VADIM SOKOLOV

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May 2018

APPOINTMENTS

George Mason University
Assistant Professor, Department of Systems Engineering and Operations Research
(Aug 2016 – present)

Argonne National Laboratory
Principal Computational Scientist, Transportation Research and Analysis Computing Center, Energy Systems Division
(Sep 2013 – Aug 2016)

University of Chicago
Lecturer, Master of Science in Analytics Program
(June 2015 – present)

University of Chicago
Fellow, Computation Institute
(Dec 2014 – Aug 2016)

Argonne National Laboratory
Computational Scientist, Transportation Research and Analysis Computing Center, Energy Systems Division
(Nov 2008 – 2013)

EDUCATION

Northern Illinois University
Ph.D. in Computational Mathematics
(Jan 2004 - Oct 2008; advisor: Biswa N. Datta)

Rostov State University, Russia (now Southern Federal University)
Diploma in Applied Mathematics
(Sep 1999 - Jun 2004; High Honors)

University of Chicago
Graduate Studies in Statistics
(Sep 2013 - 2014)

JOURNAL ARTICLES

1. J. Warren, J. Lipkowitz, and V. Sokolov, "Clusters of Driving Behavior from Observational Smartphone Data," *IEEE Intelligent Transportation Systems Magazine* (2018), under first revision, available at https://arxiv.org/abs/1710.04502

2. Y. Zha, J. Foster, S. Parker and V Sokolov, "Urban Housing Market Demand Index with Home Showings Events," *Cities*, (2018), under first revision
3. M. Dixon, N. Polson, V. Sokolov, "Deep Learning for Spatio-Temporal Modeling: Dynamic Traffic Flows and High Frequency Trading," *Applied Stochastic Models In Business and Industry* (2018), forthcoming, available at `https://arxiv.org/abs/1705.09851`
4. N Polson and V Sokolov, "Bayesian Particle Tracking of Traffic Flows," *IEEE Transactions on Intelligent Transportation Systems* (2018), 19 (2), 345-356, available at `http://arxiv.org/abs/1411.5076`
5. N Polson and V Sokolov, "Deep Learning: A Bayesian Perspective," *Bayesian Analysis* (2017), 12(4), 1275-1304, available at `https://arxiv.org/abs/1706.00473`
6. N. Polson and V. Sokolov, "Deep learning for short-term traffic flow prediction," *Transportation Research Part C* (2017), 79, 1-17, available at `https://arxiv.org/abs/1604.04527`
7. V Sokolov, J Larson, T Munson, J Auld, and D Karbowski "Maximization of Platoon Formation Through Centralized Routing and Departure Time Coordination," (2017), *Transportation Research Record: Journal of the Transportation Research Board*, 2667, 10-16.
8. J Auld, V Sokolov, and T Stephens, "Analysis of the Effects of Connected-Automated Vehicle Technologies on Travel Demand," (2017) *Transportation Research Record: Journal of the Transportation Research Board*, (2625), 1-8.
9. V. Sokolov, "A Perspective on Deep Learning in Finance: Deep Portfolios," (2017) *Applied Stochastic Models in Business and Industry*, forthcoming
10. V. Sokolov, J. Larson, T. Munson, J. Auld and D. Karbowski, "Assessing the Mobility Benefit of Coordinated Platooning," (2017) *Transportation Research Record*, forthcoming, available at `https://arxiv.org/abs/1701.01391`
11. N. Polson and V. Sokolov, "Bayesian Analysis of Traffic Flow on Interstate I-55: The LWR Model," *The Annals of Applied Statistics* (2016), available at `http://arxiv.org/abs/1409.6034`
12. J. Auld, M. Hope, H. Ley, V. Sokolov, B. Xu and K. Zhang, "POLARIS: Agent-Based Modeling Framework Development and Implementation for Integrated Travel Demand and Network and Operations Simulations," *Transportation Research Part C* (2016)
13. V. Sokolov, J. Auld, D. Karbowski and N. Kim, "Assessing The Energy Impact Of Traffic Management and Vehicle Hybridization", *International Journal of Complexity in Applied Science and Technology* (2016)
14. J. Auld, V. Sokolov, A. Fontes, R. Bautista, "Internet-based stated response survey for no-notice emergency evacuations," *Transportation Letters: The International Journal of Transportation Research*, **4** (2012), no. 1 pp. 41-53
15. B. Datta and V. Sokolov, "A solution of the affine quadratic inverse eigenvalue problem," *Linear Algebra and Its Applications*, **434** (2011) pp. 1745-1760
16. B. Datta, S. Deng, D. R. Sarkissian and V. Sokolov, "An optimization technique for damped model updating with measured data satisfying quadratic orthogonality constraint," *Mechanical Systems and Signal Processing*, **23** (2009), no. 6, pp. 1759-1772
17. B. N. Datta and V Sokolov, "Quadratic inverse eigenvalue problems, active vibration control and model updating," *Appl. Comput. Math*, **8** (2009), no. 2, pp. 170-191
18. L. Krukier, O. Pichugina and V. Sokolov, "Numerical investigation of Krylov subspace methods for solving non-symmetric systems of linear equations with dominant skew-symmetric part," *International Journal of Numerical Analysis And Modeling*, **3** (2005), no. 1, pp. 115-124

