

Liam Solus

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ACADEMIC POSITIONS

KTH Royal Institute of Technology, Stockholm, Sweden.

Assistant Professor of Combinatorics and Probability in Artificial Intelligence September 2019 –

Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany.

Nonlinear Algebra Group, Visiting Researcher September 2019 – November 2019

KTH Royal Institute of Technology, Stockholm, Sweden.

NSF Mathematical Sciences Postdoctoral Research Fellow September 2016 – August 2019

Massachusetts Institute of Technology, Cambridge, Massachusetts, USA.

Visiting Scholar: Postdoctoral Researcher with Caroline Uhler February 2016 – May 2016

Institute of Science and Technology Austria, Klosterneuburg, Austria.

Postdoctoral Researcher in Caroline Uhler Group January 2016 – August 2016

EDUCATION

University of Kentucky Lexington, KY, USA.

- Ph.D., Mathematics December 2015
 - *Dissertation:* Polyhedral Problems in Combinatorial Convex Geometry
 - *Thesis Advisor:* Benjamin Braun
- M.A., Mathematics April 2014

Oberlin College Oberlin, OH, USA.

- B.A., Mathematics with Honors May 2011
 - *Honors Thesis:* Normal and Δ -Normal Configurations in Toric Algebra
 - *Thesis Advisor:* Kevin Woods

GRANTS, AWARDS, AND HONORS

Vetenskapsrådet (The Swedish Research Council)

- VR Starting Grant 2020–2023.

(United States) National Science Foundation

- NSF Mathematical Sciences Postdoctoral Research Fellowship 2016–2019.
- NSF East Asia and Pacific Summer Institute Fellowship 2014.
- NSF Graduate Research Fellowship Program Honorable Mention 2013.

University of Kentucky

- Graduate School of Arts and Sciences Outstanding Teaching Award 2015.

- Summer Research Fellowship (Jointly funded by Dept. of Math./Dept. of Stat.) 2015.
- Max Steckler Fellowship 2012-2014/2015-2016.

Oberlin College

- Honors Student in Mathematics 2011.

RESEARCH

Research Interests:

- Combinatorics/Discrete Mathematics; Geometric and Algebraic Combinatorics; Discrete Geometry.
- Statistics, Causality, Machine Learning, and Artificial Intelligence.

Publications: The authors on papers marked with a \star are ordered according to contribution (first author is the main contributor). Authors on all other papers are listed alphabetically.

Preprints:

- E. Duarte and L. Solus. *Representation and learning of context-specific causal models with observational and interventional data*. Preprint available on the arXiv at: <https://arxiv.org/abs/2101.09271> (2021).
- E. Duarte and L. Solus. *Algebraic geometry of discrete interventional models*. Preprint available on the arXiv at: <https://arxiv.org/abs/2012.03593> (2020).
- M. Hlavacek and L. Solus. *Subdivisions of shellable complexes*. Preprint available on the arXiv at: <https://arxiv.org/abs/2003.07328> (2020).
- L. Solus. *Interventional Markov equivalence in mixed graph models*. Preprint available on the arXiv at: <https://arxiv.org/abs/1911.10114> (2020).
- \star V. Karwa, D. Pati, S. Petrović, L. Solus, N. Alexeev, M. Raič, D. Wilburne, R. Williams, and B. Yan. *Exact tests for stochastic block models*. Preprint available on the arXiv at: <https://arxiv.org/abs/1612.06040> (2019).

Accepted and/or Published Papers:

