

Samuel S. Schiavone

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Education

Dartmouth College

Hanover, New Hampshire

PH.D. IN MATHEMATICS

September 2014 - September 2019

- Thesis title: *On algebras of low rank and on Belyi maps*
- Advisor: John Voight

The University of Vermont

Burlington, Vermont

M.S. IN MATHEMATICS

January 2012 - December 2013

- GPA: 4.00.
- Major: Abstract algebra, Minor: Cryptography.

Amherst College

Amherst, Massachusetts

B.A. IN MATHEMATICS, *magna cum laude*

September 2006 - May 2010

- GPA: 3.86 overall, 3.79 in mathematics.
- Member of Phi Beta Kappa.
- Completed a senior honors thesis in applied mathematics.

Université Paris VII

Paris, France

STUDY ABROAD

September 2008 - December 2008

- Took courses in math and linguistics, both taught in French.

Experience

Massachusetts Institute of Technology

Cambridge, Massachusetts

RESEARCH SCIENTIST

September 2019 - Present

- Conduct research in arithmetic geometry under the supervision of Bjorn Poonen and Andrew Sutherland.
- Aid in the development and maintenance of the L-functions and Modular Forms Database (lmfdb.org).

Dartmouth College

Hanover, New Hampshire

GRADUATE STUDENT INSTRUCTOR

September 2016 - September 2019

- Instructed undergraduate students in introductory and intermediate mathematics courses.
- Prepared and gave lectures three to four times per week, teaching courses in differential equations, linear algebra, and calculus.
- Evaluated students' performance on homework assignments, quizzes, and exams.

Dartmouth College

Hanover, New Hampshire

GRADUATE TEACHING ASSISTANT

September 2014 - August 2016

- Led evening tutorial sessions three times per week, responding to students' questions about homework.
- Graded students' exams.

Dartmouth College

Hanover, New Hampshire

RESEARCH ASSISTANT

January 2014 - September 2014

- Worked with Professor John Voight to improve and extend results from our publication, *Numerical calculation of three-point branched covers of the projective line*.

The University of Vermont

GRADUATE TEACHING FELLOW

Burlington, Vermont

January 2012 - December 2013

- Instructed undergraduate students in introductory mathematics courses. Planned and gave lectures three times per week.
- Evaluated students' performance on homework assignments, quizzes, and exams.

The Joshua M. Stimson Mathematics Program

MATHEMATICS INSTRUCTOR

North Haverhill, New Hampshire

July 2013

- Instructed middle school students in a mathematics enrichment program at Haverhill Cooperative Middle School.
- Designed a curriculum focusing on combinatorics, probability, and number theory.
- Planned daily lessons and activities with an emphasis on discovery and inquiry.

French Ministry of National Education

ENGLISH TEACHING ASSISTANT

Vendôme, France

October 2010 - April 2011

- Instructed French middle school students in English in two schools, as a part of the Teaching Assistant Program in France.
- Planned lessons focusing on oral expression and comprehension, grammar, and vocabulary.

The Claremont Colleges

UNDERGRADUATE RESEARCHER

Claremont, California

June 2009 - July 2009

- Studied formal groups over the p-adic numbers at the NSF-sponsored research program for undergraduates, working in a small group under Professor Ghassan Sarkis.
- Chronicled results in an individual paper.
- Presented results at WIMIN conference (Smith College, Northampton, Massachusetts) and at undergraduate poster competition at 2010 Joint Math Meetings (San Francisco, California).

Publications

17T7 is a Galois group over the rationals

(WITH RAYMOND VAN BOMMEL, EDGAR COSTA, NOAM D. ELKIES, TIMO KELLER, AND JOHN VOIGHT), PREPRINT

- Preprint available at <https://arxiv.org/abs/2411.07857>
- We prove that the transitive permutation group 17T7, isomorphic to a split extension of C_2 by $\mathrm{PSL}_2(\mathbb{F}_{16})$, is a Galois group over the rationals. The group arises from the field of definition of the 2-torsion on an abelian fourfold with real multiplication defined over a real quadratic field. We find such fourfolds using Hilbert modular forms. Finally, building upon work of Dembélé, we show how to conjecturally reconstruct a period matrix for an abelian variety attached to a Hilbert modular form; we then use this to exhibit an explicit degree 17 polynomial with Galois group 17T7.

