Jeffrey Larson

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Education

2012 Ph.D. Applied Mathematics, University of Colorado Denver
- Thesis Title: Derivative-free Optimization of Noisy Functions
- Advisor: Stephen C. Billups

2008 M.S. Applied Mathematics, University of Colorado Denver

2006 B.A. Mathematics (with honors; minor in Natural Sciences), Carroll College, Helena, MT

Professional Experience

Research Experience

Jan '14 - Present ***Postdoctoral Appointee* - Argonne National Laboratory**
Developing parallel, multistart numerical optimization algorithms for high-performance computers. Applications include particle accelerator design and quantum entanglement. Responsibilities also include supervising students and assisting in grant writing.

Aug '12 - Jan '14 ***Postdoctoral Researcher* - KTH Royal Institute of Technology, Sweden**
Responsibilities included scientific research, teaching graduate courses, advising graduate and undergraduate students, and assisting in grant writing.

Summer '11 ***Consultant* - SpaceNav**
Developed models and provided derivative-free optimization software to solve a satellite collision avoidance problem.

Spring '11 ***Research Assistant* - Argonne National Laboratory**
Researched termination of algorithms for optimizing noisy, computationally expensive functions. Produced solver-independant, nonintrusive tests for determining when to stop an algorithm.

Summer '10 ***Research Assistant* - NSF Rocky Mountain Middle School Math-Science Partnership**
Worked collaboratively with a team of four teachers as they investigated open problems in statistical genomics.

April '08 - Aug '08 ***Research Assistant* - Radiation Oncology, CU Anschutz Medical Campus**
Designed and solved a mathematical model to determined the optimal wall composition to sufficiently shield radiation therapists.

Teaching Experience

Spring '15 ***Instructor* - DePaul University**
Taught a section of Trigonometry.

Fall '10 ***Instructor* - International College of Beijing**
Taught 3 sections and 6 recitations of Differential Calculus.

June '08 - July '10 ***Fellow* - NSF GK-12 Transforming Experiences Project**
Assisted in middle school classrooms designing research activities, increasing content knowledge, working with students, and developing inquiry-based instructional methods. Served one year as a mathematics fellow and one year as a science fellow.

Summer '07 & '09 ***Teaching Assistant* - NSF Rocky Mountain Middle School Math-Science Partnership**
Assisted in courses for in-service teachers. Program goals included increasing content knowledge of classroom teachers for improving student performance, and helping teachers achieve highly qualified status per No Child Left Behind standards.

Aug '06 - July '11 ***Teaching Assistant* - University of Colorado Denver**
Instructor and assistant for various upper- and lower-level undergraduate courses.

Awards

CU Denver College of Liberal Arts and Sciences Outstanding Ph.D. Student, Fall 2012

Lynn Bateman Memorial Fellowship, Academic Year 2010-11 (declined) and Academic Year 2011-12

CU Denver College of Liberal Arts and Sciences Outstanding Masters Student, Fall 2008

NSF GK-12 Mathematics Fellowship, Summer 2009 - Summer 2010

NSF GK-12 Science Fellowship, Summer 2008 - Summer 2009

SIAM Travel Awards: $650 in 2011, $2000 in 2015

Research and Outreach Coverage

Coordinating the Platooning of Heavy-Duty Vehicles. *Argonne Mathematics and Computer Science Division Science Highlights.* January 9, 2015

Math on My Mind Equates to More Learning in Denver Area Schools. *Pinnacle - University of Colorado Denver Alumni Magazine.* May 8, 2012

Water Balloons Experiment. *Denver 9NEWS.* May 8, 2009

Science and Math. *Denver 9NEWS.* October 20, 2008

Publications

Journal Articles

J. Larson, S. Wild. A Batch, Derivative-Free Algorithm for Finding Multiple Local Minima. *Optimization and Engineering* (to appear), 2015

E. Larsson, G. Sennton, J. Larson. The Vehicle Platooning Problem: Computational Complexity and Heuristics. *Transportation Research Part C: Emerging Technologies* 60:258-277, November 2015

J. Larson, K.-Y. Liang, K. H. Johansson A Distributed Framework for Coordinated Heavy-Duty Vehicle Platooning. *IEEE Transactions on Intelligent Transportation Systems*, 16(1):419-429, February 2015

