

JACK WESTBROOK

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EDUCATION

Imperial College London | MSc Pure Mathematics

2025-2026

Programme and dissertation completed; final results and award pending.

Dissertation: On Serre's Open Image Theorem (supervisor: Prof. George Boxer). Wrote an exposition of Serre's proof, with original worked examples in algebraic number theory and group theory.

University of Wisconsin-Madison | BA Mathematics

May 2025

Overall GPA: 3.63/4.00 | Graduate-level mathematics coursework GPA: 3.91/4.00

RESEARCH AND ANALYTICAL EXPERIENCE

University of Michigan | Mathematics Research Assistant (REU)

Summer 2024

Developed a two-parameter family with varying Hilbert-Kunz multiplicities, combining density arguments and Segre-product constructions; coauthored a research manuscript.

Contributed to a separate project on deformation of perfectoid purity in mixed characteristic; coauthored a submitted preprint (arXiv:2504.02966).

University of Wisconsin-Madison | Mathematics Research Assistant (REU)

Summer 2022

Used MATLAB to investigate Newton polygons for Lie algebras of vector fields through dimension 14, then developed combinatorial arguments addressing general dimensions.

Presented findings at research venues and coauthored a manuscript in preparation.

SELECTED TECHNICAL AND MATHEMATICAL PROJECTS

Segre and Veronese Presentations | Macaulay2 software

2024-2025

Developed Macaulay2 packages to compute generators and defining relations for Segre products and Veronese subrings of graded rings; refined the implementation following mentor feedback.

Original Number Theory Problems | Independent project

Designed nine original Diophantine and modular-arithmetic problems with complete solutions; one was selected for a UW-Madison Putnam Club meeting.

TECHNICAL SKILLS

Programming: Python, MATLAB, Macaulay2 (package development); familiarity with C++, SageMath, PARI/GP. Tools: Git, LaTeX.

SELECTED PUBLICATIONS AND LEADERSHIP

On Deformation of Perfectoid Purity in Gorenstein Domains (coauthor; submitted 2025; arXiv:2504.02966). Additional manuscripts on Hilbert-Kunz multiplicities and Newton polygons in preparation.

Directed Reading Program Mentor, Imperial College London (2025-2026); led undergraduate reading group on elliptic curves and Galois representations.