



RTU Riga Business School  
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## Specialization

Algebraic topology, computational mathematics, topological data analysis, topological neuroscience, data visualization, stratified spaces, configuration spaces.

## Academic affiliations

**Riga Technical University** (Riga, Latvia): Assistant Professor  
**University of Aberdeen** (Aberdeen, UK): Honorary Research Fellow  
**EPFL / BlueBrain Project** (Geneva, Switzerland): External Collaborator

## Education

**University of Illinois at Chicago**, Chicago, Illinois, USA

PhD (Doctor of Philosophy, 2019)

- *Stability of universal constructions for persistent homology*
- Advised by Benjamin Antieau

**University of Waterloo**, Waterloo, Ontario, Canada

MMath (Master of Mathematics, 2014)

- *Characterizations of the Chern characteristic classes*
- Co-advised by Benoit Charbonneau and Spiro Karigiannis

**University of Waterloo**, Waterloo, Ontario, Canada

BMath (Bachelor of Mathematics, 2013)

- Honours Pure Mathematics & Combinatorics and Optimization (with distinction)

## Positions held

**Printful**, Riga, Latvia.

since 2023.09 :

Data Analyst, Data Science & Analytics Team

**Riga Technical University**, Riga, Latvia.

since 2022.02 :

Assistant Professor (docents) in RTU Riga Business School

2020.08 - 2022.02 :

Lecturer in RTU Riga Business School

**University of Aberdeen**, Aberdeen, Scotland, United Kingdom.

since 2020.08 :

Honorary Research Fellow in the Institute of Mathematics

2019.08 - 2020.08 :

Research Fellow in EPSRC project "Topological Analysis of Neural Systems"

**University of Latvia**, Riga, Latvia.

2021.01 - 2021.07 :

Visiting Assistant Professor (viesdocents) in the Department of Mathematics

2020.09 - 2020.12 :

Lecturer in the Department of Mathematics

2020.09 - 2020.12 :

Senior Expert in the Laboratory of Magnetic Soft Materials

2011.04 - 2011.06 :

Research Assistant in quantum algorithms to Andris Ambainis

**University of Illinois at Chicago**, Chicago, Illinois, USA.

2016.08 - 2016.12 :

Research Assistant to Benjamin Antieau

2014.08 - 2019.05 :

Teaching Assistant in the Department of Mathematics

## Publications

*Efficiency and reliability in biological neural network architectures*

With D.E. Santander, C. Pokorny and others  
March 2024. Preprint in preparation.

*DONUT - Creation, development, and opportunities of a database.*

With B. Giunti and B. Rieck  
November 2023. Published in "Notices of the American Mathematical Society".

*Combinatorial Exploration of Morse–Smale Functions on the Sphere via Interactive Visualization.*

With Y. Zhou, M.J. Catanzaro, M. Zabka, B. Wang.  
October 2023. Accepted to "Topological Data Analysis and Visualization 2023" conference.

*Pruning vineyards: updating barcodes by removing simplices.*

With B. Giunti  
September 2023. Manuscript in preparation.

*Modeling and Simulation of Rat Non-Barrel Somatosensory Cortex.*

With M.W. Riemann, D.E. Santander and others  
July 2022. Preprint on bioRxiv.

*An application of neighbourhoods in digraphs to the classification of binary dynamics.*

With P.R. da Conceicao, D. Govc, R. Levi, H. Riihimäki, J.P. Smith.  
June 2022. Published in "Network Neuroscience".

*Topology of synaptic connectivity constrains neuronal stimulus representation, predicting two complementary coding strategies.*

With M.W. Riemann, H. Riihimäki, J.P. Smith, C. Pokorny, R. Levi.  
January 2022. Published in "PLOS ONE".

*Stratifications on the Ran Space.*

June 2021. Published in "Order".