J. Larson, M. Johansson, M. Carlsson. An Integrated Constraint Programming Approach to Scheduling Sports Leagues with Divisional and Round-Robin Tournaments. In: *Lecture Notes in Computer Science, Integration of AI and OR Techniques in Constraint Programming*, Ed: Helmut Simonis, Springer, 8451:144-158, 2014

J. Larson, M. Johansson. Constructing Schedules for Sports Leagues with Divisional and Round-Robin Tournaments. *Journal of Quantitative Analysis in Sports*, 10(2):119-129, 2014

S. Billups, J. Larson, P. Graf. Derivative-Free Optimization of Expensive Functions with Computational Error Using Weighted Regression. *SIAM Journal on Optimization*, 23(1):27-53, 2013

J. Larson, S. Wild. Non-Intrusive Termination of Noisy Optimization. *Optimization Methods and Software*, 28(5):993-1011, 2013

J. Larson, F. Newman. An Implementation of Scatter Search to Train Neural Networks for Brain Lesion Recognition. *Involve, a Journal of Mathematics*, 4(3):203-211, 2011

Refereed Proceedings

J. Larson, C. Kammer, K.-Y. Liang, K. H. Johansson. Coordinated Route Optimization for Heavy-Duty Vehicle Platoons. *Proceedings of the IEEE Intelligent Transportation Systems Conference*, 1196-1202, October, 2013

J. Larson, M. Johansson. Scheduling a Sports League with Divisional and Round-Robin Play. *Proceedings of the 4th International Conference on Mathematics in Sport*, June 2013

Submissions and Reports (full text available at `mcs.anl.gov/~jlarson/`)

J. Larson, M. Menickelly, S. Wild. Manifold Sampling for L1 Nonconvex Optimization. Under review at *SIAM Journal on Optimization*

J. Larson, S. Billups. Stochastic Derivative-Free Optimization using a Trust Region Framework. Under review at *Computational Optimization and Applications*

M. Carlsson, M. Johansson, J. Larson. A Stronger Integrated Constraint Programming Approach to Scheduling Sports Leagues with Divisional and Round-Robin Tournaments.

Grants

Advanced Control Algorithms for Improving Energy Consumption of Connected and Automated Vehicles
- PI for the grant. Assisted in writing and will deliver research for the grant's work packages
- Co-PIs: Dominik Karbowski and Vadim Sokolov with Argonne's Energy Systems Division
- Awarded $540 K from Strategic Laboratory Directed Research and Development. 2015-2018

COMPANION: Cooperative Dynamic Formation of Platoons for Safe and Energy-optimized Goods Transportation
- Co-PI for the grant. Assisted in writing and delivered research to the grant's work packages
- Partners: Scania CV AB, Volkswagen, KTH, OFFIS E.V, IDIADA, S&T AS, and Transportes Cerezuela
- Awarded 3 million euros by European Commission Seventh Framework Programme. 2013-2016

Computational Complexity of Vehicle-Network Problems
- Wrote grant. Supervised undergraduate students' research and their technical reports
- Participants: Erik Larsson and Gustav Sennton
- Awarded 72,000 SEK by KTH ACCESS. 2013

High-performance, Large-scale Computing
- Wrote grant. Supervised undergraduate students' research and their technical reports
- Participants: Björn Tegelund and Saman Bidgol
- Awarded 72,000 SEK by KTH ACCESS. 2013

Awarded 116,000 core-hours from ANL's Laboratory Computing Resource Center. 2014-2016

Research Presentations

Invited Conference and Symposia

Using Concurrent Function Evaluations to Identify Local Minima of a Derivative-Free Optimization Problem. *International Congress on Industrial and Applied Mathematics.* Beijing, China. August 12, 2015

A Model-Based Trust Region Method for Stochastic Derivative-Free Optimization. *I-Sim Workshop: At the Interface of Simulation and Optimization.* Purdue University. July 26, 2015

Locating All Minima of a Smooth Function without Access to Its Derivatives. *International Symposium on Mathematical Programming.* Pittsburgh, PA. July 16, 2015

Finding Multiple Optima of Particle Accelerator Simulations. *CORS/INFORMS International Conference.* Montreal, Canada. June 14, 2015

