

Sara Kališnik Hintz

Curriculum Vitae

Rämistrasse 101, HG FO 27.8
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Personal Information

Place and date of birth Slovenj Gradec (Slovenia), July 17, 1986.
Language skills Slovenian (native), English and Russian (fluent), German (intermediate).
Citizenship Slovenian citizen, US permanent resident.
Civil status Married.

Employment

2021 - **ETH Zurich**.
present Senior Scientist
2020 - **Bentley University**.
present Assistant Professor of Mathematics (on leave)
2018 - 2021 **Wesleyan University**.
Assistant Professor of Mathematics
2017–2018 **Max Planck Institute for Mathematics in the Sciences**.
Postdoc in the Nonlinear Algebra Group
2016–2017 **Brown University**.
Postdoctoral Research Associate in Mathematics

Education

2011-2016 **Stanford University**.
PhD in Mathematics (Tropical Coordinates on the Space of Persistence Barcodes)
Advisor: Gunnar Carlsson
2005–2009 **University of Ljubljana**.
Diploma in Mathematics (The geometric meaning of Bass's conjecture)
Advisor: Jaka Smrekar

Publications

Alexander Duality for Parametrized Homology.
Homology, Homotopy and Applications, vol. 15(2), 2013, pp.227-243.
Symmetric and r -Symmetric Tropical Polynomials and Rational Functions (joint work with Gunnar Carlsson).
Journal of Pure and Applied Algebra, vol. 220 (11), 2016, pp. 3610-3627.
Extended Topological Persistence and Contact Arrangements in Folded Linear Molecules (joint work with Alireza Mashaghi).
Frontiers in Applied Mathematics and Statistics, 2016. <https://doi.org/10.3389/fams.2016.00006>.

Tropical Coordinates on the Space of Persistence Barcodes.

Foundations of Computational Mathematics, 2018. <https://doi.org/10.1007/s10208-018-9379-y>.

Symmetric Polynomials in Tropical Algebra Semirings (*joint work with Davorin Lešnik*).

Journal of Symbolic Computation, 2018. <https://doi.org/10.1016/j.jsc.2018.04.008>.

Learning Algebraic Varieties from Samples (*joint work with Bernd Sturmfels, Paul Breiding and Madeleine Weinstein*).

Revista Matemática Complutense, 2018. <https://doi.org/10.1007/s13163-018-0273-6>.

The Higher-Dimensional Skeletonization Problem (*joint work with Vitaliy Kurlin and Davorin Lešnik*).

Advances in Applied Mathematics, vol. 102, 2019. <https://doi.org/10.1016/j.aam.2018.07.004>

Parametrized Homology (*joint work with Gunnar Carlsson, Vin de Silva and Dmitriy Morozov*).

Algebraic & Geometric Topology vol.19 (2), 2019, 657-700. <https://doi.org/10.2140/agt.2019.19.657>

Tropical Sufficient Statistics for Persistent Homology (*joint work with Anthea Monod, Juan Ángel Patiño-Galindo and Lorin Crawford*).

SIAM J. Appl. Algebra Geometry, 3(2), 337-371, 2019. <https://doi.org/10.1137/17M1148037>

Symmetric Polynomials in Upper-bound Semirings (*joint work with Davorin Lešnik*).

Journal of Symbolic Computation, 2020. <https://doi.org/10.1016/j.jsc.2020.02.001>.

Geometric and Probabilistic Limit Theorems in Topological Data Analysis (*joint work with Christian Lehn and Vlada Limic*).

Advances in Applied Mathematics, vol. 131, 2021, <https://doi.org/10.1016/j.aam.2021.102244>.

Finding the Homology of Manifolds using Ellipsoids (*joint work with Davorin Lešnik*).

submitted.

Honors and Awards

- 2016 Polya Teaching Award (for outstanding teaching at Stanford University).
- 2011-2016 Melvin and Joan Lane Stanford Graduate Fellow.
- 2009 Prešernova Nagrada Award for the Diploma Thesis.

