

# Anatoly Zavyalov

[anatoly.zavyalov@mail.utoronto.ca](mailto:anatoly.zavyalov@mail.utoronto.ca) | [GitHub: firetto](https://github.com/firetto) | [Website: firetto.github.io](https://fretto.github.io) | [LinkedIn: anatoly-zavyalov](https://www.linkedin.com/in/anatoly-zavyalov)

## Education

---

### University of Toronto

September 2020 - June 2024 (expected)

H.B.Sc. MATHEMATICS, COMPUTER SCIENCE, PHYSICS

3.98 cGPA

*Relevant Coursework:* Algorithm Design and Analysis; Data Structures and Analysis; Computational Complexity and Computability; Probability; Complex Analysis; Linear Algebra; Combinatorics; Analysis; Advanced Ordinary Differential Equations

## Honors and Awards

---

### Wasteneys Chancellor's Scholarship - \$500

November 2023

AWARDED FOR HIGH ACADEMIC ACHIEVEMENT IN THE 2022-2023 ACADEMIC SESSION BY THE TRINITY COLLEGE AT THE UNIVERSITY OF TORONTO.

### Dean's List Scholar

June 2021, June 2022, June 2023

AWARDED TO A SMALL GROUP OF THE UNIVERSITY OF TORONTO'S FACULTY OF ARTS & SCIENCE STUDENTS WHO HAVE A CUMULATIVE GPA OF 3.50 OR HIGHER AFTER COMPLETING 6 CREDITS.

### NSERC Undergraduate Student Research Award - \$7,500

March 2023

OFFERED BY THE UNIVERSITY OF TORONTO'S DEPARTMENT OF COMPUTER SCIENCE FOR THE PROJECT "COMMUTATIVITY IN PROGRAM VERIFICATION".

### Ashbaugh Chancellor's Scholarship - \$500

November 2022

AWARDED FOR HIGH ACADEMIC ACHIEVEMENT IN THE 2021-2022 ACADEMIC SESSION BY THE TRINITY COLLEGE AT THE UNIVERSITY OF TORONTO.

### University of Toronto Scholar - \$1,500 $\times$ 2

August 2021, August 2022

AWARDED FOR BEING ONE OF THE MOST OUTSTANDING STUDENTS IN MY COHORT AFTER COMPLETING FIRST AND SECOND YEARS.

### NSERC Undergraduate Student Research Award (Declined the offer) - \$7,500

March 2022

OFFERED BY THE UNIVERSITY OF TORONTO'S DEPARTMENT OF COMPUTER SCIENCE FOR THE PROJECT "ONLINE AND OTHER MYOPIC ALGORITHMS". I DECLINED THE OFFER.

### Fields Undergraduate Summer Research Program (Declined the offer)

March 2022

OFFERED BY THE FIELDS INSTITUTE FOR THE PROJECT "EXTENDING TRACE THEORY FOR CONCURRENT PROGRAM ANALYSIS". I DECLINED THE OFFER.

### Elizabeth Kingstone Scholarship - \$500

November 2021

AWARDED FOR HIGH ACADEMIC ACHIEVEMENT IN THE 2020-2021 ACADEMIC SESSION BY THE TRINITY COLLEGE AT THE UNIVERSITY OF TORONTO.

## Summer Undergraduate Research Program (SURP) Fellowship - \$9,595

May 2021

AWARDED BY THE DAVID A. DUNLAP DEPARTMENT OF ASTRONOMY AND ASTROPHYSICS AT THE UNIVERSITY OF TORONTO.

## University of Toronto Excellence Award (UTEA) - \$7,500

April 2021

AWARDED TO SUPPLEMENT FUNDING FOR SURP RESEARCH.

## Publications

---

- 2023     Jeffrey Shallit, **Anatoly Zavyalov**, “Transduction of Automatic Sequences and Applications”, In: Nagy, B. (eds) Implementation and Application of Automata. CIAA 2023. Lecture Notes in Computer Science, vol 14151. Springer, Cham. (10 August 2023); [https://doi.org/10.1007/978-3-031-40247-0\\_20](https://doi.org/10.1007/978-3-031-40247-0_20)
- 2022     Adam D. Hincks, **Anatoly Zavyalov**, and Dhananjhay Bansal, “A graph database solution for tracking the deployment and layout of a large radio interferometer”, Proc. SPIE 12189, Software and Cyberinfrastructure for Astronomy VII, 1218909 (29 August 2022); <https://doi.org/10.1117/12.2627960>
- Devin Crichton, et al., “The Hydrogen Intensity and Real-time Analysis eXperiment: 256-Element Array Status and Overview.” J. Astron. Telesc. Instrum. Syst. 8 (1), 011019 (12 January 2022); <https://doi.org/10.1117/1.JATIS.8.1.011019>

## Talks

---

- 2023     • 27th International Conference on Implementation and Application of Automata (CIAA 2023): “*Transduction of Automatic Sequences and Applications*”. (September 22, 2023, 30min) **(Slides)**
- SigmaCamp 2023: “*Automata Theory: The Foundations of Computer Science*”. (August 14, 2023, 1hr) **(Slides)**
- Canadian Undergraduate Math Conference (CUMC) 2023: “*Automatic Sequences*”. (June 21, 2023, 30min) **(Slides)**
- UTSC CMS Undergraduate Seminar: “*Automatic Sequences*”. (January 19, 2023, 1hr) **(Slides) (Recording)**

## Research Experience

---

### UNIVERSITY OF WATERLOO | RESEARCH ASSISTANT

May 2022 – Present

DAVID R. CHERITON SCHOOL OF COMPUTER SCIENCE

- Researching and implementing algorithms into **Walnut**, a theorem proving software for automatic sequences written in **Java**, under the supervision of Professor Jeffrey Shallit.
- Research culminated in a publication and presentation at the *27th International Conference on Implementation and Application of Automata* (CIAA 2023).