Multi-Start, Model-Based Derivative-Free Optimization. *4th International Conference on Engineering Optimization.* Lisbon, Portugal. September 10, 2014

Coordinated Route Optimization for Heavy-Duty Vehicle Platoons. *16th International IEEE Annual Conference on Intelligent Transportation Systems.* The Hague, Netherlands. October 8, 2013

Stochastic Derivative-Free Optimization Using a Trust Region Framework. *International Conference on Continuous Optimization.* Lisbon, Portugal. July 29, 2013

Non-Intrusive Termination of Noisy Derivative-Free Optimization. *INFORMS Annual Meeting.* Charlotte, NC. November 15, 2011

Exploiting Uncertainty Quantification in Derivative-Free Optimization. *SIAM Conference on Computational Science and Engineering.* Reno, NV. March 1, 2011

Seminars and Colloquia

Exploiting Problem-Specific Knowledge and Computational Resources in Derivative-Free Optimization. *Data Science Seminar.* Illinois Institute of Technology. September 8, 2015

Optimal Tiled QR Factorization. *NetCon Workshop.* Stockholm, Sweden. January 9, 2014

Constructing Schedules for Sports Leagues with Divisional and Round-robin Tournament Play. *Swedish Institute of Computer Science Seminar.* Stockholm, Sweden. October 29, 2013

Optimization of Heavy-Duty Vehicle Routes to Facilitate Platooning. *KTH NetCon Seminar.* Stockholm, Sweden. May 27, 2013

Noisy Derivative-Free Optimization. *KTH Optimization and Systems Theory Seminar.* Stockholm, Sweden. September 28, 2012

Derivative-Free Optimization Using a Trust Region Framework. *Institute of Computational Mathematics and Scientific/Engineering Computing.* Chinese Academy of Sciences. Beijing, China. September 28, 2010

The Integer Linear Complementarity Problem. *East China University of Science and Technology Mathematics Seminar.* Shanghai, China. June 14, 2009

Other Presentations

Finding Multiple Local Minima for Computationally Expensive Simulations (Poster). *ACNW Optimization Workshop.* Northwestern University. June 8, 2015

Global Derivative-Free Optimization. *Chicago-area SIAM Student Chapters Meeting.* Argonne National Laboratory. April 10, 2015

Derivative-Free Multi-Agent Optimization. *SIAM Conference on Optimization.* San Diego, CA. May 19, 2014

Large-Scale Coordinated Platooning of Heavy-Duty Vehicles. *Joint Mathematics Meetings.* Baltimore, MD. January 17, 2014

Optimization of Pool and Tournament Play in the Top Swedish Handball League (Poster). *ICT Platform Day.* Stockholm, Sweden. September 10, 2013

Optimization of Pool and Tournament Play in the Top Swedish Handball League (Poster). *SIAM Annual Meeting.* San Diego, CA. July 9, 2013

Scheduling a Sports League with Divisional and Round-robin Play. *4th International Conference on Mathematics in Sport.* KU Leuven, Belgium. June 5, 2013

Stochastic Approximation Methods. *KTH Internal Seminar.* Stockholm, Sweden. June 3, 2013

Sport League Scheduling. *KTH Internal Seminar.* Stockholm, Sweden. January 7, 2013

Auction Drafts in Fantasy Baseball. *KTH Internal Seminar.* Stockholm, Sweden. November 13, 2012

Fantasy Sports and Mathematics. *KTH Internal Seminar.* Stockholm, Sweden. October 23, 2012

Derivative-Free Optimization Applications. *KTH Automatic Control Lab Research Day.* Stockholm, Sweden. September 18, 2012

Increasing Hydrogen Production in *Chlamydomonas reinhardtii* Using Derivative-Free Optimization (Poster). *ACCESS Ph.D. and Post-Doc Workshop.* Stockholm, Sweden. September 6, 2012

Derivative-Free Techniques for Minimizing Stochastic Functions. *Front Range SIAM Student Conference.* University of Colorado Denver. March 3, 2012

Non-intrusive Termination of Noisy Optimization. *CU Denver Optimization Seminar.* University of Colorado Denver. November 8, 2011

Optimal Scheduling of Tiled QR Factorization. *CU Denver Optimization Seminar.* University of Colorado Denver. October 4, 2011

