

# Michael Musty

Ph.D. Candidate, Mathematics, Dartmouth College

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## Education

**Ph.D. Mathematics**, Dartmouth College, Hanover, New Hampshire, USA expected 2019  
**M.Sc. Mathematics**, University of Vermont, Burlington, Vermont, USA 2014  
**B.A. Mathematics/Scientific Computing**, Boston College, Chestnut Hill, Massachusetts, USA 2008

## Work Experience

**Graduate Research and Teaching Assistant**, Dartmouth College, Hanover, NH, USA 2014-Present  
**Graduate Research and Teaching Assistant**, University of Vermont, Burlington, VT, USA 2012-2014  
**Adjunct Professor**, Norwich University, Northfield, VT, USA 2011-2013  
**Seasonal Landscaper**, JM Landscaping, Bradford, VT, USA 2000-2011  
**Shipping Assistant**, Pleasant View Gardens, Loudon, NH, USA 2009-2010  
**Permanent Substitute Teacher**, Merrimack Valley High School, Penacook, NH, USA 2009-2010  
**Graduate Research and Teaching Assistant**, McGill University, Montreal, QC, Canada 2008-2009  
**Misc Laborer**, Glen Farm, Piermont, NH, USA 1990-2000

## Research Experience

**2-Group Belyi Maps**, Ph.D. Thesis expected 2019

- Developed and implemented an algorithm to compute a database of 2-group Belyi maps up to degree 256
- Analyzed this data to steer conjectures about these objects
- Used this analysis to search for special number fields ramified only at 2
- Repository: <https://github.com/michaelmusty/solvabledessins>
- Visualization: <https://dessin-explorer.org>

**Computing Canonical Rings of Hilbert Modular Forms**, Programmer 2018

I worked on a large (10 person) team to implement techniques to compute canonical rings of Hilbert modular forms. I was responsible for the data structure to store and compute with Fourier expansions of Hilbert modular forms necessary to support these computations.

- repository: <https://github.com/edgarcosta/hilbertmodularforms>

**A Database of Belyi Maps**, Co-author 2018

In this paper, we compute a database of thousands of Belyi maps up to degree 9. On top of the group effort to compute an exhaustive list of Belyi maps, my main responsibility in this project was implementing the database backend using Magma (see repository below) to save the results. I then worked in a team of 4 to migrate the data over to the LMFDB ([www.lmfdb.org](http://www.lmfdb.org)).

- Awarded Selfridge Prize at ANTS-XIII: <http://www.math.grinnell.edu/~paulhusj/ants2018/index.html>
- repository: <https://github.com/michaelmusty/BelyiDB>
- LMFDB: <http://beta.lmfdb.org/Belyi>

**Understanding the cost of dermatologic care: A survey study of dermatology providers, residents, and patients**, Co-author 2017

Using R, I ran the statistical analysis for survey results in this dermatology study and generated Likert scale visualizations to analyze the data.

**Numerical calculation of three-point branched covers of the projective line**, Co-author 2014

In this paper, we implement a general numerical method to compute Belyi maps using power series expansions of modular forms. I implemented code to visualize Belyi maps as (equivalent) dessins d'enfants conformally embedded in the hyperbolic unit disk. My code produced figures drawn using PSTricks (see Figure 1).

In my M.Sc. thesis I implemented an algorithm to compute the Iwasawa  $\lambda$ -invariant of an abelian number field in Magma. Using these computations, I was able to correct some mistakes in the literature.

## Publications

### Peer-Reviewed Articles

- [Mus+19] A Database of Belyi Maps  
Michael Musty, Sam Schiavone, Jeroen Sijsling, John Voight  
(to appear in conference proceedings for ANTS-XIII) *The Open Book Series* 2 (2019). Mathematical Sciences Publishers, 2019
- [Ste+17] Understanding the cost of dermatologic care: A survey study of dermatology providers, residents, and patients  
Aaron J Steen, Julianne A Mann, Valerie M Carlberg, Alexa B Kimball, Michael J Musty, Eric L Simpson  
*Journal of the American Academy of Dermatology* 76.4 (2017) pp. 609–617. Elsevier, 2017
- [Klu+14] Numerical calculation of three-point branched covers of the projective line  
Michael Klug, Michael Musty, Sam Schiavone, John Voight  
*LMS Journal of Computation and Mathematics* 17.1 (2014) pp. 379–430. London Mathematical Society, 2014

## Selected Talks

- [1] 2-Group Belyi Maps  
*JMM Special Session on Number Theory, Arithmetic Geometry, and Computation*, Baltimore, MD, January 2019
- [2] A Database of Belyi Maps  
*Simons Collaboration Short Talks*, Cambridge, MA, August 2018
- [3] 2-Group Belyi Maps  
*Quebec Maine Number Theory Seminar*, October 2017
- [4] Computing Iwasawa  $\lambda$ -Invariants  
*Dartmouth Number Theory Seminar*, Hanover, NH, February 2015

## Community

- Dartmouth Mathematics Youth Summer Program**, Guest Lecturer, Hanover, NH, USA 2016  
I gave four guest lectures on probability and knot theory and helped organize this two week summer program.
- Johns Hopkins Program for Talented Youth**, Guest Lecturer, Hanover, NH, USA 2015  
I gave a guest lecture on group theory.
- Joshua M. Stimson Math Program**, Organizer, North Haverhill, NH, USA 2011-2012  
I organized a four week long summer program for advanced middle school students. I was the organizer for the first two years of this summer program.

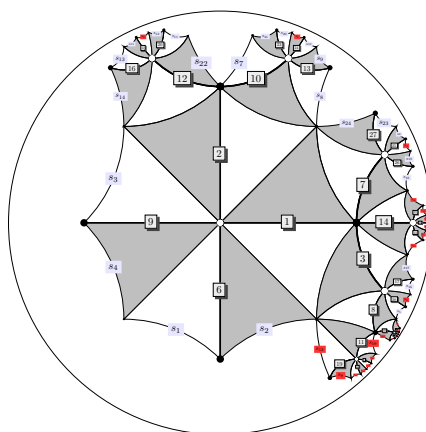


Figure 1: A genus 5 dessin d'enfant drawn using  $\LaTeX$  and PSTricks.