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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

**Selected coding** *pftools*: Internal Python package for convenient querying  
 Active 11.2023 -  
 Creator: custom software to connect Python to corporate MySQL and PostgreSQL databases

*TriDy*: A pipeline for classifying binary dynamics on digraphs  
 Active 04.2021 -  
 Contributor: mathematical functions in Python and user interface

*neurotop-nest*: Activation of neurological circuits for topological analysis  
 Active 04.2020 - 06.2021

Creator: workflow, visuals, and user interface

## Publications

### *Efficiency and reliability in biological neural network architectures*

With D.E. Santander, C. Pokorny and others  
March 2024. Preprint on bioRxiv.

### *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. Submitted for publication.

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

With P.R. da Conceicao, D. Govc, R. Levi, H. Riihimaki, 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. Riihimaki, 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"

## 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.  
Deep skills in R, SQL, PowerBI, Excel.  
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)