Conference Talks and Poster Presentations

- 4/2021 **Topological Data Analysis.**
Sampling Smooth Manifolds using Ellipsoids, Chicago, Illinois, USA
- 10/2019 **Special Session on Applied Topology: Theory and Applications at the AMS Fall Southeastern Sectional Meeting.**
Geometric and Probabilistic Limit Theorems in Topological Data Analysis, Gainesville, Florida, USA.
- 9/2019 **Union College Mathematics Conference.**
Strengthening topological signal with lenses, Schenectady, NY, USA.
- 1/2019 **Joint Math Meetings, AWM Workshop:WinCompTop: Applied and Computational Topology.**
Learning Varieties from Samples, Baltimore, Maryland, USA.
- 11/2018 **A mini course at ‘5ta ESCUELA DE ANALISIS TOPOLOGICO DE DATOS’.**
Learning Varieties from Samples, CIMAT, Guanajuato, Mexico.
- 11/2018 **‘Workshop on Topology: Identifying Order in Complex Systems’.**
Learning Varieties from Samples, New Brunswick, New Jersey, USA.

- 6/2018 **‘Symposium on Computational Geometry 2018’**.
Learning Varieties from Samples, Budapest, Hungary.
- 6/2018 **Abel Symposium on Topological Data Analysis**.
Geiranger, Norway.
- 12/2017 **‘Geometry and Topology of Data’ workshop**.
Tropical Sufficient Statistics for Persistent Homology, Providence, RI, USA.
- 9/2017 **Invited talk at the Fall Eastern Sectional Meeting 2017**.
A Higher-Dimensional Homologically Persistent Skeleton, Buffalo, NY, USA.
- 8/2017 **Topological Data Analysis: Developing Abstract Foundations**.
Banff, Canada.
- 7/2017 **Applied and Computational Algebra and Geometry’ MCA2017**.
Tropical Coordinates on the Space of Persistence Barcodes, Montréal, Canada.
- 7/2017 **‘Computational Topology and Geometry’ at the Foundations of Computational Mathematics Conference**.
Tropical Coordinates on the Space of Persistence Barcodes, Barcelona, Spain.
- 3/2017 **‘Brown University SUMS 2017’**.
Math and Serendipity, Providence, Rhode Island, USA.
- 1/2017 **‘Workshop on non-linear algebra’**.
The Interplay between Persistent Homology and Tropical Algebra, Leipzig, Germany.
- 12/2016 **‘Union College Mathematics Conference’**.
Tropical Coordinates on the Space of Persistence Barcodes, Schenectady, New York, USA.
- 11/2016 **‘Geometry and Topology in Image and Shape Analysis’ at the AMS Sectional Meeting**.
Tropical Coordinates on the Space of Persistence Barcodes, Raleigh, North Carolina, USA.
- 10/2016 **Invited talk at SIAM Central States Section conference**.
Tropical Coordinates on the Space of Persistence Barcodes, Little Rock, Arkansas, USA.
- 7/2016 **Contributed talk at ‘ATMCS7’ conference**.
Tropical Coordinates on the Space of Persistence Barcodes, Turin, Italy.
- 7/2015 **Contributed talk at ‘Young Topologists Meeting’**.
Parametrized homology and Parametrized Alexander Duality, EPFL, Lausanne, Switzerland.
- 6/2015 **Invited talk at ‘Summer School on Computational Topology’**.
Parametrized homology and Parametrized Alexander Duality, University of Ljubljana, Ljubljana, Slovenia.
- 4/2015 **Invited talk at ‘AWM Research Symposium’**.
Parametrized homology and Parametrized Alexander Duality, University of Maryland, College Park, USA.
- 3/2014 **Poster presentation at ‘Topological Systems: Communication, Sensing, and Actuation’ workshop**.
Alexander Duality for Parametrized Homology, IMA, Minneapolis, Minnesota.
- 7/2013 **Invited talk at ‘Summer school on Computational Topology and Topological Data Analysis’**.
Classification of Hepatic Lesions using the Matching Metric, University of Ljubljana, Ljubljana, Slovenia.

