

MIROSLAV KRAMÁR

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University of Oklahoma
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Employment

2019 - Assistant Professor, University of Oklahoma, USA
2017 - 2019 Researcher, INRIA Saclay, France
2015 - 2017 Assistant Professor, Advanced Institute for Materials Research, Japan
2009 - 2015 Postdoctoral Associate, Rutgers University, USA

Education

Vrije Universiteit Amsterdam, The Netherlands
Ph.D. Mathematics, February 2009
Thesis Advisor: R.C.A.M van der Vorst

Univerzita Komenského, Slovakia
M.S. Mathematics, June 2020, with Honors Math Degree
Thesis Advisor: Milan Medved

Awards & Honors

2020-2021 Junior Faculty Fellowship Program at University of Oklahoma
2016-2017 AIMR Fusion research grant: *Analyzing Dynamical Processes in Cells via Persistent Homology*

Areas of Interest

Topological data analysis: computational algebraic topology, analysis of non-linear structures in high-dimensional data, manifold reconstruction, persistent homology.

Non-linear dynamics: reconstruction of dynamics from data, pattern formation, Conley index theory, anomaly detection.

Interdisciplinary research: dense granular media, turbulent flows, dynamics of silo deformation, protein structure and function, spreading processes on networks.

Publications in refereed journals and Preprints

M. KRAMÁR, C. CHENG, R. BASAK, AND L. KONDIC, *On intermittency in sheared granular systems* submitted to Journal of Soft Matter, (arXiv:2112.11344), (2021)

R. BASAK, M. CARLEVARO, R. KOZLOWSKI, C. CHENG, L. A. PUGNALONI, M. KRAMÁR, H. ZHENG, J. E. S. SOCOLAR, AND L. KONDIC, *Two Approaches to Quantification of Force Networks in Particulate Systems* Journal of Engineering Mechanics, Volume 147 (2021)

- R. SERGAZINOV AND M. KRAMÁR, *Machine learning approach to force reconstruction in photoelastic materials*, Machine Learning: Science and Technology, Volume 2 (2021).
- M. KRAMÁR, L. KOVALCINOVA, L. KONDIC AND K. MISCHAIKOW, *Quantitative measure of memory loss in complex spatio-temporal systems*, Chaos: An Interdisciplinary Journal of Nonlinear Science, Volume 31 (2021).
- S. HARKER, M. KRAMÁR, R. LEVANGER AND K. MISCHAIKOW, *A comparison framework for interleaved persistence modules*, Journal of Applied and Computational Topology, Volume 3 (2019).
- C. COLONNELLO AND M. KRAMÁR, *Dynamics of silo deformation under granular discharge*, Physical Review E, Volume 98 (2018).
- J.A. DIJKSMAN, L. KOVALCINOVA, J. REN, R.P. BEHRINGER, M. KRAMAR, K. MISCHAIKOW AND L. KONDIC, *Characterizing granular networks using topological metrics*, Physical Review E, Volume 97 (2018).
- L. KONDIC, M. KRAMÁR, L. KOVALČINOVÁ AND K. MISCHAIKOW, *Evolution of force networks in dense granular matter close to jamming*, Powders & Grains (2017).
- J. JAQUETTE AND M. KRAMAR, *On ϵ -approximations of persistence diagrams*, Mathematics of Computation, Volume 86 (2017).
- M. KRAMÁR, R. LEVANGER, J. TITHOF, B. SURI, M. XU, M. PAUL, M.F. SCHATZ AND K. MISCHAIKOW, *Analysis of Kolmogorov flow and Rayleigh-Bénard convection using persistent homology*, Physica D, Volume 334 (2016).
- L. KONDIC, M. KRAMÁR, L.A. PUGNALONI, C.M. CARLEVARO AND K. MISCHAIKOW, *Structure of force networks in tapped particulate systems of disks and pentagons. II. Persistence analysis*, Physical Review E, Volume 93 (2016).
- L.A. PUGNALONI, C.M. CARLEVARO, M. KRAMÁR, K. MISCHAIKOW AND L. KONDIC, *Structure of force networks in tapped particulate systems of disks and pentagons. I. Clusters and loops*, Physical Review E, Volume 93 (2016).
- D. TAYLOR, F. KLIMM, H.A. HARRINGTON, M. KRAMAR, K MISCHAIKOW, M.A. PORTER AND P.J. MUCHA, *Topological data analysis of contagion maps for examining spreading processes on networks*, Nature Communications, Volume 6 (2015).
- M. KRAMAR, A. GOULLET, L. KONDIC AND K. MISCHAIKOW, *Evolution of force networks in dense particulate media*, Physical Review E, Volume 90 (2014).
- M. GAMEIRO, Y. HIRAOKA, S. IZUMI, M. KRAMAR, K. MISCHAIKOW AND V. NANDA, *A topological measurement of protein compressibility*, Japan Journal of Industrial and Applied Mathematics, Volume 32 (2014).
- M. KRAMAR, A. GOULLET, L. KONDIC AND K. MISCHAIKOW, *Quantifying force networks in particulate systems*, Physica D, Volume 283 (2014).
- M. KRAMAR, A. GOULLET, L. KONDIC AND K. MISCHAIKOW, *Persistence of force networks in compressed granular media*, Physical Review E, Volume 87 (2013).
- L. KONDIC, A. GOULLET, C. S. O'HERN, M. KRAMAR, K. MISCHAIKOW AND R.P. BEHRINGER, *Topology of force networks in compressed granular media*, Europhysics Letters, Volume 97 (2012).