- \star L. Solus, Y. Wang, and C. Uhler. *Consistency guarantees for greedy permutation-based causal inference algorithms*. *Biometrika*. <https://doi.org/10.1093/biomet/asaa104> (2021).
- P. Brändén and L. Solus. *Some algebraic properties of lecture hall polytopes*. *Séminaire Lotharingien de Combinatoire (FPSAC 2020 accepted for a talk)*, 84B.25 (2020), 12 pp.
- N. Gustafsson and L. Solus. *Derangements, Ehrhart theory, and local h -polynomials*. *Advances in Mathematics* 369 (2020): 107169.
- P. Brändén and L. Solus. *Symmetric decompositions and real-rootedness*. *International Mathematics Research Notices (IMRN)* <https://doi.org/10.1093/imrn/rnz059> (2019).
- L. Solus. *Simplices for numeral systems*. *Transactions of the American Mathematical Society* 371.3 (2019): 2089-2107.
- E. Perrone, L. Solus, and C. Uhler. *The Geometry of Discrete Copulas*. *Journal of Multivariate Analysis* 172 (2019): 162-179.
- F. Liu and L. Solus. *On the relationship between Ehrhart unimodality and Ehrhart positivity*. *Annals of Combinatorics* 23.2 (2019): 347-365.
- L. Solus. *Local h^* -polynomials of some weighted projective spaces*. *The Proceedings of the 2018 Summer Workshop on Lattice Polytopes at Osaka University* (2018).

- B. Braun, R. Davis, and L. Solus. *Detecting the integer decomposition property and Ehrhart unimodality in reflexive simplices*. Advances in Applied Mathematics. 100 (2018): 122-142.
- B. Braun and L. Solus. *r-Stable Hypersimplices*. Journal of Combinatorial Theory, Series A **157** (2018) 349-388.
- A. Radhakrishnan, L. Solus, and C. Uhler. *Counting Markov equivalence classes for DAG models on trees*. Discrete Applied Mathematics 244 (2018): 170-185.
- ★ Y. Wang, L. Solus, K. Dai Yang, and C. Uhler. *Permutation-based causal inference algorithms with interventions*. Advances in Neural Information Processing Systems (2017).
- A. Radhakrishnan, L. Solus, and C. Uhler. *Counting Markov equivalence classes by number of immoralities*. The Proceedings of the 2017 Conference on Uncertainty in Artificial Intelligence and The Proceedings of the 2017 UAI Special Workshop on Causality (2017).
- L. Solus, C. Uhler, and R. Yoshida. *Extremal positive semidefinite matrices whose sparsity pattern is given by graphs without K_5 minors*. Linear Algebra and its Applications 509 (2016): 247-275.
- T. Hibi and L. Solus. *The facets of the r-stable (n, k) -hypersimplex*. Annals of Combinatorics 20.4 (2016): 815-829.
- J. Calcut, J. Metcalf-Burton, T. Richard, L. Solus. *Borromean rays and hyperplanes*. The Journal of Knot Theory and Its Ramifications Vol. 23, No. 4 (2014).
- L. Solus. *A topological generalization of partition regularity*. Involve: A Journal of Mathematics 3.4 (2011): 421-433.

Contributions to The Online Encyclopedia of Integer Sequences (OEIS):

- A318408: sequence authored. Status: approved, Aug 26 2018.
- A318407: sequence authored. Status: approved, Aug 26 2018.
- A318406: sequence authored. Status: approved, Aug 26 2018.
- A318405: sequence authored. Status: approved, Aug 26 2018.
- A318404: sequence authored. Status: approved, Aug 26 2018.
- A318376: sequence authored. Status: approved, Aug 24 2018.
- A000045: comment and link added, Aug 23 2018.
- A011973: comment and link added, Aug 23 2018.
- A046739: comment and link added, Aug 23 2018.
- A130477: comment and link added, Aug 23 2018.
- A002301: comment and link added, Aug 23 2018.
- A034807: comment and link added, Aug 23 2018.
- A001610: comment and link added, Aug 23 2018.

Refereeing Responsibilities:

- International Mathematics Research Notices (IMRN)
- Advances in Mathematics,
- Journal of Combinatorial Theory, Series A,
- The Electronic Journal of Combinatorics,
- Discrete and Computational Geometry,
- European Journal of Combinatorics,
- Journal of Algebraic Combinatorics,
- Annals of Combinatorics,
- Monatshefte für Mathematik
- ARS Mathematica Contemporanea,
- Journal of Mathematical Biology,
- Journal of Algebraic Statistics.