PEER-REVIEWED PROCEEDINGS

1. L. Schultz and V. Sokolov, "Bayesian Optimization for Transportation Simulators,' *Procedia Computer Science* (2018), 130, pp.973-978.
2. J. Larson, T. Munson and V. Sokolov, "Coordinated Platoon Routing in a Metropolitan Network," *SIAM Workshop on Combinatorial Scientific Computing (CSC16)*, available at `http://www.mcs.anl.gov/papers/P6010-0516.pdf`
3. Q. Luo, J. Auld and V. Sokolov, "Addressing Some Issues of Map-Matching for Large-Scale, High-Frequency GPS Data Sets," *TRB Annual Meeting* (2016)
4. J. Auld, D. Karbowski, N. Kim and V. Sokolov , "A Disaggregate Model System for Assessing the Energy Impact of Transportation at the Regional Level," *TRB Annual Meeting* (2016)
5. N. Polson and V. Sokolov, "Bayesian Particle Tracking of Traffic Flows," *TRB Annual Meeting* (2016)
6. V. Sokolov, J. Auld, D. Karbowski and N. Kim, "POLARIS: A General Purpose Agent-Based Modeling Framework for Transportation Simulation," *ITS World Congress* (2015)
7. V. Sokolov, D. Karbowski and N. Kim, "Energy Impact Of Traffic Management and Vehicle Hybridization," *ITS America Annual Meeting*, (2015)
8. V. Sokolov, J. Auld, D. Karbowski and N. Kim, "A Disaggregate Model System For Assessing The Energy Impact Of Traffic Management and ITS Technologies," *14th International Conference on Travel Behaviour Research (IATBR)* (2015)
9. J. Auld, M. Hope, V. Sokolov, B. Xu, and K. Zhang, "POLARIS: Agent-Based Modeling Framework Development and Implementation for Integrated Travel Demand and Network and Operations Simulations", *TRB (Transportation Research Board) Annual Meeting*, (2015)
10. M. Hope, J. Auld, H. Ley, V. Sokolov, B. Xu, and K. Zhang, "POLARIS: A general purpose agent-based modeling framework specialized for transportation simulations," *4th Transportation Research Board Conference on Innovations in Travel Modeling* (2014)
11. J. Auld, M. Hope, H. Ley, V. Sokolov, B. Xu, and K. Zhang, "POLARIS: A fully integrated agent-based simulation model of activity travel behavior and network operations," *4th Transportation Research Board Conference on Innovations in Travel Modeling* (2014)
12. V. Sokolov, D. Karbowski and N. Kim, "Assessing Energy Impact of Traffic Management and ITS Technologies," *The 21st World Congress on Intelligent Transport Systems* (2014)
13. V. Sokolov, J, Auld, M. Hope, H. Ley, B. Xu and K. Zhang, "Modelling framework for regional integrated simulation of transportation network and activity-based demand (Polaris)," *Proc. of International Symposium for Next Generation Infrastructure* (2013)
14. V. Sokolov, J. Auld and M. Hope, "A flexible framework for developing integrated models of transportation systems using an agent-based approach," *Procedia Computer Science*, **10** (2012), pp. 854-859
15. Y. Park, M. E, H. Ley and V. Sokolov, "Fuzzy Rule-base approach for evacuation trip demand modeling," *TRB (Transportation Research Board) Annual Meeting* (2010)
16. S. Are, P. Dostert, B. Ettinger, J. Liu, V. Sokolov, A. Wei and K. Wiegand, "Reservoir model optimization under uncertainty," *IMA Preprint Series* (2006)
17. V. Sokolov "Investigation of eigenvalue distribution of a matrix arising from a central difference approximation of the two dimensional convection diffusion problem," *Proc. of the Conference on Numerical Methods for Solving Linear and Non-linear Boundary Problems,* Kazan', Russia (2003), pp. 216-221 (Russian)
18. V. Sokolov and L. Krukier, "Investigation of eigenvalue distribution of transition operators of iterative methods for solution strongly non-symmetric systems," *Proc. of the Workshop on Contemporary Problems in Mathematical Modeling*, Durso, Russia (2003), pp. 206 - 212 (Russian)

