John Hunn Smith

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Education

August 2024 – present
- **MMath in Theoretical Computer Science** University of Waterloo.
  GPA: 94.2/100.

August 2019 – May 2024
- **BS-Eng in Electrical Engineering, Highest Honors** University of Illinois Urbana-Champaign.
  GPA: 3.98/4.0.
- **BS-LAS in Mathematics, Doctoral Prep Concentration, Summa Cum Laude** University of Illinois Urbana-Champaign.
  GPA: 3.98/4.0.
  Senior Thesis: *Effective computation of asymptotic positivity-guaranteeing index using ACSV*

Teaching & Mentoring

August 2024 – · · · ·
- **Instructional Assistant,** University of Waterloo Computer Science Department. (*Note that TA positions primarily consist of marking, while IA positions indicate teaching tutorial sections, holding office hours, monitoring course forums, and other instructional duties.* Course list:
  - **Fall 2025** CS 245: Intro to Logic for Computer Science, IA
  - **Spring 2025** CS 245: Intro to Logic for Computer Science, IA
  - **Winter 2025** CS 245: Intro to Logic for Computer Science, IA
  - **Fall 2024** CS 115: Intro to CS 1, TA

July 2024 – August 2024
- **Lab Assistant,** Illinois ECE Summer Camp, (sections EYO and DE). Worked with middle and high-schoolers as a lab instructor. Taught students the basics of circuit design and analysis, as well as to effectively and safely use tools such as multimeter, oscilloscope, and arbitrary waveform generators. Also aided in software instruction– taught students how to use the Arduino IDE, as well as the basic constructs of imperative programming. (Hopefully) inspired curiosity in engineering topics among younger students.

August 2021 – August 2023
- **CARE Academic Tutor & Peer Advisor,** University of Illinois Urbana Champaign. Worked part-time at the *Center for Academic Resources in Engineering*, the Grainger College of Engineering's official tutoring hall. Tutored students one-on-one in introductory math, physics, and engineering courses ranging from calculus and linear algebra to Newtonian mechanics to signal processing. Also organized and led large-format exam preparation workshops in multivariable calculus and ODEs with a focus on presenting key concepts and problem-solving, to much success. (Typically, we would have $\geq$ 100 attendees per session, and many would report – unprompted– that the sessions were helpful in their exam prep.)

Teaching & Mentoring (continued)

May 2019 – August 2023 — **Private Tutor.** Tutored middle and high-school students in mathematics, Algebra I through Calculus.

Research

Journal Articles

1. C. Albert, O. Beckwith, I. Demetoglu, R. Dicks, J. H. Smith, and J. Wang, "Integer partitions with large dyson rank", *Journal of the Ramanujan Mathematical Society*, Mar. 2023, ArXiv link:`https://arxiv.org/abs/2203.08987`. URL: `https://jrms.ramanujanmathsociety.org/archieves/v38-1.html`.

Presentations

1. "Computing periods of rational integrals", given at the Algorithms and Complexity Group's student seminar. Abstract: 'I'll discuss the problem of computing a differential equation for the integral of a multivariate rational function algorithmically. We'll see a reduction-based solution to the problem in the univariate case, then introduce concepts from commutative algebra needed to prove termination of analogous algorithms in the multivariate case.', Jul. 2025.
2. "Coefficient positivity and analytic combinatorics", given at the University of Waterloo's Algebraic and Enumerative Combinatorics Seminar. Consisted of two parts. First, a 50-minute pre-seminar discussing background material, presented at the level of a beginning graduate student. Next, the 50-minute seminar presentation where I gave my findings., Oct. 2024.
3. "Computing asymptotic-guaranteeing index for multivariate generating functions using acsv", a 10-minute Zoom presentation given at the Illinois Virtual Research Symposium, sponsored by the ECE department, where I discussed findings from my senior thesis, May 2024.

Current Projects

1. ACSV Coefficient Positivity: Completed work set out in senior thesis. Am attempting to generalize the methods presented there to derive eventual-positivity for multivariate rational functions using an ACSV-based 'uniformity over directions' approach.
2. Periods of Rational Integrals: Am attempting to implement the algorithm described in this paper, 'https://arxiv.org/abs/1404.5069,' in Sage. The only existent implementation is fairly preliminary and is written in Magma, which is closed source and rather expensive. We can also achieve faster computation times by using MSolve as our polynomial systems-solving backend. Additionally, we are investigating one or two unsolved conjectures in the paper, as well as applications to problems in combinatorics and physics. This will be completed in fulfillment of our Master's Thesis project.

Skills

Coding	Python, C/C++, Mathematica, Matlab, Lean4, Julia, Java, JavaScript, HTML, CSS
Hardware	Arduino, RaspPi, Altera and Xilinx FPGAs
Misc. Software	Sage Math, TEX, Linux, Git, Altera Quartus Prime, Xilinx Vivado

Miscellaneous Experience

Awards and Achievements

2024
- **Dr. Derick Wood Graduate Scholarship in Computer Science**, awarded based on academic excellence and research potential.
- **International Master's Award of Excellence (IMAE)**, based on academic record.

Society Memberships

2023
- **Phi Beta Kappa**, University of Illinois branch
- **Eta Kappa Nu**, Illinois ECE branch

References

Available on Request