- Conference on Uncertainty in Artificial Intelligence (UAI)
- The International Conference on Machine Learning (ICML),

ORGANIZATIONAL ACTIVITIES

- *WASP Kick-off Workshop*. Co-organized with Kathlén Kohn, KTH Royal Institute of Technology, Stockholm, Sweden (POSTPONED).
- *Combinatorics and Its Interactions*. Co-chairing with Florian Kohl, The Nordic Congress of Mathematics, Aalto University, Helsinki, Finland (August 2021).
- *AlCoVE 2020: An Algebraic Combinatorics Virtual Expedition*. Co-organized with Laura Colmenarejo, Maria Gillespie, and Oliver Pechenik, Planet Earth (June 2020).
- *Combinatorics, Codes, Designs, and Graphs Track*. Co-chairing with Zafeirakis Zafeirakopoulos, The 8-th Conference on Mathematical Aspects of Computer and Information Sciences (MACIS), Istanbul, Turkey (November 2019)
- *Minisymposium on Combinatorics and Algorithms in Decision and Reason*. Organized jointly with Svante Linusson, SIAM Conference on Applied Algebraic Geometry, Bern, Switzerland (July 2019).
- *Lecture Series on the g -Theorem by Karim Adiprasito*. Institutionen för Matematik, KTH (May 2019)
- *2019 Kombinatorik Seminariet*. Institutionen för Matematik, KTH (January 2019 - December 2019)
- *KTH Mathematics Postdoc Community Events*. Co-organized with Diane Holcomb, Institutionen för Matematik, KTH (January 2019 - August 2019)
- *Session on Combinatorial Commutative Algebra and Polytopes*, Organized jointly with Robert Davis, Joint Mathematics Meetings, San Deigo, California, USA (January 2018).
- *KTH Mathematics Postdoc Day*, Organized jointly with Svante Linusson and Barbara Gris, KTH Royal Institute of Technology, Stockholm, Sweden (September 2017).
- *Minisymposium on the Algebra and Combinatorics of Graphical Models*, Organized jointly with Carline Uhler, SIAM Conference on Applied Algebraic Geometry, Georgia Institute of Technology, Atlanta, Georgia, USA (July-August 2017).

INVITED TALKS

- *Algebra, geometry and statistics of interventional discrete models*, SIAM Conference on Applied Algebraic Geometry, Minisymposium on Algebraic Methods in Graphical Models. Texas A&M, College Station, Texas, USA (August 2021)
- *Talk title to be determined*, Applied Algebra Session at The Nordic Congress of Mathematics, Aalto University, Helsinki, Finland. (August 2021).
- *Talk title to be determined*, 24-th International Conference on Computational Statistics, Bologna, Italy (August 2021)
- *Talk title to be determined*, Brummer & Partners MathDataLab Conference on Mathematics of Complex Data, KTH, Stockholm, Sweden (June 2021)
- *The algebra and statistics of context-specific causal modeling* Nonlinear Algebra Seminar (online), Max Planck Institute for Mathematics in the Natural Sciences, Leipzig, Germany (March 2021)
- *Invited lecture series on ‘Combinatorics and Causality,’* (Invited Lecturer for) The Summer School on Mathematics and Data, The Arctic University of Norway in Tromsø (POSTPONED)
- *Talk title to be determined*, Symposium on Characteristic Polynomials of Hyperplane Arrangements and Ehrhart Polynomials of Lattice Polytopes, RIMS, Kyoto, Japan (POSTPONED).
- *Some recent applications of real-rooted polynomials*, Discrete CATS Seminar, University of Kentucky (October 2020)