UNPUBLISHED MANUSCRIPTS

1. E. Jacquier, N. Polson and V. Sokolov, "Bayesian Filtering and Learning in Finance: Application to the Jump Stochastic Volatility Model", (2017), arxiv preprint, available at `https://arxiv.org/abs/1610.09750`

SPONSORED RESEARCH

George Mason University

2018-2021 Air Force Research Laboratory for *Mobile Manned/Unmanned Distributed Lethality Airborne Network (MUDLAN)*, SEOR share: $125K

2017-2020 US Department of Energy for *Collaborative Approaches to Energy Efficient Logistics in the Albany - New York City Corridor*, share: $112K

2016-2018 US Department of Transportation for *Coordinated Transit Response Planning and Operations Support Tools for Mitigating Impacts of All-Hazard Emergency Events*, subcontract with University of Chicago, subcontract awarded: $240K

2016-2018 US Department of Energy for *Calibration of Large-Scale Urban Transportation Models*, subcontract with Argonne National Laboratory, subcontract awarded: $200K

Argonne National Laboratory

2016-2018 US Department of Transportation for *Coordinated Transit Response Planning and Operations Support Tools for Mitigating Impacts of All-Hazard Emergency Events*, co-PI with H. Ley, amount awarded $2.9M

2015-2018 US Department of Energy for *Energy Impact of Connected and Automated Vehicle Technologies*, subcontract with University of Michigan, subcontract awarded: $900K

2015- Department of Energy for *Plug-In Electric Vehicle-Infrastructure Systems Interactions and Optimization*, co-PI with Yan Zhou, amount awarded: $200K

2013-2016 Department of Energy for *Modeling Energy Consumption and Electricity Demand of a Transportation System using Behavioral Travel Demand and Vehicle Models*, co-PI with D. Karbowski, amount awarded: $350K

2015- Argonne National Laboratory for *Advanced Control Algorithms for Improving Energy Consumption of Connected and Automated Vehicles*, co-PI with Jeff Larson, amount awarded: $180K

2015- Argonne National Laboratory for *Data-Driven Multiscale Coupled Urban Systems Modeling*, lead investigator, Charlie Catlett(PI), amount awarded: $220

2015- Argonne National Laboratory for *Vehicle as Sensor: Utilizing Vehicle Connectivity to Sense a Transportation System for Improved*, co-PI with Eric Rask, amount awarded: $100

2015- Argonne National Laboratory for *Agent-Based Behavioral Modeling of Ebola Spread in Chicago*, team member with Charles Macal (PI)

2014- Argonne National Laboratory for *The Chemical Stockpile Emergency Preparedness Program - U.S. Army Pueblo Chemical Depot*, lead investigator, W. Metz (PI), amount awarded: $130K

