Ivan Markovsky's Curriculum Vitae

Department ELEC, Vrije Universiteit Brussel
http://homepages.vub.ac.be/~imarkovs

Biographical sketch

I obtained my PhD in electrical engineering from the Katholieke Universiteit Leuven in 2005. Since then, I was teaching and doing research in control and system theory at the School of Electronics and Computer Science of the University of Southampton and the ELEC department of the Vrije Universiteit Brussel, where I am currently an associate professor. My expertise is in structured low-rank approximation, system identification, and data-driven control, topics on which I've published 96 peer-reviewed papers, 11 book chapters, and 2 monographs. I am an associate editor of the International Journal of Control. In 2011, I was awarded an ERC starting grant.

Education

- 02/2005 PhD in electrical engineering, Katholieke Universiteit Leuven, Belgium
  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 and fellowships

- 10/2012–present current position, hoofddocent, Vrije Universiteit Brussel, Belgium
- 03/2012–09/2012 senior lecturer, University of Southampton, UK
- 01/2007–02/2012 lecturer, University of Southampton, UK
- 03/2005–12/2006 postdoctoral researcher, Katholieke Universiteit Leuven, Belgium
- 02/2005–03/2005 visiting researcher, CNR, Bari and CINECA, Bologna, Italy
- 11/2000–02/2005 research fellowship, Katholieke Universiteit Leuven, Belgium
- 01/2000–09/2000 teaching assistant, Technical University of Sofia, Bulgaria
- 08/1998–12/1999 research fellowship, University of Notre Dame, USA

Research record

- 2 monographs published by Springer (sole author) and SIAM (main author)
- 11 book chapters (sole author for 3, main author for 6) published by Kluwer, Springer, CRC, IET
- 52 journal papers (sole author for 12, main author for 22)
- 44 refereed conference papers (sole author for 6, main author for 28)

Recent teaching activities

- 06/2017 and 06/2019 PhD course on "Data-driven design: A missing data approach", *ELEC workshop on System Identification*, Brussels, Belgium
- 10/2016 Lectures on "Structured low-rank approximation", delivered at the *Data Analysis master course*, Deportment Computational Mathematics, Antwerpen
- 07/2014 Mini-course on "System identification in the behavioral setting", delivered at the *21st Int. Symp. on Math. Theory of Networks and Systems*, Groningen, Netherlands
- 03/2014 PhD course on "Low-rank approximation and its applications", delivered at the *Graduate school in systems, optimization, control and networks*, Leuven, Belgium

Supervision of graduate students and postdocs

- 2019–present, promotor of V. Mishra and B. Grossmann, "Data-driven signal processing"
- 2018–present, promotor of P. Dreesen, "Convex relaxations for data-driven control"
- 2017–present, PhD co-promotor of A. Fazzi, "Matrix nearness problems with applications"
- 2016–present, PhD promotor of G. Quintana Carapia, "Data-driven dynamic measurement"
- 2013–2016, PhD co-promotor of S. Rhode, "Robust and regularized system identification"
- 2013–2015, 2018–2019, promotor of M. Ishteva, "Tensor approximations"
- 2011–2014, promotor of K. Usevich, "Structured low-rank approximation"
- 2008–2012, PhD co-promotor of M. Przedwojski, "Analysis of synchronization errors"
- 2007–2011, PhD promotor of F. Le, "Identification of electrically stimulated muscle after stroke"

Organization of scientific meetings

- 12/2019 organizer low-rank approximation session, *58th IEEE Conf. Decision and Control*, Nice
- 03/2015 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

- 01/2019–present 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*
- 01/2007–present associate editor of the *International Journal of Control*

Funding ID

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

Invited plenary presentations in the last two years

- 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

- 03/2012 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

Collaborations

- within the department ELEC of the VUB:
  R. Pintelon on statistical analysis of missing data estimation
  M. Ishteva on low multilinear rank approximation
  P. Dreesen on nonlinear system identification
- K. Usevich (CNRS, Nancy) on low-rank approximation methods (11 joint papers)
- N. Guglielmi (GSSI, Italy) on approximate GCD computation (2 journal papers)
- G. Mercère (Université de Poitiers, France) on subspace methods with prior knowledge
- P.-L. Dragotti (Imperial College, U.K.) on sparse approximation – low-rank approximation link
- A. Cuyt (University of Antwerpen, Belgium) on the MEXICA project
- M. Niranjan (University of Southampton, U.K.) on structured matrix factorization

Selected publications

My PhD work on the *total least-squares*

> I. Markovsky and S. Van Huffel. "Overview of total least squares methods". In: *Signal Proc.* 87 (2007), pp. 2283–2302. (Citations: 256 in WoS, 514 in GS)

and *system identification in the behavioral setting*

> I. Markovsky et al. *Exact and Approximate Modeling of Linear Systems: A Behavioral Approach*. SIAM, 2006. (Citations: 106 in GS)

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

> I. Markovsky. "Structured low-rank approximation and its applications". In: *Automatica* 44.4 (2008), pp. 891–909. (Citations: 49 in WoS, 127 in GS)

Specific contributions of my work on low-rank approximation, are recognizing the role of the matrix structure and developing *fast methods for applications in system theory, signal processing, and computer algebra.* Having published over 40 papers, a monograph

> I. Markovsky. *Low Rank Approximation: Algorithms, Implementation, Applications*. First. Springer, 2012. (Citations: 189 in GS)

and having developed with K. Usevich the SLRA software package, which incorporates the current state-of-the-art methods, *I have established expertise* in this fast growing research topic.

In 2008, I became interested in *data-driven control*. Leveraging on prior work in subspace identification, 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. Control* 81.12 (2008), pp. 1946–1959. (Citations: 19 in WoS, 48 in GS)

A *fundamentally new idea of our approach is the construction of system's responses directly from data* without knowing the system. This idea has applications beyond data-driven control.

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. (Citations: 13 in WoS, 36 in GS)

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 2017), pp. 1972–1978. issn: 1558–2523

is to use missing data for solving signal processing and control problem, where the *missing data is what we aim to compute*. This idea, *connects my major research topics*—low-rank approximation and data-driven control.