- *Interventional Varieties*, Algebraic Statistics 2020 Virtual Workshop, Planet Earth, (June 2020)
- *Interventional Markov Equivalence for Mixed Graph Models*, Mørketidens Mattemøte, The Arctic University in Norway, Tromsø, Norway (January 2020)
- *Probability, combinatorics, and causality*, Mathematics Colloquium, Universität Osnabrück, Osnabrück, Germany (November 2019)
- *s-derangement polynomials and some conjectures on lattice polytopes*, Workshop on Commutative Algebra and Lattices Polytopes, RIMS, Kyoto University, Kyoto, Japan (October 2019)
- *Interventional Markov Equivalence for Mixed Graph Models*, Workshop on Graphical Models: Conditional Independence and Algebraic Structures, Technische Universität München, Munich, Germany (October 2019)
- *s-derangement polynomials and some conjectures on lattice polytopes*, Discrete Mathematics Seminar, Freie Universität, Berlin, Germany (October 2019)
- *Interventional Markov Equivalence for Mixed Graph Models*, Nonlinear Algebra Seminar, Max Planck Institute for Mathematics in the Natural Sciences, Leipzig, Germany (July 2019)
- *Interventional Markov Equivalence for Mixed Graph Models*, SIAM Conference on Applied Algebraic Geometry, Minisymposium on Graphical Models. Universität Bern, Bern, Switzerland (July 2019)
- *Discrete geometry in model discovery*, Workshop on Mathematics for Complex Data, KTH, Stockholm, Sweden (June 2019)
- *Discrete geometry in model discovery*, Uppsala Universität, Uppsala, Sweden (June 2019)
- *Real Zeros and the alternating increasing property*, Institut für Mathematik, Universität Wien, Vienna, Austria (May 2019)
- *Real Zeros and Symmetric Decompositions of Polynomials*, Seminar for the Semester on The Geometry of Polynomials, The Simons Institute, Berkeley, California, USA (May 2019)
- *Real Zeros and the Alternatingly Increasing Property in Algebraic Combinatorics*, ASGARD 2019, Universitet i Oslo (May 2019)
- *An Introduction to Causal Discovery*, Klinisk Epidemiologi (KEP) Metoder Seminariet, Karolinska Institutet (April 2019)
- *Real Zeros and the Alternatingly Increasing Property*, Algebra and Geometry Seminar, Institut für Algebra und Geometri. Otto-von-Guericke-Universität-Magdeburg, Magdeburg, Germany (January 2019)
- *Thinking Gamma-positively about Lattice Polytopes*, Summer Workshop on Lattice Polytopes. Osaka University, Osaka, Japan (August 2018)
- *Real-rootedness, Unimodality, and Symmetric Decompositions of Polynomials*, Summer Workshop on Lattice Polytopes. Osaka University, Osaka, Japan (August 2018)
- *Simplices for Numeral Systems*, Miniworkshop on Lattice Polytopes: Methods, Advances, and Applications. Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany (September 2017)
- *Ehrhart Unimodality*, MSRI Semester on Geometric and Topological Combinatorics, Introductory Workshop. MSRI, Berkeley, CA, USA (September 2017)
 - Video available at: <https://www.msri.org/workshops/813>.
- *Combinatorial geometry of Bayesian networks*, SIAM Conference on Applied Algebraic Geometry, Minisymposium on Algebra and Combinatorics of Graphical Models. Georgia Institute of Technology, Atlanta, Georgia, USA (July 2017)
- *Simplices for Numeral Systems*, Methods for Discrete Structures Seminar. Freie Universität, Berlin, Germany (April 2017)
- *Learning Bayesian Networks via Edgewalks on DAG Associahedra*, Workshop on Algebraic Statistics. Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany (April 2017)
- *Learning Bayesian Networks via Edgewalks on DAG Associahedra*, Workshop on Convex Polytopes. Osaka University, Osaka, Japan (January 2017)
- *On consistency guarantees in DAG model selection*, Special Session on Algebraic Statistics I (a Mathematics Research Communities Session). Joint Mathematics Meetings, Atlanta, Georgia, USA (Jan-

uary 2017)

