

# Tobias G. Timofeyev

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## HIGHER EDUCATION

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### University of Vermont

*Doctoral Program in the Mathematical Sciences*

Burlington, VT

Aug. 2021–present

**Selected Coursework:** *Numerical Analysis · Numerical Differential Equations · Advanced Ordinary Differential Equations · Partial Differential Equations · Convex Optimization · Graph Theory · Chaos and Dynamical Systems · Matroids and Polytopes · Algebraic Topology*

### Bard College

*Bachelor of Arts in Mathematics*

Annandale-On-Hudson, NY

Aug. 2017–May. 2021

**Selected Coursework:** *Physics I/II · Real Analysis · Complex Analysis · Philosophy from a Multicultural Perspective*

### University College Roosevelt

*Semester abroad*

Middelburg, Netherlands

Aug. 2019–Dec. 2019

**Selected Course Work:** *Abstract Algebra · Dutch · Classical Mythology · Music Theory*

## RESEARCH EXPERIENCE

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### Doctoral Research

*University of Vermont (Research Advisor Prof. Alice Patania)*

Sept 2022 – Present

Burlington, VT

- Relating structure and function in dynamical models with graph theory and algebraic topology
- Applications to Power systems, Climate science and Neuroscience

### SCaN Higher-Math Applications for Near Space Network Modeling

*NASA Goddard Space Flight Center (GSFC)*

June 2024 - Aug. 2024

Greenbelt, MD

- (Remote internship) Worked with Dr. Alan Hylton and a team of interns on applying sheaf, category, and hypergraph theory to problems of network routing in space.

### Mathematical Sciences Graduate Internship (NSF MSGI)

*National Renewable Energy Lab (NREL)*

May 2023 - Aug. 2023

Golden, CO

- (Remote internship) Worked with Dr. Bai Cui on a Kuramoto - Sakaguchi Inspired Fixed point Algorithm for the AC power flow problem

### Senior Thesis

*Bard College (Research Advisor Prof. Steven Simon)*

Sept. 2020 – May 2021

Annandale-On-Hudson, NY

- “Tverberg Type Partitions: Sub-Regular and Elliptical Polygons”
- Received M. Susan Richman Senior Project Prize in Mathematics

### 2020 Bard Summer Research Institute

*Bard College (P.I. Prof. Stefan Mendez-Diez)*

July 2020 – Aug. 2020

Remote

- Developed open source software in Python for computing Adinkra graphs

## PUBLICATIONS

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T. Timofeyev, A. Patania (2025), *Cluster synchronization via graph Laplacian eigenvectors*. *Chaos* 1 September 2025; 35 (9): 093109. doi: 10.1063/5.0280142

A. Hylton, O. Chiriac, J. Cleveland, J. Hwang, D. Koizumi, K. Petwe, T. Timofeyev (2025), *On the Theory of Network Architectures in the Solar System Internet*, IEEE Aerospace Conference, Big Sky, MT, USA, 2025, pp. 1-20, doi: 10.1109/AERO63441.2025.11068754.

A. Hylton, O. Chiriac, J. Cleveland, J. Hwang, K. Petwe, T. Timofeyev, R. Kassouf-Short (2025), *Towards Practical Clock Synchronization in the Solar System Internet*, IEEE Aerospace Conference, Big Sky, MT, USA, 2025, pp. 1-16, doi: 10.1109/AERO63441.2025.11068429.

S. Simon and T. Timofeyev (2022), *Inscribed Tverberg-type partitions for orbit polytopes*. *Mathematika*, 68: 1135-1152. doi: 10.1112/mtk.12160

## FELLOWSHIPS AND AWARDS

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### **Graduate Research Fellowship Program (GRFP)**

*National Science Foundation (NSF)*

*Sept. 2023 - Present*

- Awarded to pursue my thesis work
- Provides Three full years of funding to work on proposed and related research projects

### **Nam Sang Kil Scholarship in Mathematics**

*University of Vermont College of Engineering and Mathematical Sciences*

*May 2025*

- Presented to an outstanding student studying Mathematics.

### **M. Susan Richman Senior Project Prize in Mathematics**

*Bard College*

*May 2021*

- Presented for senior thesis exhibiting the most mathematical creativity.

