

# DYLAN PENTLAND

DPENTLAND@MATH.HARVARD.EDU

DPENTLAND.GITHUB.IO

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## EDUCATION

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<b>Harvard</b>	2022- Present
Ph.D in Mathematics	
<b>MIT</b>	2018 - 2022
B.S. in Mathematics	5.0/5.0 GPA

## PUBLICATIONS

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<b>Extensions of mod <math>p</math> representations of local division algebras</b>	2024
<i>Journal de Théorie des Nombres de Bordeaux</i>	
<b>Filtrations on block subalgebras of restricted universal enveloping algebras</b>	2022
<i>Journal of Algebra and Applications</i>	
<b>Computing <math>L</math>-polynomials of Picard curves in polylogarithmic time</b>	2022
<i>Mathematics of Computation</i>	
<b>Coefficients of Gaussian Polynomials Modulo <math>N</math></b>	2020
<i>Electronic Journal of Combinatorics</i>	

## RESEARCH

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### Syntomification and crystalline local systems

Extends a result of Bhatt-Lurie showing there is an equivalence of categories between reflexive sheaves on the stack  $\mathbf{Z}_p^{\text{Syn}}$  and  $\mathbf{Z}_p$ -lattices in crystalline representations to the general case of smooth  $X/\text{Spf } \mathcal{O}_K$ , where  $K/\mathbf{Q}_p$  is a finite extension. I show  $\text{Perf}(X^{\text{Syn}})[1/p]$  is a certain derived category of admissible filtered  $F$ -isocrystals when  $X$  is proper, giving a derived variant of the  $C_{\text{cris}}$  conjecture. Can be accessed [here](#).

### Extensions of mod $p$ representations of local division algebras

Determines the extension groups of smooth irreducible representations of a division algebra  $D$  over a non-Archimedean local field by studying the structure of  $H^\bullet(I_1, \pi)$  where  $I_1 = 1 + \varpi_D \mathcal{O}_D$  and  $\pi$  is some irreducible representation of  $D^\times$ . Published in *Journal de Théorie des Nombres de Bordeaux*. Can be accessed [here](#).

### Filtrations on block subalgebras of restricted universal enveloping algebras

Studies the associated graded algebras for the PBW filtration and related filtrations on blocks of restricted universal enveloping algebras. Published in the *Journal of Algebra and its Applications*. Can be accessed [here](#).

### Computing $L$ -polynomials of Picard curves in polylogarithmic time

Develops and implements a practical algorithm to compute the zeta function of a curve in genus  $> 2$ . The implementation was done in SAGE and PARI/GP, and has applications to cryptography. Published in *Mathematics of Computation*. Can be accessed [here](#).

### Coefficients of Gaussian Polynomials Modulo $N$

Resolves and extends a conjecture of Prof. Richard Stanley on periods of coefficients in  $q$ -binomial coefficients modulo  $N$ . Published in *The Electronic Journal of Combinatorics*. Can be accessed [here](#).

## AWARDS

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<b>NSF Fellowship</b>	2022
<b>Regeneron STS Finalist</b>	2018

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## TEACHING AND OTHER ACTIVITIES

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### **Linear Algebra**

Taught a section of Math 21b at Harvard.

2025 Spring

### **Summer Tutorial**

Taught a Harvard summer tutorial on Bass-Serre theory.

2023 Summer

### **DRP Mentor**

Mentored an undergraduate student in étale cohomology,  $p$ -adic Hodge theory, rational points on elliptic curves, and group theory.

2023-

### **Head Counselor at PROMYS**

Managed program for motivated high school students learning number theory.

2022

## LANGUAGES/TOOLS

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Java, Python, Sage, PARI/GP, L<sup>A</sup>T<sub>E</sub>X