- *Ehrhart h^* -polynomials and regular unimodular triangulations*, Combinatorics Seminar. KTH Royal Institute of Technology, Stockholm, Sweden (October 2016)
- *On reflexive IDP lattice simplices and unimodality of h^* -polynomials*, RIMS Workshop on Computational Commutative Algebra and Convex Polytopes. RIMS, Kyoto, Japan (August 2016)
- *Recovery of covariance matrices for Gaussian graphical models*, SIAM Annual Meeting, Algebraic Statistics Mini-Symposium. Boston, MA, USA (July 2016)
- *Extremal positive semidefinite matrices for graphs without K_5 minors*, Algebra Seminar. Georgia Institute of Technology, Atlanta, GA, USA (November 2015)
- *Extremal positive semidefinite matrices for certain graphs*, Special Session on Geometric, Algebraic, and Enumerative Combinatorics, AMS Sectional Meeting. Loyola University, Chicago, IL, USA (October 2015)
- *Extremal positive semidefinite matrices for certain graphs*, Research seminar. Institute of Science and Technology Austria, Klosterneuburg, Austria (July 2015)
- *Gorenstein r -stable $(n, 2)$ -hypersimplices*, Combinatorics Seminar. Rikkyo University, Tokyo, Japan (Summer 2014)
- *A shelling of the odd second hypersimplex*, Workshop on Applications of Algebraic Geometry and Algebraic Analysis. Kobe University, Kobe, Japan (Summer 2014)
- *Facets of the r -stable second hypersimplices*, Conference on Gröbner Bases. Osaka University, Osaka, Japan (Summer 2014)

CONTRIBUTED TALKS

- *Some algebraic properties of lecture hall polytopes*, FPSAC 2020 (Online), Planet Earth (July 2020)
- *Counting Markov equivalence classes by number of immoralities*, Special Workshop on Causality. Conference on Uncertainty in Artificial Intelligence. Sydney, Australia (August 2017)
- *Extremal positive semidefinite matrices for certain graphs*. Contributed Session III. SIAM Conference on Applied Algebraic Geometry, National Institute of Mathematical Sciences, Daejeon, South Korea (August 2015)
- *Facets of the r -stable $n, 2$ -hypersimplex*, Osaka University, Osaka, Japan. Combinatorics Seminar (Summer 2014)
- *Unimodality of h^* -polynomials of the n, k -hypersimplex*, Combinatorics Seminar. Osaka University, Osaka, Japan (Summer 2014)
- *r -stable hypersimplices*, Poster Session, IMA Workshop on Geometric and Enumerative Combinatorics. University of Minnesota, Minneapolis, MN, USA (Fall 2014)
- *Identifying extreme rays with cuts*, Combinatorics Seminar. University of Kentucky, Lexington, KY, USA (Spring 2015)
- *Connecting two problems with a spectrahedron*, Algebra Seminar. University of Kentucky, Lexington, KY, USA (Spring 2015)
- *r -stable hypersimplices*, Qualifying Exam. Combinatorics Seminar. University of Kentucky, Lexington, KY, USA (Fall 2014)
- *Not all simplicial polytopes are weakly vertex decomposable*, Master's Exam. Combinatorics Seminar. University of Kentucky, Lexington, KY, USA (Spring 2014)
- *Semigroup algebras of the Veronese type*, Algebra Seminar. University of Kentucky, Lexington, KY, USA (Fall 2013)
- *Metric and topological spaces for studying partition regularity*, The Young Mathematicians Conference. The Ohio State University, Columbus, OH, USA (Summer 2010)
- *Partition regularity for the Jordan canonical form and nilpotent linear operators*, Mathfest 2010, Pittsburgh, PA, USA (Summer 2010)

