# DYLAN PENTLAND

DPENTLAND@MATH.HARVARD.EDU

DPENTLAND.GITHUB.IO


## EDUCATION

**Harvard** 2022- Present
Ph.D in Mathematics

**MIT** 2018 - 2022
B.S. in Mathematics 5.0/5.0 GPA

## PUBLICATIONS

**Extensions of mod $p$ representations of local division algebras** 2024
*Journal de Théorie des Nombres de Bordeaux*

**Filtrations on block subalgebras of restricted universal enveloping algebras** 2022
*Journal of Algebra and Applications*

**Computing $L$-polynomials of Picard curves in polylogarithmic time** 2022
*Mathematics of Computation*

**Coefficients of Gaussian Polynomials Modulo $N$** 2020
*Electronic Journal of Combinatorics*

## RESEARCH

**A prismatic Riemann-Hilbert correspondence for open varieties (in progress)**

**Syntomification and crystalline local systems (in progress)**

Extends a result of Bhatt-Lurie showing there is an equivalence of categories between reflexive sheaves on the stack $\mathbf{Z}_p^{\mathrm{Syn}}$ and $\mathbf{Z}_p$-lattices in crystalline representations to the general case of smooth $\mathrm{X}/\mathrm{Spf}\mathcal{O}_K$, where $K/\mathbf{Q}_p$ is a finite extension. I show $\mathsf{Perf}(\mathrm{X}^{\mathrm{Syn}})[1/p]$ is a certain derived category of crystalline local systems when X is proper, giving a slightly simplified proof of the $C_{\mathrm{cris}}$ conjecture and relating $\mathrm{Ext}$ groups of crystalline local systems to syntomic cohomology.

**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 $\mathrm{H}^\bullet(I_1, \pi)$ 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 $N$** 2018
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

**NSF Fellowship** **2022**

**Regeneron STS Finalist** **2018**

# DYLAN PENTLAND

DPENTLAND@MATH.HARVARD.EDU

DPENTLAND.GITHUB.IO


## TEACHING AND OTHER ACTIVITIES

**Linear Algebra** 2025 Spring
Taught a section of Math 21b at Harvard.

**Summer Tutorial** 2023 Summer
Taught a Harvard summer tutorial on Bass-Serre theory.

**DRP Mentor** 2023-
Mentored an undergraduate students in étale cohomology, $p$-adic Hodge theory, rational points on elliptic curves, and group theory.

**Head Counselor at PROMYS** 2022
Managed program for motivated high school students learning number theory.

## LANGUAGES/TOOLS

Java, Python, Sage, PARI/GP, LaTeX