Increasing Hydrogen Production in *Chlamydomonas reinhardtii* Using Derivative-Free Optimization (Poster). *Research and Creative Activities Symposium.* University of Colorado Denver. April 30, 2010

Derivative-Free Optimization Using a Trust Region Framework. *Front Range SIAM Student Conference.* University of Colorado Denver. March 6, 2010

Applications and Algorithms for Derivative-Free Optimization. *MAA Rocky Mountain Section Meeting.* Colorado State University. Fort Collins, CO. April 17, 2010

Sparse Principal Component Analysis. *Student Research Conference.* University of Colorado Denver. November 16, 2009

An Implementation of Scatter Search to Classify Medical Images. *MAA Rocky Mountain Section Meeting.* Colorado School of Mines. Golden, CO. April 17, 2009

An Implementation of Scatter Search to Classify Medical Images. *Front Range SIAM Student Conference.* University of Colorado Denver. March 14, 2009

Advisory Responsibilities

Matt Menickelly. Argonne National Laboratory Givens Associate. 2014-2015
- Nonsmooth Derivative-Free Optimization

Christoph Kammer. KTH Department of Automatic Control Master's Degree Project. 2012-2013
- Coordinated Heavy Truck Platoon Routing using Global and Locally Distributed Approaches

Erik Larsson and Gustav Sennton. KTH ACCESS Undergraduate Research Project. Summer 2013
- Computational Complexity of Vehicle Network Problems

Björn Tegelund and Saman Bidgol. KTH ACCESS Undergraduate Research Project. Summer 2013
- High-Performance, Large-Scale Computation for Control Problems

Teaching Experience

University Courses (instructor of record unless otherwise noted)

DePaul University
- Trigonometry, Spring 2015

KTH Royal Institute of Technology, Stockholm, Sweden
- Convex Optimization with Engineering Applications (with Anders Forsgren and Mikael Johansson), Fall 2012

International College of Beijing
- Differential Calculus (3 sections and 6 recitations), Fall 2010

University of Colorado Denver
- Integral Calculus, Summer 2011
- Linear Programming (Guest Lecturer), Fall 2010
- Introduction to Abstract Mathematics, Summer 2008
- Algebra for Social Science and Business, Spring 2008
- Polynomial Calculus, Summer 2007
- College Algebra, Fall 2007 & Spring 2007
- Differential Calculus (TA), Fall 2006

NSF Rocky Mountain Middle School Math-Science Partnership
- Math and Science of Musical Instruments (TA), Summer 2009
- Math of Change (TA), Summer 2007

Educational/Outreach Presentations

- From Student to Researcher. *KTH ACCESS Undergraduate Research Kick-Off.* Stockholm, Sweden. June 10, 2013
- Probability and Non-Euclidean Geometry. *Stockholm International School.* Stockholm, Sweden. May 24, 2013
- Möbius Strips and Games. *Stockholm International School.* Stockholm, Sweden. April 26, 2013
- Mathematics Cheerleading. *KTH Internal Seminar.* Stockholm, Sweden. March 11, 2013
- Math Careers and Games. *Stockholm International School.* Stockholm, Sweden. January 28, 2013
- Ricochet Robots. *Cesar Chavez Academy Denver.* Denver, CO. May 23, 2012
- Discrete Optimization Problems and Algorithms. *Rocky Mountain Math Teachers' Circle.* Denver, CO. May 5, 2012
- Surface Area, Volume, and Mammalian Heart Rate. *West Denver Preparatory Charter School – Highland Campus.* Denver, CO. April 17, 2012
- Surprising Applications of Math. *West Denver Preparatory Charter School – Highland Campus.* Denver, CO. November 1, 2011
- Subtraction Games. *STEM Magnet Lab School.* Northglen, CO. October 28, 2011
- Helping Parents Help Their Kids. *Otho E. Stuart Middle School.* Commerce City, CO. September 29, 2011
- Optimal Egg Dropping. *Capstone Course for Secondary Teachers.* University of Colorado Denver. September 21, 2011
- Sizes of Infinity. *Bennett High School.* Bennett, CO. May 13, 2011
- Combinatorial Games - Taxman. *Bennett High School.* Bennett, CO. May 13, 2011
- Sizes of Infinity. *Core Knowledge Charter School.* Parker, CO. May 3, 2011
- Fun with Math. *Overland Trail Middle School Science Expo.* Brighton, CO. April 21, 2011