CONFERENCE AND WORKSHOP PARTICIPATION

- *WASP Kick-off Workshop*. KTH Royal Institute of Technology, Stockholm, Sweden (POSTPONED)
- *The Summer School on Mathematics and Data*. The Arctic University of Norway in Tromsø (POSTPONED)
- *Symposium on Characteristic Polynomials of Hyperplane Arrangements and Ehrhart Polynomials of Lattice Polytopes*. RIMS, Kyoto, Japan (March 2021).
- *Applied Algebra Session at The Nordic Congress of Mathematics*. Aalto University, Helsinki, Finland. (August 2021).
- *24-th International Conference on Computational Statistics*. Bologna, Italy (August 2021)
- *Conference on the Mathematics of Complex Data*. KTH Royal Institute of Technology, Stockholm, Sweden (June 2021)
- *FPSAC 2020 (Online)*. Planet Earth (July 2020)
- *Algebraic Statistics 2020 Virtual Workshop*. Planet Earth, (June 2020)
- *Mørketidens Mattemøte*. The Arctic University in Norway, Tromsø, Norway (January 2020)
- *Semester on Algebraic and Enumerative Combinatorics*, Participating as a faculty member. Institute Mittag-Leffler, Stockholm, Sweden (January - April 2020)
- *WASP Winter Conference*. Linköping, Sweden (January 2020)
- *The 8th Conference on the Mathematical Aspects of Computer and Information Sciences*. Istanbul, Turkey (November 2019)
- *Workshop on Commutative Algebra and Lattice Polytopes*. RIMS, Kyoto University, Kyoto, Japan (October 2019)
- *Workshop on Graphical Models: Conditional Independence and Algebraic Structures*. Technische Universität München, Munich, Germany (October 2019)
- *NORCOM 2019*, Copenhagen, Denmark (August 2019)
- *Workshop on Mathematics of Complex Data*, KTH Royal Institute of Technology, Stockholm, Sweden (June 2019)
- *SIAM Conference on Applied Algebraic Geometry*, Bern, Switzerland (July 2019)
- *Workshop on Randomness and Nonlinear Algebra*, Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany (July 2019)
- *ASGARD 2019*, Universitet i Oslo, Oslo, Norge (May 2019)
- *Hyperbolic Polynomials and Hyperbolic Programming*, Program on Geometry of Polynomials, Simons Institute for the Theory of Computing (April 2019)
- *Deep Learning Theory Meeting*, Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany (March 2019)
- *Deterministic Counting, Probability, and Zeros of Partition Functions*, Program on Geometry of Polynomials, Simons Institute for the Theory of Computing (March 2019)
- *10-th Polymake Conference and Developer Meeting*, TU Berlin, Berlin, Germany (January 2019)
- *WASP Winter Conference*, Göteborg, Sweden (January 2019)
- *Einstein Workshop on Algebraic Combinatorics*, ZUSE Institute, Berlin, Germany (November 2018)
- *Einstein Workshop on Geometric and Topological Combinatorics*, ZUSE Institute, Berlin, Germany (October 2018)
- *Summer Workshop on Lattice Polytopes*, Osaka University, Osaka, Japan (July-August 2018)
- *Joint Mathematics Meetings*, San Diego, California, USA (January 2018)
- *Oberwolfach Mini-Workshop on Lattice Polytopes: Methods, Advances, Applications*, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany (September 2017)
- *Interactions with Lattice Polytopes*, Universität Magdeburg, Magdeburg, Germany (September 2017)
- *MSRI Introductory Workshop: Geometric and Topological Combinatorics*, MSRI, Berkeley, California, USA (September 2017)
- *Conference on Uncertainty in Artificial Intelligence*, Sydney, Australia (Upcoming August 2017)
- *SIAM Conference on Applied Algebraic Geometry*, Georgia Institute of Technology, Atlanta, Georgia,

USA (Upcoming July-August 2017)