**UNIVERSITY OF TORONTO | RESEARCH ASSISTANT**

May 2023 – August 2023

DEPARTMENT OF COMPUTER SCIENCE

- Researched algebraic methods for concurrent program verification and race condition detection.
- Created a **Python** program for detecting race conditions in models of multithreaded programs.
- Research done as part of the CS Undergraduate Research Summer Program at the University of Toronto, supported by an **NSERC Undergraduate Student Research Award**.

**UNIVERSITY OF TORONTO | RESEARCH FELLOW**

May 2021 – April 2022

DAVID A. DUNLAP DEPARTMENT OF ASTRONOMY AND ASTROPHYSICS

- Developed **Padloper**, a full-stack graph database solution for tracking deployment and layout of a large radio interferometer, using **JanusGraph**, **Flask** and **React**, under the supervision of Professor Adam Hincks.
- Benchmarked ways to represent properties, connections, and changes to components in a **JanusGraph** graph database for efficient and intuitive querying.
- Research done in part during the **Summer Undergraduate Research Program (SURP)** in the DADDAA, conducted in the summer of 2021.
- Research culminated in a publication in *SPIE Astronomical Telescopes + Instrumentation 2022* and proceedings at SPIE's *Software and Cyberinfrastructure for Astronomy VII* conference.
- Padloper is to be used for the **Hydrogen Intensity and Real-time Analysis eXperiment (HIRAX)** and at the **Simons Observatory**.

## Teaching Experience

---

**UNIVERSITY OF TORONTO | TEACHING ASSISTANT**

February 2022 – Present

- Teaching Assistant for **CSC363: Computational Complexity and Computability** (January 2024 - Present)
- **Lead** Teaching Assistant for **CSC373H5: Algorithm Design and Analysis** (September 2023 - December 2023)
  - Authoring problems for course assignments, supervising a team of five teaching assistants.
- Teaching Assistant for **CSC240H1: Enriched Introduction to the Theory of Computation** (February 2022 - May 2022)
  - Graded assignments and tests for 90+ students, ran tutorials on automata theory and correctness of algorithms.

**UNIVERSITY OF TORONTO | SUMMER CAMP ASSISTANT**

July 2021 - August 2021

MATHEMATICS OUTREACH OFFICE, DEPARTMENT OF MATHEMATICS

- Supervised online camp sessions, tracked student attendance, and solved technical problems.
- Helped students during problem-solving sessions to turn their ideas into proper solutions.

**WESTON LEARNING CENTRE | TEACHING ASSISTANT**

March 2018 - August 2020

- Instructed accelerated Grade 12 Physics (SPH4U) and Grade 11 Functions (MHF3U) curricula.
- Led a course on computer fluency and introduction to programming using Scratch and Python.

**PRIVATE TUTOR**

2016 - Present

- Working with dozens of clients over several years, solidifying students' understanding of material, exposing them to new topics, and preparing them for tests, examinations and contests.
- Teaching mathematics, physics, computer science and programming in Python and Java.

## Other Experience/Volunteering

---

### SIGMACAMP | COUNSELOR

2022 - Present

- Teaching Assistant for "Surprises in Probability" semilab instructed by Professor Sofya Raskhodnikova; prepared hands-on activities involving counterintuitive topics in probability.
- Leading the creation of "Problems of the Month" for computer science for anyone to solve throughout the year, providing an opportunity for continuous learning and problem-solving.
- Gave lectures on automata theory, graph algorithms, and Python basics.

## Projects

---

### SUPREM.IO [↗](#)

REACT, JAVASCRIPT, HTML, CSS, PIXIJS, NODE.JS, COLYSEUS

An online multiplayer battle arena platformer game with tons of weapons and enthralling, high-pace gameplay.

- SUPREM.IO achieved more than 200,000 page views in March 2023.
- Created and fostered a community of 650+ players around the game.
- Singlehandedly created and developed the game, including all game assets and graphics, gameplay, game logic and server-side infrastructure.
- Used the **PixiJS** rendering library for rendering the game, and used **React**, **JavaScript**, **HTML** and **CSS** for the front-end interface.
- Used **NodeJS**, **Colyseus**, and **Nginx** for the backend.

### DIFFMUUSE [↗](#)

PYTORCH, NUMPY

A diffusion model for generating classical piano music.

- Implemented quantitative metrics for model evaluation in **PyTorch**.
- Created an algorithm for cleaning datasets of piano performances to remove short notes in **PyTorch**, which was used to assemble the model's training set.

### VESSEL CLASH [↗](#)

C++, SFML

A space-themed endless arcade shooter with thrilling powerups, unique enemies, and epic bosses.

### OGYGIUS [↗](#)

C++, SFML

A top-down Minecraft-esque survival game, with crafting, animals, building, and procedurally generating biomes.

## Skills

---

- **Languages:** English (fluent), Russian (fluent), German (intermediate)
- **Programming Languages:** C++, Java, Python, JavaScript, TypeScript
- **Web & Backend:** React, HTML, CSS, Flask, PostgreSQL, JanusGraph, Colyseus
- **Other:** NumPy, Pandas, PixiJS, SFML,  $\text{\LaTeX}$ , Git

## Professional Development

---

### Linear Regression with NumPy and Python (Coursera) [↗](#)

AUGUST 2022

### Database Design and Basic SQL in PostgreSQL (Coursera) [↗](#)

JUNE 2022