Seminars and Colloquia

- 4/2021 **Sampling Smooth Manifolds using Ellipsoids**.
UPenn’s Graduate Applied Topology Seminar, University of Pennsylvania, Pennsylvania, USA.
- 3/2021 **Uvod v uporabno topologijo**.
University of Ljubljana, Ljubljana, Slovenia.

- 5/2018 **Learning Varieties from Samples.**
INRIA, Saclay, France.
- 4/2018 **A Higher-Dimensional Homologically Persistent Skeleton.**
Wesleyan University, Middletown, CT, USA.
- 4/2018 **Learning Varieties from Samples.**
University of Ljubljana, Ljubljana, Slovenia.
- 4/2018 **A Higher-Dimensional Homologically Persistent Skeleton.**
TU Munich, Munich, Germany.
- 3/2018 **Tropical Coordinates on the Space of Persistence Barcodes.**
Mathematical Institute, University of Oxford, Oxford, UK.
- 2/2018 **A Higher-Dimensional Homologically Persistent Skeleton.**
University of Liverpool, Liverpool, UK.
- 12/2017 **A Higher-Dimensional Homologically Persistent Skeleton.**
University of Ljubljana, Ljubljana, Slovenia.
- 11/2017 **A Higher-Dimensional Homologically Persistent Skeleton.**
IHP, Paris, France.
- 11/2017 **Tropical Sufficient Statistic for Persistent Homology.**
Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany.
- 6/2017 **A Higher-Dimensional Homologically Persistent Skeleton.**
Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany.
- 4/2017 **A Higher-Dimensional Homologically Persistent Skeleton.**
Columbia University, New York, NY, USA.
- 3/2017 **A Short Introduction to Applied Topology.**
Manchester University, Manchester, UK.
- 3/2017 **Tropical Coordinates on the Space of Persistence Barcodes.**
Swansea University, Swansea, UK.
- 2/2017 **Tropical Coordinates on the Space of Persistence Barcodes.**
The University of North Carolina at Greensboro, Greensboro, NC, USA.
- 2/2017 **The Shape of Data.**
The College of the Holy Cross, Worcester, Massachusetts, USA.
- 2/2017 **Tropical Coordinates on the Space of Persistence Barcodes.**
Wesleyan University, Middletown, Connecticut, US.
- 1/2017 **A Short Introduction to Applied Topology.**
Sheffield University, Sheffield, UK.
- 11/2016 **Tropical Coordinates on the Space of Persistence Barcodes.**
Ohio State University, Columbus, OH, USA.
- 10/2016 **Tropical Coordinates on the Space of Persistence Barcodes.**
Rochester University, Rochester, NY, USA.
- 4/2016 **Tropical Coordinates on the Space of Persistence Barcodes.**
Brown University, Providence, RI, USA.
- 2/2016 **Tropical Coordinates on the Space of Persistence Barcodes.**
University at Albany, SUNY, Albany, NY, USA.
- 1/2016 **Functions on the Barcode Space.**
University of Ljubljana, Ljubljana, Slovenia.
- 11/2015 **Parametrized Homology & Parametrized Alexander Duality Theorem.**
Columbia University, New York, NY, USA.

- 10/2015 **Parametrized Homology & Parametrized Alexander Duality Theorem.**
University of Pennsylvania, Philadelphia, PA, USA.
- 10/2015 **Parametrized Homology & Parametrized Alexander Duality Theorem.**
University of Ljubljana, Ljubljana, Slovenia.
- 12/2014 **Parametrized Homology & Parametrized Alexander Duality Theorem.**
University of Ljubljana, Ljubljana, Slovenia.
- 12/2013 **The Structure and Stability of Persistence Modules.**
University of Ljubljana, Ljubljana, Slovenia.
- 2/2013 **Alexander Duality for Parametrized Homology.**
Stanford University, Stanford, CA, USA.
- 5/2012 **Topology and Data: Presenting Mapper.**
Stanford University, Stanford, CA, USA.
- 9/2011 **Topological Persistence and Duality.**
Pomona College, Claremont, CA, USA.