- *Interactions Between Algebra and the Sciences*, Max Planck Institute for Mathematics in the Sciences and University of Leipzig, Leipzig, Germany (May 2017)
- *The Chow Lectures*, Max Planck Institute for Mathematics in the Sciences and University of Leipzig, Leipzig, Germany (May 2017)
- *Oberwolfach Workshop on Algebraic Statistics*, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany (April 2017)
- *Workshop on Convex Polytopes*, Osaka University, Osaka, Japan (January 2017)
- *Joint Mathematics Meetings*, Atlanta, GA, USA (January 2017)
- *MRC Collaboration Workshop on Linear Structural Equation Models*, University of Washington, Seattle, WA, USA (December 2016)
- *MRC Collaboration Workshop on Network Models*, Illinois Institute of Technology, Chicago, IL, USA (November 2016)
- *RIMS Workshop on Computational Commutative Algebra and Convex Polytopes*, RIMS, Kyoto, Japan (August 2016)
- *SIAM Annual Meeting*, Boston, MA, USA (July 2016)
- *Summer School on Algebra, Statistics, and Combinatorics*, Helsinki, Finland (June 2016)
- *MRC (Mathematical Research Community) in Algebraic Statistics*, Snowbird, UT, USA (June 2016)
- *AMS Sectional Meetings*, Loyola University, Chicago, IL, USA (October 2015)
- *SIAM Conference on Applied Algebraic Geometry*, National Institute of Mathematical Sciences, Daejeon, South Korea (Summer 2015)
- *BMS School on Discrete/Convex Geometry*, Berlin Mathematical School, Berlin, Germany (Summer 2015)
- *Midwest Combinatorics Conference*, University of Minnesota, Minneapolis, MN, USA (Summer 2015)
- *Graduate Student Combinatorics Conference*, University of Kentucky, Lexington, KY, USA (upcoming, April 2015)
- *IMA Workshop on Geometric and Enumerative Combinatorics*, University of Minnesota, Minneapolis, MN, USA (November 2014)
- *Workshop on Applications of Algebraic Geometry and Algebraic Analysis*, Kobe University, Kobe, Japan (July 2014)
- *Conference on Gröbner Bases*, Osaka University, Osaka, Japan (July 2014)
- *Triangle Lectures in Combinatorics*, High Point University, High Point, NC, USA (October 2014)
- *Triangle Lectures in Combinatorics*, North Carolina State University, Raleigh, NC, USA (September 2013)
- *The Young Mathematicians Conference*, The Ohio State University, Columbus, OH, USA (August 2010)
- *MAA Mathfest*, Pittsburgh, PA, USA (August 2010)

TEACHING

University Pedagogy Courses Completed:

- *LH207V Doctoral Supervision*, KTH (Fall 2020)
- *LH231V Teaching and Learning in Higher Education*, KTH (Spring 2020)

PhD Students:

- Danai Deligeorgaki
 - **Thesis topic:** Combinatorial and Algebraic Aspects of Artificial Intelligence
 - **Date:** August 2020 –
 - Co-advised by Johan Håstad

- Petter Restadh
 - **Thesis topic:** Combinatorics in Causality.
 - **Date:** August 2018 –
 - Co-advised by Svante Linusson.
- Albin Toft
 - **Thesis topic:** Scalable Causal Inference in Media
 - **Date:** January 2021 –
 - Co-advised by Tatjana Pavlenko and Raazesh Sainudiin.

Masters Students:

- Nazaal Ibrahim
 - **Thesis topic:** Causal discovery for context-specific models
 - **Date:** January 2021 –
- Georgios-Nikolaos Karelakos
 - **Thesis topic:** A game theory approach to context-specific causal discovery
 - **Date:** January 2021 –
- Viktor Ossmark
 - **Thesis topic:** Road detection and optimal route prediction from satellite data using deep neural networks
 - **Date:** January 2021 –
- Jonas Bederoff Eriksson
 - **Thesis topic:** Graph Properties of DAG Associahedra and Related Polytopes.
 - **Date:** January 2018 – June 2018
- David Evholt
 - **Thesis topic:** Generative Adversarial Networks and Natural Language Processing for Macroeconomic Forecasting
 - **Date:** January 2020 – June 2020
- Oscar Larsson
 - **Thesis topic:** Generative Adversarial Networks and Natural Language Processing for Macroeconomic Forecasting
 - **Date:** January 2020 – June 2020
- Nils Gustafsson
 - **Thesis topic:** Box Polynomials of Lattice Simplices.
 - **Date:** January 2018 – June 2018
 - **Awards:** 2018 Stockholm Mathematics Centre Prize for Excellent Masters Thesis

Classes Taught as Primary Instructor:

- *Probabilistic Graphical Models: Representation, Inference, and Learning*, PhD course, Module 1, WASP, KTH, Sweden (Fall 2021)
- *Combinatorial and Algebraic Statistics*, PhD course, KTH, Sweden (Spring 2021)
- *Enumerative Combinatorics (SF2741)*, Masters course, KTH, Sweden (Fall 2020)
- *Probabilistic Graphical Models: Representation, Inference, and Learning*, PhD course, Module 1, WASP, KTH, Sweden (Fall 2019)
- *MA 114, Calculus II*, University of Kentucky (Spring 2015)
- *MA 123, Elementary Calculus and its Applications*, University of Kentucky (Summer 2013)

