Anatoly Zavyalov

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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

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 Professor Azadeh Farzan from 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 outstanding academic achievement in first and second years of undergraduate studies.

NSERC Undergraduate Student Research Award (Declined the offer) - $7,500   March 2022
Offered by Professor Allan Borodin from 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.

Canada Summer Jobs Grant - $2,400 $\times$ 2   July 2018, July 2019
AWARDED TWICE BY THE GOVERNMENT OF CANADA AS FUNDING AT WESTON LEARNING CENTRE.

Publications

2023   Jeffrey Shallit, **Anatoly Zavyalov**, " Transduction of Automatic Sequences and Applications", *arXiv e-prints* arXiv:2303.15203 (27 March 2023); https://doi.org/10.48550/arXiv.2303.15203

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   Canadian Undergraduate Math Conference: *"Automatic Sequences"*. (June 21, 2023) (Slides)

UTSC CMS Undergraduate Seminar: *"Automatic Sequences"*. (January 19, 2023) (Slides) (Recording)

Research Experience

UNIVERSITY OF TORONTO | RESEARCH ASSISTANT   May 2023 – Present
DEPARTMENT OF COMPUTER SCIENCE

- Researching algebraic methods for concurrent program verification, under the supervision of Professor Azadeh Farzan.
- Research is done as part of the CS Undergraduate Research Summer Program at the University of Toronto, supported by an NSERC Undergraduate Summer Research Award.

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.
- Discovered novel approaches to transducing non-morphic sequences and proved new theorems regarding running sums of the Thue-Morse sequence, resulting in a publication.

UNIVERSITY OF TORONTO | RESEARCH FELLOW   May 2021 – April 2022
DAVID A. DUNLAP DEPARTMENT OF ASTRONOMY AND ASTROPHYSICS

- Developed a full-stack interface for hardware layout for the **Hydrogen Intensity and Real-time Analysis eXperiment (HIRAX)** 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** in the DADDAA, conducted in the summer of 2021.

Teaching Experience

UNIVERSITY OF TORONTO | Teaching Assistant   February 2022 – May 2022
- Teaching Assistant for **CSC240H1: Enriched Introduction to the Theory of Computation**.
- 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.
- Worked with students of Grades 1 through 12 to make learning fun and straightforward.

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.
- Gave lectures on breadth-first search, depth first search, and Python basics.
- Authored problems for math, CS, physics, and linguistics for Problem of the Month.
- Judged academic tournaments for CS, engineering, linguistics, chemistry, and biology.

COMPUTER CLUB | Executive   2018 - 2020
Thornhill Secondary School
- Organized and led weekly lessons to teach the Java and Python programming languages, as well as tackle challenging problems with the help of programming.
- Created interactive lessons using the Pygame graphics library and the Python programming language.
- Contributed to development of the TSS Competitive Programming Online Judge (tssoj.ca), authored programming questions for the platform.

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 178,000 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.

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 (elementary)
- **Programming Languages**: C++, Java, Python, JavaScript, TypeScript
- **Web**: React, HTML, CSS
- **Backend**: PostgreSQL, Flask, JanusGraph, Gremlin, Apache TinkerPop, 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