J.B. VAN DEN BERG, M. KRAMAR, R.C.A.M. VANDERVORST, *Oscillatory solutions of fourth order conservative systems via the Conley index*, Journal of Differential Equations, Volume 252 (2012).

J.B. VAN DEN BERG, M. KRAMAR, R.C.A.M. VANDERVORST, *The order of bifurcation points in fourth order conservative systems via braids*, SIAM Journal on Applied Dynamical Systems, Volume 10 (2011).

M. KRAMÁR, *Generic and stability properties of reciprocal and pseudogradient vector fields*, Mathematica Slovaca, Volume 54 (2004).

Academic and Teaching Experience

Summer and Winter schools

- 2018 **The Complex Math of the Real World**,
Israel Institute of Technology, Haifa, Israel.
- 2016 **Dalian Winter School on Computational Topology**,
Dalian University of Technology, Dalian, China.
- 2016 **CNU-International Workshop on Industrial Mathematics**,
Chungnam National University, Daejeon, South Korea.
- 2016 **A3 Foresight Winter School**,
Tohoku University, Sendai, Japan.
- 2014 **Mathematical and Statistical Analysis of Big Data**,
Wits University, Johannesburg, South Africa.

The University of Oklahoma

- 2021 Fall Topics in Topology (Introduction to Topological Data Analysis)
- 2021 Fall Introduction to Partial Differential Equations
- 2021 Spring Applied Numerical Methods
- 2021 Spring Calculus and Analytical Geometry III
- 2020 Fall Calculus and Analytical Geometry III
- 2020 Fall Introduction to Partial Differential Equations
- 2020 Spring Calculus and Analytical Geometry III
- 2019 Fall Calculus and Analytical Geometry II

Rutgers University

- 2015 Spring Advanced calculus for engineers.
- 2014 Fall Stochastic models in operations research.
- 2014 Spring Introduction to mathematical reasoning.
- 2013 Fall Introduction to mathematical reasoning.
- 2013 Spring Differential equations for engineering and physics.
- 2012 Fall Introduction to mathematical reasoning.
- 2012 Spring Differential equations for engineering and physics.
- 2011 Fall Elementary differential equations.
- 2011 Spring Elementary differential equations.
- 2010 Fall Elementary differential equations.
- 2010 Spring Elementary differential equations.
- 2009 Fall Differential equations for engineering and physics.

Vrije Universiteit Amsterdam

2007 Fall Partial differential equations.
2005 Fall Calculus II.

Univerzita Komenského

2004 Fall Differential equations.
2004 Spring Mathematical analysis III.
2003 Fall Mathematical analysis II.
2003 Spring Mathematical analysis III, Differential equations.
2002 Fall Mathematical analysis II.