*Moduli Spaces of Morse Functions for Persistence.*

With M.J. Catanzaro, J.M. Curry, B.T. Fasy, G. Malen, H. Riess, B. Wang, M. Zabka.  
June 2020. Published in "Journal of Applied and Computational Topology"

**Selected coding**

*TriDy: A pipeline for classifying binary dynamics on digraphs*

Active 04.2021 -  
Contributor: mathematical functions and user interface

*neurotop-nest: Activation of neurological circuits for topological analysis*

Active 04.2020 - 06.2021  
Creator: workflow, visuals, and user interface

**Teaching experience**

PBM 778: Introduction to Linear Algebra (lecturer, 2021 - )  
PBM 776: Introduction to Visualization (laboratory instructor, 2022 - )  
PBM 766: Data Structures (teaching assistant, 2020 - )  
PBM 763: Introduction to Discrete Structures (teaching assistant, 2021 - )  
PBM 797: Introduction to Probability (teaching assistant, 2021 - )  
PBM 713: Mathematics (teaching assistant, 2020 - )  
  
Matemātika 2065: Mathematical analysis IV (teaching assistant, 2021)  
Matemātika 1105: Mathematical analysis II (teaching assistant, 2021)  
Matemātika 1027: Mathematical analysis I (teaching assistant, 2020)  
  
Math 294: Introduction to Advanced Mathematics (workshop instructor, 2018)  
Math 589: Teaching and Presentation of Mathematics (teaching assistant, 2017)  
Math 182: Calculus II (workshop instructor, 2016 - 2019)  
Math 179: Calculus I (workshop instructor, 2015)  
  
Pure Math 667: Algebraic topology (teaching assistant, 2014)  
Math 138: Linear algebra for engineers (teaching assistant, 2014)  
Math 116: Calculus II for engineers (teaching assistant, 2014)  
Math 115: Calculus I for engineers (teaching assistant, 2013)

**Conference talks**

*MVF Designer: Design and Visualization of Morse Vector Fields.*

ATMCS 2020 (with Y. Zhou, M.J. Catanzaro, M. Zabka, B. Wang).

*Stratifications and sheaves on the Ran space.*

AMS Joint Mathematics Meetings, Special Session on Topological Data Analysis, January 2019

*Complex bordism theory.*

West Coast Algebraic Topology Summer School, July 2016 (with Maximilien Péroux).

*Khovanov homology.*

West Coast Algebraic Topology Summer School, July 2014 (with Robin Koytcheff).

**Organizing experience**    *2x2 Pasaules latviešu jaunatnes seminārs.* Camp Saulaine, June 26 - July 3 2019.  
*Graduate student topology and geometry conference.* UIC, April 7-8 2018.  
*Graduate infinity categories seminar.* UIC, Fall 2017.  
*Characteristic classes learning seminar.* UW, Fall 2013.

**Community service**    *2x2 Latvian Seminars* (board member, 2019 - 2024)  
*Friends of Sydney Academy Debate Society* (board member, 2017 - )  
*Graduate Employees Organization* (communications chair, 2017-2019)

**Language skills**    Fluent in English, Latvian. Good command of French.  
Basic knowledge of Russian.

**Computer skills**    Fluent in Python, Julia, Mathematica, LaTeX, HTML, Excel.  
Broad skills in R, SQL, PowerBI.  
Familiar with JavaScript, Slurm, HPCs, and parallel processing.  
Experience with C, C++, C#.

**References**    Ran Levi, University of Aberdeen  
email: [r.levi@abdn.ac.uk](mailto:r.levi@abdn.ac.uk)  
  
Kathryn Hess, École Polytechnique Fédérale de Lausanne  
email: [kathryn.hess@epfl.ch](mailto:kathryn.hess@epfl.ch)  
  
Benjamin Antieau, University of Illinois at Chicago  
email: [dantie1@uic.edu](mailto:dantie1@uic.edu)  
  
Shmuel Weinberger, University of Chicago  
email: [shmuel@math.uchicago.edu](mailto:shmuel@math.uchicago.edu)  
  
Brittany Fasy, Montana State University  
email: [brittany.fasy@montana.edu](mailto:brittany.fasy@montana.edu)