Teaching

- Spring 2020-2021 **Applied Calculus for Business II (Instructor, 2 sections).**
Bentley University, Waltham, MA, USA.
- Spring 2019-2020 **Multivariable Calculus undergraduate (Instructor).**
Wesleyan University, Middletown, CT, USA.
- Spring 2019-2020 **Topology II, graduate (Instructor).**
Wesleyan University, Middletown, CT, USA.
- Fall 2019-2020 **Point Set Topology, undergraduate (Instructor).**
Wesleyan University, Middletown, CT, USA.
- Fall 2019-2020 **Multivariable Calculus, undergraduate (Instructor).**
Wesleyan University, Middletown, CT, USA.
- Spring 2018-2019 **Applied Topology, graduate (Instructor).**
Wesleyan University, Middletown, CT, USA.
- Spring 2018-2019 **Applied Topology, undergraduate (Instructor).**
Wesleyan University, Middletown, CT, USA.
- Fall 2018-2019 **Linear Algebra (Instructor).**
Wesleyan University, Middletown, CT, USA.
- Fall 2017-2018 **Mathematics of Data (Instructor).**
Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany.
- Fall 2016-2017 **Applied Topology (Instructor).**
Brown University, Providence, RI, USA.
- Spring 2014-2015 **Linear Algebra and Multivariable Calculus (Teaching Assistant).**
Stanford University, Stanford, CA, USA.
- Winter 2014-2015 **Calculus (Course Assistant).**
Stanford University, Stanford, CA, USA.
- Fall 2014-2015 **Calculus (Course Assistant).**
Stanford University, Stanford, CA, USA.
- Spring 2013-2014 **Calculus (Teaching Assistant).**
Stanford University, Stanford, CA, USA.
- Winter 2013-2014 **Applied Algebraic Topology (Course Assistant).**
Stanford University, Stanford, CA, USA.

2009-2011 **Linear Algebra, Calculus (Instructor)**.

University of Ljubljana, Ljubljana, Slovenia.

2007-2009 **Linear Algebra (Course Assistant)**.

University of Ljubljana, Ljubljana, Slovenia.

Conferences organized and co-organized

July 1-4, 2019 **Topology in Data Science session at the 33rd Summer Conference on Topology and its Applications.**

Johannesburg, Republic of South Africa.

January 19, 2019 **AMS Special Session on Topological Data Analysis: Theory and Applications (with Justin Curry and Mikael Vejdemo-Johansson).**

Baltimore, MD, USA.

February 19-23, 2018 **TAGS - Linking Topology to Algebraic Geometry and Statistics (with Christiane Görgen and Vlada Limić).**

Leipzig, Germany.

Seminars organized and co-organized

2018-present **Co-director of the Applied Algebraic Topology Research Network.**

We host a weekly online seminar for which recordings are available at our YouTube channel, which has over 1200 YouTube subscribers, and averages over 1,800 hours watched per year.

2016-2017 **Data Science Colloquium.**

Brown University, Providence, RI, USA.

2016-2017 **Horizons Seminar.**

Brown University, Providence, RI, USA.

2016-2017 **Applied Topology Seminar.**

Brown University, Providence, RI, USA.

2013-2015 **Stanford's Computational Topology Reading Group.**

Stanford University, Stanford, CA, USA.

Outreach Teaching

7/2019 **One-month minicourses on Calculus and Statistics in China (organized by Special A).**

7/2018 **One-month minicourses on Applied Topology and Linear Algebra in China (organized by Special A).**

6/2017 **One-week minicourse on Computational Topology at the REU program Summer@ICERM.**

Graduate Students

Miguel O'Malley.

graduate student at Wesleyan University, expected to graduate in Spring 2022

References

Gunnar Carlsson, *Stanford University*, email: gunnar@math.stanford.edu.

Bernd Sturmfels, *University of California at Berkeley*, email: bernd@berkeley.edu.

Gregory Brumfiel, *Stanford University*, email: brumfiel@math.stanford.edu.

Vin de Silva, *Pomona College*, email: email:vin.desilva@pomona.edu.