## PROFESSIONAL EXPERIENCE

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### **University of Vermont**

*Pre-Doctoral Fellow*

*Burlington, VT*

*Aug. 2023 - Present*

- Self directed research position with funding from the GRFP

### **University of Vermont**

*Graduate Teaching Assistantship*

*Burlington, VT*

*Aug. 2021 - May 2023*

- Prepared and presented exams, homework, and multiple lectures a week in the calculus sequence

## PRESENTATIONS

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### **Oral Presentations**

“A Sheaf Theoretic Approach to Near Space Network Routing,” Netsci, Maastricht, June. 2025

“A Sheaf Theoretic Approach to Near Space Network Modeling,” Combinatorics Seminar, University of Vermont, Dec. 2024

“The Role of Graph Partitions in Cluster Synchronization of Weighted Graphs,” NetSci, Quebec City, June 2024

“Kuramoto model and Applications,” Graduate Student Seminar, University of Vermont, Dec. 2023

“Open Source Software for Computing Adinkras,” Women In Math In New England, Online, Oct. 2020

### **Poster Sessions**

“Cluster Synchronization Through the Eigenspectrum of the Graph Laplacian”, SIAM Dynamical Systems, US, Denver, May. 2025

“Cluster Synchronization Through the Eigenspectrum of the Graph Laplacian”, Dynamics Days US, Denver, Jan. 2025

“Tverberg Type Partitions: Sub-Regular and Elliptical Polygons”, Senior Project Poster Session, Bard College, NY, May 2021

“Open Source Software for Computing Adinkras”, Bard Virtual Poster Session, Oct. 2020

## WORKSHOPS ATTENDED

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### **Graduate Research Workshop in Combinatorics (GRWC)**

*June. 2025*

*Ames, Iowa*

- Research workshop meant to foster collaboration between mathematicians, and explore a variety of research areas in Combinatorics
- Close group collaboration, working on algorithmic approaches to finding Kernels in digraphs and conditions for prism hamiltonicity in regular graphs.

### **AMS Math Research Communities**

*June. 2024*

*Beaver Hollow, New York*

- Climate Science at the Interface Between Topological Data Analysis and Dynamical Systems Theory
- Worked closely with a group to develop new methods of classifying dynamical systems data with topological data analysis. **Leading the project from this opportunity, and we hope to publish our findings soon.**

### Topology and Geometry in Neuroscience Workshop

Oct. 2023

*ICERM, Brown University*

- Attended numerous presentations interrogating the roles of graph structure and topology in neuronal networks
- Very interested in this interplay between network structure and the available dynamics in network models

### Mathematical Challenges in Neuronal Network Dynamics Workshop

Sept. 2023

*ICERM, Brown University*

- Presentations had an emphasis on current research in modeling neuronal dynamics
- Interested in scale and analytical tools in systems modeling

### Graduate Student Mathematical Modeling Camp (GSMMC)

June 2022

*University of Delaware*

- Collaborated with other Graduate students and Professors in investigating models of snow accretion in clouds
- Gained valuable experience working with applied mathematical models as a piece of a larger project, in a group setting

### Mathematical Problems in Industry Workshop (MPI)

June 2022

*Worcester Polytechnic Institute*

- Collaborated with other attendees on a project investigating the limits of machine learning in path optimization
- Learned more about working on a mathematical project in a large group of collaborators

## TECHNICAL SKILLS/ LANGUAGES

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**Coding Experience** with Matlab,  $\text{\LaTeX}$ , Python, Julia, Java, and Windows Command Line

**Linguistic Ability** in English (native), German (near native), Russian (heritage speaker), French (good reading skills), and some experience in Dutch after taking an introductory class

## MISCELLANEOUS

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**Service:** Presented an introduction to applied mathematics and combinatorics research at the Vermont State MATHCOUNTS competition (Mar. 2025). Has participated in and creatively directed a number of educational and slightly humorous baroque music videos on YouTube (2020-2021)

**Design Programs:** Large body of Graphic design work in Adobe Photoshop. Experience in Adobe Illustrator, Autodesk Inventor, Rhinoceros 3D, AutoCad, and Gimp

**Cello Performance:** Studied Cello performance since age three. Played Cello in a number of ensembles throughout his time at Bard College (2017-2021).