Classes Taught as Teaching Assistant:

- *Discrete Mathematics* (SF1662), KTH, (Spring 2020)
- *MA 113, Calculus I*, University of Kentucky (Fall 2015)
- *MA 114, Calculus II*, University of Kentucky (Spring 2015)
- *MA 138, Calculus II for the Life Sciences*, University of Kentucky (Spring 2014)
- *MA 137, Calculus I for the Life Sciences*, University of Kentucky (Fall 2014, Fall 2013)
- *MA 123, Elementary Calculus and its Applications*, University of Kentucky (Spring 2013, Fall 2012)

Additional Experience: Grading for graduate classes.

- *MA 561, Algebra I*. University of Kentucky (Fall 2014).

OUTREACH

KTH PRAO session leader: (December 2017) The PRAO program brings small groups of 8–9 students to the mathematics department at KTH for one week, during which time they discuss and work with various researchers on problems aimed at engaging them in higher level mathematics. In this two hour PRAO session, I guided the students through learning counting methods and visualization techniques in discrete geometry. The students computed the face vectors for a variety of polyhedra, from which they discovered Euler’s theorem. The students then worked on problems aimed at guiding them through a proof of Euler’s theorem and an application to combinatorial game.

IST Austria Sommercampus session leader; “What is Science?”: (August 2016) IST Austria Sommercampus is a week long Summer camp for children of primary school age in the greater Vienna area. The “What is Science?” session begins the sommercampus with a group discussion with the children lead by two different-bodied researchers studying in two different areas. Together we lead a discussion introducing the children to the various aspects of science and the research areas they will encounter throughout the week. We then lead special hands-on sessions where the children experiment with an engaging problem from each of our fields. My problem had the children constructing their own polyhedral complexes with toys, and then searching for Hamiltonian paths on the edge graphs of their creations. The children also worked together to build origami icosahedra encoding the solution with colors.

University of Kentucky Graduate Student Mentor: (Fall 2015) Duties include offering individual mentorship and guidance to a first-year graduate student from an underrepresented group who is transitioning in a PhD program in mathematics.

High School Math Circle Writer/Leader: Duties include writing and leading inquiry-based learning sessions for high school students, and managing graduate and undergraduate assistants. High School Math Circles bring 9 – 12th grade students from the Bluegrass region together to participate in mathematical activities with the goal of exposing young students to ideas in higher mathematics not typically seen until college. Activities are designed to stimulate a deeper interest in mathematics and promote mathematical discussion amongst high school students.

- *Graph Laplacians and the Matrix-Tree Theorem* (September 2015).
- *Symmetries of Polygons: Introducing Abstract Algebra* (November 2014).
- *The Rubik’s Cube: Introducing Abstract Algebra* (November 2014).

High School Math Circle Leader: Duties include leading inquiry-based learning sessions for high school students, and managing graduate and undergraduate assistants.

- *Adjacency Matrices of Graphs* (September 2015).
- *Euler’s formula* (Fall 2013).

High School Math Circle Assistant: Duties include assisting with inquiry-based learning sessions for high school students by encouraging group discussions and mathematical experimentation.

- *Exploring addition and multiplication of big numbers.* University of Kentucky (Spring 2013).

Elementary School Math Circle Assistant: Duties include assisting with inquiry-based learning sessions for $K - 5^{th}$ grade students by encouraging group discussions and mathematical experimentation.

- *Polygons, Rigidity, and Platonic Solids* (Spring 2015).

PROFESSIONAL MEMBERSHIPS

Wallenberg AI, Autonomous Systems, and Software Program (WASP), <i>assistant professor</i>	2019–
Society for Industrial and Applied Mathematics, <i>Member</i>	2017– 2020.
American Mathematical Society, <i>Member</i>	2016– 2020.
American Mathematical Society, <i>Graduate Student Member</i>	2012–2015.
Association for Women and Mathematics, <i>Graduate Student Member</i>	2012–2015.
U of Kentucky Mathematics Graduate Student Council, <i>Treasurer</i>	2012–2013.
U of Kentucky Mathematics Graduate Student Council, <i>First-Year Representative</i>	2012.