Service to the profession*Referee*

Physics of Fluids
Journal of Mathematical Biology
PhysicaD: Nonlinear Phenomena
SIAM Journal on Mathematics of Data Science
FoCM
SOSG
Mathematica Slovaca

Conference organizer

2017 TDART 2017 (Topological Data Analysis and Related Topics),
Sendai, Japan.
2015 AMS special session at Fall Eastern AMS Sectional Meeting,
New Brunswick, USA.
2013 Special session at Canadian applied and industrial Mathematics society meeting,
Quebec, Canada.

Service to the department*Seminar organizer/founder*

2017 - 2019 DataShape seminar,
INRIA Saclay, France.
2015 - 2017 Applied Math Seminar,
Advanced Institute for Materials Research, Sendai, Japan.

Invited talks

- Feb 2021** Applied mathematics seminar, Montana State University, USA.
Oct 2018 Applied mathematics seminar, University of Southampton, UK.
Sep 2018 Applied mathematics seminar, Comenius University, Slovakia.
Sep 2018 Dragon Applied Topology Conference, Swansea, UK.
July 2018 Algebraic topology in data and dynamics, Montana, USA.
May 2018 Annual seminar of Inria, Hyeres, France.
Nov 2017 Seminar Inria, Saclay France.
Oct 2017 Seminar of Department of Physics and Applied Mathematics, Universidad de Navarra, Pamplona, Spain.
Sep 2017 Geometry and physics of spatial random systems, Bad Herrenalb, Germany.
July 2017 Applied topology in Będlewo, Będlewo, Poland.
Apr 2017 Seminar Inria, Saclay France.
Aug 2016 Patterns and Waves 2016, Sapporo, Japan.
Jun 2016 International Workshop on Theoretical Aspects of Near-Wall Turbulence Studies, Kyoto, Japan.
Jun 2016 RIMS workshop on dynamical systems, Kyoto, Japan.
Jan 2016 ICMC Summer Meeting on Differential Equations, Sao Carlos, Brazil.
Sep 2015 Seminar, AIMR Tohoku University, Sendai, Japan.
May 2015 Colloquium, Universidad Simón Bolívar, Caracas, Venezuela.
Dec 2014 FoCM, Montevideo, Uruguay.
Aug 2014 Colloquium, Kyoto University, Japan.
Aug 2014 PASI, La Plata, Argentina.
Jul 2014 SIAM Annual Meeting, Chicago, USA.
Apr 2014 Colloquium, Montana State University, USA.
Feb 2014 IMA - Topological Data Analysis, USA.
Nov 2013 Computational and Applied Mathematics Seminar, Rutgers University, USA.
Nov 2013 APS-DFD meeting, Pittsburgh, USA.
Oct 2013 IMA - Topological Data Analysis, USA.
Jun 2013 Canadian applied and industrial Mathematics society meeting, Quebec, Canada.
May 2013 SIAM Conference on Applications of Dynamical Systems, USA.
Nov 2012 AMS Sectional Meeting , USA.
Jun 2012 8th European Solid Mechanics Conference, Graz, Austria.
Jun 2012 Applied and computational topology: ATMCS, Edinburgh, UK.
Jan 2012 Joint Mathematics meetings, Boston, USA.
Nov 2011 4th Annual Meeting of the APS Division of Fluid Dynamics, Maryland, USA.
Jul 2011 Workshop on applied topology, Hakata, Japan.
Jul 2011 FoCM, Budapest, Hungary.
May 2011 SAIM Conference on Applications of Dynamical Systems, USA.
May 2010 AMS Sectional Meeting, NJIT, USA.
Mar 2010 APS March Meeting, Portland USA.

Computer Proficiency

Programming: C/C++ with STL, MPI, Open MPI, CSS/HTML, Matlab, Python, Mathematica, Maple and L^AT_EX.

OS: Experienced with Mac OS X, cluster computers and various GNU/Linux distributions.