Creating a dynamic database of finite groups

(WITH LEWIS COMBES, JOHN JONES, JENNIFER PAULHUS, DAVID ROE, AND MANAMI ROY), PREPRINT

- Preprint available at: <https://arxiv.org/abs/2409.09189>
- We have added a database of abstract groups to the *L-functions and Modular Forms Database* (LMFDB), available at: <https://www.lmfdb.org/Groups/Abstract/>. We discuss the functionality of the database and what makes it distinct from other available databases of abstract groups.

Equations of genus 4 curves from their theta constants

(WITH JEROEN HANSELMAN AND ANDREAS PIEPER)

- In this article we give explicit formulas for the equations of a generic genus 4 curve in terms of its theta constants. The method uses 20 tritangent planes as well as the Prym construction and the beautiful classical geometry around it.
- Preprint available at: <https://arxiv.org/abs/2402.03160>.

A database of basic numerical invariants of Hilbert modular surfaces

(WITH ERAN ASSAF, ANGELICA BABEI, BEN BREEN, EDGAR COSTA, JUANITA DUQUE-ROSE, ALEKSANDER HORAWA, JEAN KIEFFER, AVINASH KULKARNI, GRANT MOLNAR, AND JOHN VOIGHT), ACCEPTED TO CONTEMPORARY MATHEMATICS.

- We describe algorithms for computing geometric invariants for Hilbert modular surfaces, and we report on their implementation.

Gluing curves of genus 1 and 2 along their 2-torsion

(WITH JEROEN HANSELMAN AND JEROEN SIJSLING), MATHEMATICS OF COMPUTATION **90** (2021), No. 331, 2333–2379

- Let X (resp. Y) be a curve of genus 1 (resp. 2) over a base field k whose characteristic does not equal 2. We give criteria for the existence of a curve Z over k whose Jacobian is up to twist $(2, 2, 2)$ -isogenous to the products of the Jacobians of X and Y . Moreover, we give algorithms to construct the curve Z once equations for X and Y are given.

A Database of Belyi Maps

(WITH MICHAEL MUSTY, JEROEN SIJSLING, AND JOHN VOIGHT), PROCEEDINGS OF ANTS XIII, OPEN BOOK SERIES **2** (2019), No. 1, 375–392, MATH. SCI. PUBL.

- We use a numerical method to compute a database of three-point branched covers of the complex projective line of small degree. We report on some interesting features of this data set, including issues of descent.

Numerical calculation of three-point branched covers of the projective line

(WITH MICHAEL KLUG, MICHAEL MUSTY, AND JOHN VOIGHT), LMS JOURNAL OF COMPUTATION AND MATHEMATICS, **17** (2014), No. 1, 379–430.

- We exhibit a numerical method to compute three-point branched covers of the complex projective line. We develop algorithms for working explicitly with Fuchsian triangle groups and their finite index subgroups, and we use these algorithms to compute power series expansions of modular forms on these groups.

Honors & Awards

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|------|---|-----------------------|
| 2018 | Selfridge Prize in Number Theory , Algorithmic Number Theory Symposium XIII | <i>Madison, WI</i> |
| 2014 | Graduate Assistance in Areas of National Need (GAANN) Fellowship , Dartmouth College | <i>Hanover, NH</i> |
| 2013 | Kenney award for excellence in graduate mathematics , University of Vermont | <i>Burlington, VT</i> |

Teaching

Massachusetts Institute of Technology

MENTOR

- Summer Program in Undergraduate Research (SPUR), Summer 2024.