2013-2016: McCaffery Interests and University of Chicago for *Computation-Enabled Design for the Chicago Lakeside Development*, lead investigator, C. Catlett and Leah Guzowski (PI)

2014-2015: Federal Emergency Management Agency for *Analysis of Evacuation Induced Demand for Transit Services*, PI, amount awarded: $30K

2011-2014: US Department of Transportation Federal Highway Administration for *TRANSIMS Research and Deployment*, Lead Investigator with H. Ley (PI); amount awarded: $3.5M

2010-2011: Federal Emergency Management Agency Regional Catastrophic Preparedness Grant Program for *Regional Transportation Simulation Tool for Evacuation Planning*, co-PI with H. Ley, amount awarded: $2M

2008-2010: U.S. Department of Energy Office of Energy Efficiency and Renewable Energy for *The New GREET Model Development*, lead developer with A. Elgowainy, M. Wang (PI); 2008-2014

Illinois Department of Transportation for *Chicago Metropolitan Evacuation Simulation Project*, team member, D. Weber (PI)

2007-2011: US Department of Transportation Research and Innovative Technology Administration for *National User Facility to Meet US DOT Advanced Computation Needs*, team member, D. Weber (PI)

2005-2008: National Science Foundation for *Quadratic Inverse Eigenvalue Problems for Model Updating in Science and Engineering: Theory and Computations*, research assistant under B. Datta (PI)

SOFTWARE DEVELOPED

POLARIS GL
Lead Developer. 3D Visualization of Dynamic Urban Data
`https://polarisgl.vsokolov.org`
(JavaScript)

POLARIS
Designer. Developer. Transportation systems simulations framework
`https://github.com/anl-polaris/polaris`
(C++)

GREET
Designer. Lead Developer. An implementation of The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model.
`http://greet.es.anl.gov/greet`
(C#, .NET, SQLite; more then 800 unique users within first year of release, 2013)

MATCOM
Contributor. Distributed on CD with Numerical Linear Algebra and Applications, Second Edition book By Biswa Nath Datta, SIAM.
`http://www.siam.org/books/ot116/`
(MATLAB)

TRANSIMS
Contributor. An agent-based forecast software for modeling regional transport systems.
`http://sourceforge.net/projects/transims`
(C++; 22,295 total downloads since 2006)

Advanced Numerical Methods II
Sole Developer. Package for solving large scale control problems.
`http://library.wolfram.com/infocenter/Conferences/5787/`
(Mathematica; an experimental library that was not published)

TALKS

Invited seminar & colloquium talks

2018 University of New Hampshire: Data Science, University Seminar

2018 George Washington University: Decision Sciences

2017 George Mason University: Statistics

2016 University of California, Berkeley: Transportation

2015 University of California, Los Angeles: IPAM Traffic Program

2015 University of Chicago: Graham School

2014 George Washington University: Decision Sciences

2014 University of Chicago: Computation Institute

2014 Argonne National Laboratory: Material Science Division

2012 University of California, Berkeley: Civil Engineering

2012 University of California, Davis: Institute for Transportation Studies

2011 California Air Resources Board: Life-Cycle Assessment

2010 Turner-Fairbank Highway Research Center

2009 University of Illinois at Urbana-Champaign: Short course on *Transportaion Networks Simulation (4 lectures)*

Conferences

2018 ISBIS Meeting on Statistics in Business and Industry (invited)

2018 American Statistical Association's Symposium on Data Science and Statistics (invited)

2018 TRB Annual Meeting

2017 International Workshop on Objective Bayes Methodology (O-Bayes17)

2017 BIRS Workshop on Synthesis of Statistics, Data Mining and Environmental Sciences in Pursuit of Knowledge Discovery (invited)