- GK-12 Transforming Experiences at University of Colorado Denver. *GK-12 National Meeting*. Washington, D.C. March 27, 2010
- Rubik's Cubes Made Easy. *STEMapalooza*. Denver, CO. November 16, 2009
- Launching Water Balloons and Mathematics. *GK-12 National Meeting*. Washington, D.C. March 29, 2009
- Möbius Strips and Instant Insanity. *Steele Elementary School Math Evening*. Denver, CO. March 17, 2009
- Möbius Strips. *STEMapalooza*. Denver, CO. November 27, 2008

Service

Mathematics Community

Session Co-organizer: Parallel Methods for DFO. *CORS/INFORMS International Conference*. Montreal, Canada. June 14, 2015

Session Chair: Global Optimization. *SIAM Conference on Optimization*. San Diego, CA. May 19, 2014

Session Organizer and Chair: Advances in Derivative-Free Optimization. *International Conference on Continuous Optimization*. Lisbon, Portugal. June 29, 2013

Referee: 2013 IEEE-ITSC, 2014 IEEE-ITSC, 2015 IEEE-ITSC, 2015 Transportation Research Board Proceedings, Applied Numerical Mathematics, Computation Optimization and Applications, Environmental Modelling & Software, IEEE Transactions on Automatic Control, IEEE Transactions on Intelligent Transportation Systems, IEEE Transactions on Vehicular Technology, Journal of Quantitative Analysis in Sports, Optimization Methods and Software, Optimization and Engineering, SIAM Journal on Optimization

Recruiter and Sponsor: Mathematical Contest in Modeling. 2013
- Team 19915: Andreas Pettersson and Artur Kransengren
- Team 19916: Marcus Bertilsson, Björn Magnusson, Elsa Skuncke

Organizing Committee Member: Front Range SIAM Student Conference. 2009, 2010, 2012

Advisor: University of Colorado Denver Mathematical Contest in Modeling. 2008-2010

Community

Mentor: NAACP's Afro-Academic, Cultural, Technological, and Scientific Olympics. 2014-2015, 2015-2016

Assistant: Assigned optimal coverage of volunteers for STEMapalooza. Fall 2010

Intern: Montana Coalition against Domestic and Sexual Violence. Constructed surveys and statistically analyzed the results in order to design an advertising campaign aimed at reducing domestic and sexual violence. Fall 2005

Educational/Outreach talks at various schools. (See above)

University/Institution

Subject Matter Expert: Argonne National Laboratory LDRD Grant Review. 2014 & 2015

Organizing Committee Member: KTH ACCESS Innovation Day. May 17, 2013

Organizing Committee Member: KTH ACCESS Industrial Workshop. January 24, 2013

Student Symposium Committee Member: University of Colorado Denver Graduate School. Fall 2011

Faculty Search Committee Member: Instructor Position at the International College of Beijing. Fall 2011

Department/Division

Co-Founder and Organizer: Creative Research Activities for Argonne Postdocs. Spring 2015-Present

Organizing Committee Member: KTH's NetCon Workshop. January 9, 2014

Co-Founder and Instructor: LaTeX, Unix, and Beamer Seminar for CU Denver Graduate Students. Fall 2011

Math Department Recruiter: CU Denver's Spring Undergraduate Open House. February 2010

Panel Member: Graduate student orientation. Fall 2009 and Fall 2010

Volunteer: Math Club Finals Study Hall. Fall 2009, Spring 2010, Spring 2011, Fall 2011, and Spring 2012

Postdissertation Courses

Argonne Training Program on Extreme-Scale Computing. August 3-15, 2014

Simulation-based Dynamic Traffic Assignment for the Deployment of Intelligent Transportation Systems. October 6, 2013

ICCOPT Summer Course on Sparse Optimization and Applications to Information Processing. July 28, 2013

ICCOPT Summer Course on PDE-Constrained Optimization. July 27, 2013

Professional Memberships

2008 - Present Institute for Operations Research and the Management Sciences

2007 - Present Society for Industrial and Applied Mathematics