Anatoly Zavyalov

anatoly.zavyalov@mail.utoronto.ca | GitHub: firetto | Website: firetto.github.io | LinkedIn: anatoly-zavyalov

Education

University of Toronto   September 2020 - June 2024 (expected)
H.B.Sc. Applied Mathematics
3.98 cGPA · 94% avg

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 × 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

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 – July 2023
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.

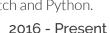**PRIVATE TUTOR**   2016 - Present

- 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.

DIFFMUSE ⧉   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, LaTeX, Git

Professional Development

Linear Regression with NumPy and Python (Coursera) ⧉   August 2022

Database Design and Basic SQL in PostgreSQL (Coursera) ⧉   June 2022