- 08/2018 “The no free lunch principle in data modeling”, [BioTensors workshop](#), Leuven
- 06/2018 “Sum-of-exponentials modeling”, [Approximation and Matrix Functions](#), Lille

Prizes, awards, and indicators of external recognition

- 03/2022 ICREA research professorship
- 03/2012 10-year research mandate by the VUB research council
- 08/2010 ERC starting grant (ERC-StG 258581)
- 06/2008 [Alston Householder Prize](#), honorable mention awarded at the [XVII Householder Symp.](#)
- 02/2005 PhD summa cum laude with congratulations of the Board of Examiners
- 08/2004 Wolfram research award at the [COMPSTAT conference](#), Prague, Czech Republic

Recent collaborations

- [F. Dörfler](#) (ETH-Zurich) on data-driven control
- [P. Patrinos](#) (K.U. Leuven, Belgium) on data-driven control
- [K. Usevich](#) (CNRS, Nancy) on low-rank approximation methods
- [N. Guglielmi](#) (GSSI, Italy) on approximate GCD computation
- [A. Takeda](#) (University of Tokyo) on low-rank approximation

Selected publications

My PhD work on the *total least-squares*

I. Markovsky and S. Van Huffel. “Overview of total least squares methods”. In: *Signal Processing* 87 (2007), pp. 2283–2302

and *system identification in the behavioral setting*

I. Markovsky, J. C. Willems, S. Van Huffel, and B. De Moor. *Exact and Approximate Modeling of Linear Systems: A Behavioral Approach*. SIAM, 2006

lead me to the concept of the *structured low-rank approximation*

I. Markovsky. *Low Rank Approximation: Algorithms, Implementation, Applications*. Springer, 2012

Specific contributions of this work are recognizing the role of the matrix structure and developing fast methods for applications in system theory, signal processing, and computer algebra. The current state-of-the-art methods are implemented in the [SLRA software package](#).

In 2008, I became interested in *data-driven control*. Based on prior work in subspace identification,

J. C. Willems, P. Rapisarda, I. Markovsky, and B. De Moor. “A note on persistency of excitation”. In: *Control Lett.* 54.4 (2005), pp. 325–329

I developed with P. Rapisarda a data-driven linear quadratic tracking method

I. Markovsky and P. Rapisarda. “Data-driven simulation and control”. In: *Int. J. Contr.* 81.12 (2008), pp. 1946–1959

A fundamentally new idea of our approach is the construction of system’s responses directly from data without knowing the system. In recent work, K. Usevich and I

I. Markovsky and K. Usevich. “Structured low-rank approximation with missing data”. In: *SIAM J. Matrix Anal. Appl.* 34.2 (2013), pp. 814–830

laid the foundation for *missing data estimation*. We make no assumptions about the nature or distribution of the missing values and can treat simultaneously missing, exact, and noisy data. The classical motivation for missing data estimation is dealing with sensor failures. A *key novel idea* of

I. Markovsky. “A missing data approach to data-driven filtering and control”. In: *IEEE Trans. Automat. Contr.* 62 (4 Apr. 2017), pp. 1972–1978. issn: 1558–2523

is to use missing data for signal processing and control. This idea, *connects my major research topics*—low-rank approximation and data-driven control.

Since 2020 I am a regular visitor at the IfA institute of the ETH-Zurich for collaboration with F. Dörfler and his team. This collaboration led to important [new results](#) as well as [tutorial/overview papers](#).