Massachusetts Institute of Technology

INSTRUCTOR

- Math 18.700: Linear Algebra, Fall 2024.
- Math 18.721: Introduction to Algebraic Geometry, Fall 2021. (Co-instructor)
- Math 18.099: Belyi Maps and Dessins d'Enfants (reading course), Spring 2021.

Dartmouth College

GRADUATE STUDENT INSTRUCTOR

- Math 8: Calculus of Functions of One and Several Variables, Spring 2019
- Math 22: Linear Algebra with Applications, Fall 2017
- Math 23: Differential Equations, Fall 2016

The University of Vermont

GRADUATE TEACHING FELLOW

- Math 19: Fundamentals of Calculus I, Fall 2012, Summer 2013, Fall 2013
- Math 17: Applications of Finite Math, Spring 2012

Skills

- Programming** Python, SageMath, Magma, Mathematica, R, \LaTeX
Languages English (native), French (fluent), Spanish (basic)

Selected Talks

Computing a database of Belyi maps

Virtual

A SERIES OF TRIMESTER PROGRAMS ON TRIANGLE GROUPS, BELYI UNIFORMIZATION, AND MODULARITY,
BHASKARACHARYA PRATISHTHANA

November 2021

Belyi maps: Computation and data

Virtual

VANTAGE: A VIRTUAL MATH SEMINAR ON OPEN CONJECTURES IN NUMBER THEORY AND ARITHMETIC GEOMETRY

September 2021

Gluing curves of genus 1 and genus 2 along their 2-torsion

Virtual

YOUNG RESEARCHERS IN ALGEBRAIC NUMBER THEORY, UNIVERSITY OF BRISTOL

August 2021

Computing Canonical Rings Of Hilbert Modular Surfaces

Québec City, Canada

QUÉBEC-MAINE NUMBER THEORY CONFERENCE, UNIVERSITÉ LAVAL

October 2018

A Database Of Belyi Maps

Madison, Wisconsin

THIRTEENTH ALGORITHMIC NUMBER THEORY SYMPOSIUM (ANTS XIII), UNIVERSITY OF WISCONSIN

July 2018

Computing A Database of Belyi Maps: A Progress Report

Orono, Maine

QUÉBEC-MAINE NUMBER THEORY CONFERENCE, UNIVERSITY OF MAINE

October 2017

The Szpiro Conjecture For Hyperelliptic Curves

Trieste, Italy

(JOINT PRESENTATION WITH NICHOLAS TRIANTAFILLOU), CURVES, L-FUNCTIONS, AND GALOIS REPRESENTATIONS
SUMMER SCHOOL, INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS

September 2017

Service

Johns Hopkins Center For Talented Youth

Hanover, New Hampshire

FAMILY AND ACADEMIC PROGRAMS, DARTMOUTH COLLEGE (JOINT WORK WITH BENJAMIN BREEN)

April 2016

- Designed a lecture on mathematical game theory.
- Created worksheets that introduced students to matrix games and Nash equilibria.
- Gave two hour-long interactive presentations for middle- and high school students and their parents.

Exploring Mathematics Summer Camp

Hanover, New Hampshire

DARTMOUTH COLLEGE

July 2015

- Designed and taught, in collaboration with other graduate students, two week-long camps for local middle- and high school students on the topics probability and knot theory.
- Created a stock market game based on Markov chains using simulations from *SageMath*.
- Created manipulatives for an activity introducing students to properties of the unknotting number.

Johns Hopkins Center For Talented Youth

Hanover, New Hampshire

FAMILY AND ACADEMIC PROGRAMS, DARTMOUTH COLLEGE (JOINT WORK WITH MICHAEL MUSTY)

October 2014

- Designed a lecture on symmetry, group theory, and their applications.
- Created a worksheet and manipulatives to aid students in learning about the dihedral and symmetric groups.
- Gave two hour-long interactive presentations for middle- and high school students and their parents.