2017 INFORMS Annual Meeting (two invited talks)

2017 5th Symposium on Games and Decisions in Reliability and Risk

2017 International Workshop on Bayesian Inference in Stochastic Processes

2017 IMS/ASA Spring Research Conference

2017 TRB Annual Meeting

2016 TRB Annual Meeting

2015 ITS World Congress

2015 ITS America Meeting

2015 TRB Annual Meeting

2014 ITS World Congress

2014 TRB Automated Vehicles Symposium

2014 TRB Innovations in Travel Modeling Conference

2013 International Symposium for Next Generation Infrastructure

2012 Council of Energy Research & Education Leaders Annual Meeting (*invited*)

2010 American Mathematical Society Spring Southern Section Meeting (*invited*)

2010 TRANSIMS Applications and Development Workshop

2009 Linear Algebra and Numerical Linear Algebra: Theory, Methods, and Application Conference

2008 XIXth International Workshop on Operator Theory

2008 Gene Golub Symposium at University of Illinois at Urbana-Champaign (*invited*)

2008 Conference on the Occasion of Richard Varga's 80th Birthday

2007 2nd International Conference on Matrix Methods and Operator Equations

2007 Numerical Linear Algebra in Signal, Systems, and Control Workshop (*invited*)

2006 X Mathematical Modeling in Industry - A Workshop for Graduate Students at University of Minnesota

2005 Wolfram Technology Conference

2003 Workshop on contemporary problems in mathematical modeling

2003 Conference on Numerical methods for solving linear and non-linear boundary problems

2002 Turkish-German Summer Academy in Izmir

2002 International Summer School on *Iterative Methods and Matrix computations*

Student Supervision

PhD in Operations Research at George Mason
Laura Schultz, "Scalable algorithms for calibrating complex simulations", 2019 (expected)

MS in Opertions Research at George Mason
Tuan Le, "Robust optimization algorithms for real-time network flows estimation", 2018

MS in Analytics at George Mason
Muhammad Imran, Naeem Khan, Salman Yousaf, Jamie Wheeler

MS in Analytics at U Chicago
James Foster, Susan Parker, Yuanyuan Zha, Ashkon Farmand, Aria Farmand, Kayvon Ali, Jeff Lipkowitz, Josh Warren

TEACHING EXPERIENCE

George Mason University
Instructor
(Fall 2016, Spring 2017: OR568 Predictive Analytics; Fall 2017: OR750 Real-Time Analytics, Spring 2018: SYST 468 Predictive Analytics; Fall 2018: OR750 Deep Learning)

University of Chicago
Instructor
(Summer 2015: Time Series Analysis; Winter 2016: Optimization and Simulation, Time Series Analysis)

Northern Illinois University
Grader/Recitation Instructor, Department of Mathematical Sciences
(Spring 2004: Math 232 Calculus III; Fall 2004/Spring 2005: Math 211 Business Calculus)

Northern Illinois University
Course Assistant/Recitation Instructor, Department of Mathematical Sciences
(Fall 2005: Math 434 Numerical Linear Algebra; Sprint 2006: Math 435 Numerical Analysis)

Argonne National Laboratory
Student supervision
(3 master's students from Northern Illinois University Engineering working on Illinois Department of Transportation project; 1 master's and 1 doctorate student from Illinois Institute of Technology Engineering working on Regional Catastrophic Preparedness Grant Program project)

Argonne National Laboratory
Three day TRANSIMS training course. Designed and taught sections on transportation networks modeling
(Apr 2008, Nov 2008, Dec 2009 and Jan 2011: Argonne National Laboratory; Jun 2008: Georgia Institute of Technology; Jan 2009: City of Moreno Valley; Jun 2009: University of Houston; Sep 2010: Turner Fairbank Highway Research Center; Apr 2011: South Carolina State University)

Argonne National Laboratory
One day GREET training-workshop. Designed and taught sections on mathematical models for life-cycle analyses
(Dec 2011 and Sep 2012)

AWARDS

ITS World Congress
Best Scientific Paper Award
(2015; given to three papers from three regions of the world, out of several thousand)

Northern Illinois University
Outstanding Graduate Student Award
(2007; nominated by faculty; awarded to an individual "who is distinguished in the area of scholarship")

Northern Illinois University
Dissertation Completion Award
(2007; awarded to 8 graduate students every year, out of more than a hundred)

