

# Isaac Holt

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## Summary

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- Highly capable mathematician, with the joint-highest grade in my undergraduate cohort.
- Involved in two summer research projects.
- Co-author of a chapter in a book published in Springer's *Algorithms and Computation in Mathematics* series.
- Developer of a popular big integer library.

## Education

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**University of Cambridge**, MASt in Pure Mathematics 10/2024 – 06/2025

- Current courses: Additive Combinatorics, Combinatorics, Information Theory, Logic and Computability, Quantum Computation, Ramsey Theory

**Durham University**, BSc Mathematics 09/2021 – 06/2024

- Grade: First Class Honours
- Marks: 90% (first year), 92% (second year), 97% (third year)
- Awards: The Mathematical Sciences Best 3H Student Prize

**Colchester Royal Grammar School** 09/2019 – 06/2021

- A-levels: Mathematics (A\*, 99%), Further Mathematics (A\*, 97%), Physics (A\*, 91%), Latin (A\*, 90%)
- Awards: Year 13 Prize for Further Mathematics

## Research Experience

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**Summer Research Project** - Durham University 06/2023 – 07/2023

- Researched and wrote a paper on using tropical geometry to determine the generic root count of a certain class of polynomial systems.
- First four weeks were mostly spent learning about the area and reading relevant books and materials.
- Last four weeks were devoted to formulating and proving a new result, where I produced a generalised proof of a theorem from a recent paper on the number of equilibria of coupled nonlinear oscillators.
- Paper has been published on [arXiv](https://arxiv.org/abs/2311.18018) and as a chapter in the book *The OSCAR Computer Algebra System*.
- Invited by my supervisor to attend a [working group](#) for OSCAR at Paderborn University, Germany, to write a [program](#) in Julia for the paper.

**Mitacs Globalink Research Internship** - University of British Columbia 06/2024 – 09/2024

- Worked on two projects: one on improving the accuracy of reconstruction of intersecting multi-surfaces (arising from atomic potential energy surfaces) given value-sorted sample data, the other relating to the benefits and drawbacks of encoding symmetries (such as rotation invariance) of a physical system into a model of that system versus “learning” these symmetries via data augmentation.
- Expecting to be a co-author of a paper on both projects.

## Work Experience

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**Web and Communications Internship** - Grey College, Durham University 07/2023 – 08/2023

- Developed the [new website](#) for Grey College's Senior Common Room.

**Student Digital Leader** - Durham University 09/2022 – 06/2023

- Worked as a User Acceptance Testing Analyst, using Azure DevOps to pass/fail test cases and report bugs for a new university-funded event-booking website.

**Software Tester** - Blutick 01/2021 – 03/2021

- Tested and contributed to Blutick's (now owned by AQA) marking software for online GCSE maths exams.

## Publications

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Holt, I., & Ren, Y. (2023, ). *Generic root counts of tropically transverse systems – An invitation to tropical geometry in OSCAR*. <https://arxiv.org/abs/2311.18018>

Holt, I., & Ren, Y. (2024). Generic root counts of tropically transverse systems. In *The Computer Algebra System OSCAR: Algorithms and Examples: Vol. 32. The Computer Algebra System OSCAR: Algorithms and Examples* (1st ed.). Springer. <https://link.springer.com/book/9783031621260>

## Conferences

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**Tomorrow's Mathematicians Today 2024** - IMA & University of Greenwich (Online) 03/2024

- [Undergraduate mathematics conference](#) at which I presented a brief introduction to tropical geometry and an overview of my summer project on it.

## Projects

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**bnum** 05/2021 – Present

- Mathematical [Rust library](#) for operating on arbitrarily-sized integers, with over 750,000 downloads.
- A dependency for four other libraries, including a popular smart contract package.
- The only library (to my knowledge) to extend functionality of Rust's primitive integer types to arbitrary, fixed size signed and unsigned integers.
- Development involved researching arithmetical algorithms, e.g. integer division, exponentiation by squaring.

## Selected Extracurriculars

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- Simon Marais Mathematics Competition (2022, 2023)
- Imperial-Cambridge Mathematics Competition (2022, 2023)
- British Mathematical Olympiad Round 1 (2020)
- ABRSM Grade 8 Piano (Distinction)