Travel Awards
NIU Graduate School (2007), *NIU Department of Mathematical Sciences* (2007), *NIU Department of Mathematical Sciences* (2006), *NIU School of Arts and Sciences* (2006), *Institute for Mathematics and its Applications* (2006), *DAAD and SIEMENS* (2002)

OTHER APPOINTMENTS

Argonne National Laboratory
Research Assistant
(Sep 2007 - Oct 2008; adviser: H. Ley)

Norhtern Illinois University
Research Assistant
(Sep 2006 - Sep 2007; adviser: B. N. Datta)

Wolfram Research
Summer Intern, Software Technologies Department
(May 2005 - Aug 2005; developed a Mathematic package for solution of large scale control problems; selectivity 6 offers out of 160 applicants)

Northern Illinois University
Teaching Assistant, Department of Mathematical Sciences
(Jan 2004 - Sep 2006)

Rostov State University
Lab Assistant, High Performance Computing Center
(Dec 2002 - Dec 2003; responsible for installing and testing software, helped writing tutorials on linear algebra packages such as LAPACK, ScaLAPACK, ARPACK)

PROFESSIONAL SERVICE

Meetings Organized

2017 International Workshop on Agent-Based Modelling of Urban Systems (Program Committee)

2016 International Workshop on Agent-Based Modelling of Urban Systems (Program Committee)

2013 Special session on Transport Network Modeling at International Symposium for Next Generation Infrastructure

2012 Integrated Transportation Models Workshop at Conference on Innovations in Travel Modeling (with J. Auld)

2010 Workshop on TRANSIMS: Applications and Development, Argonne National Laboratory (with H. Ley and B. Gardner)

2009 Linear Algebra and Numerical Linear Algebra: Theory, Methods, and Application, Northern Illinois University (with B. Datta, G. Ammar, K. Datta, S. Deng, Y. Hong, L. Reichel, V. Olshevsky, B. Shader and Q. Ye)

Referee

Applied Mathematics and Computation

Expert Systems With Applications

IEEE Transactions on ITS

Lecture Notes in Electrical Engineering

Transportation Research Part C

Mechanical Systems and Signal Processing

Transportmetrica A: Transport Science

Transportation

SIMULATION: Transactions of The Society for Modeling and Simulation International

GeoInformatica

TRB Annual Meeting 2014-2018

IATBR Innovations in Travel Modeling Conference

TRB Innovations in Travel Modeling Conference

Grant Proposals Reviewer for Argonne LDRD Grants 2012, 2014, 2015

Grant Proposal Reviewer for DTRA, 2015

NSF panelist (ENG), 2017

NSF panelist (CISE), 2017

University Service

2016-present Seminar Organizer

2016 Hiring Committee ($\times$2)

2017 PhD Committee

2017 Hiring Committee

2018 PhD Committee

Session Chair

2018 ABMTRANS

2018 INFORMS

2018 TRB

RESEARCH COVERAGE

Chicago Tribune

Argonne wins grant to help transit agencies cope with emergencies (link)

The Detroit News

UM wins $2.7M grant to study driverless cars link

Michicgan News

U-M teams with Argonne, Idaho national labs to study potential energy savings of connected vehicles (link)

University of Chicago News

Argonne, Fermilab, Marine Biological Laboratory and The University Of Chicago Discoveries That Changed The World (GREET project, link)

WBEZ
Argonne will research how transportation systems should respond to natural hazards (link)
Next City
What Happens When Developers, Scientists and Super-Computers Connect on Urban Design (link)

SKILLS

Programming
Python, C++, C#, Java, Fortran, JavaScript, MPI, OpenMP
Data Analysis
SQLite, PostgreSQL, MongoDB, Hadoop, Gephi
Spatial Analysis
PostGIS, Spatialite, ArcGIS, QuantumGIS
Mathematical
R, Maple, Mathematica, MATLAB, LaTeX, Coin-OR SYMPHONY, AMPL, CPLEX
Complex Systems
Repast, NetLogo, NodeXL for .NET
Soft Skills
Student supervision, project management, collaboration, proposal writing
Languages
English (fluent), Russian (fluent), German (basic)