Matthew John Towers

matthew.towers@gmail.com • [redacted] • ucl.ac.uk/~ucahmto
github.com/matthew-towers • sites.google.com/site/matthewtowers
[redacted] • [redacted] • [redacted] • [redacted]

Summary

I am a mathematician with a strong background in statistics and computer science. I have been programming since my parents bought me a ZX Spectrum +2 in 1988, I have experience in languages from Java to Haskell to Scheme with my primary strength being Python, and my years of teaching have helped me become an effective communicator of complex ideas in a manner accessible to a wide audience. Every day is a school day; today's class is 6.006.

Computer Skills

Python: good all-round knowledge of the language, experience in the `numpy`, `sympy`, and `pyplot` packages for scientific computing and data analysis. Projects include pathways: a project to display UCL maths modules and their prerequisites. Web and pdf text extraction using `BeautifulSoup` and `PyPDF2`, visualisation with `NetworkX` and `Graphviz`, markdown output.
Haskell: beginner Haskell programmer with a strong category theory background. Bird book errata contributor. Projects include `jewels-haskell`, a simulator for a Candy-Crush-style game using mutable IOArrays.
Maxima: `maxima-linalg` project — linear and abstract algebra computations for use in STACK e-assessment. A great way to understand why you shouldn't write code in Maxima.

Work

University College London — *Lecturer* (*Teaching*) 2017 –
Module leader for courses including:

- MATH0011 *Methods 2* (*Python*). Introductory Python course taught using Jupyter notebooks hosted by CoCalc, using `numpy`, `matplotlib`, `nbgrader`, up to 500 students.
- MATH0005 *Algebra 1*. Sets and functions, logic, linear algebra. E-assessment with STACK, up to 500 students.

Departmental teaching prize 2020/21. Project supervision: Markov chain models in Python for Candy Crush type games, RSK, category theory and functional programming, mathematics of the Enigma machine.

University of Leicester — *Teaching fellow in mathematics and statistics* 2016 – 2017
Module leader for:

- MA1202 *Introductory Statistics*. Estimation, maximum likelihood, confidence intervals, hypothesis testing, basic R.
- MA1104 *Elements of Number Theory*. Induction, well-ordering, fundamental theory of arithmetic, modular arithmetic, the RSA cryptosystem.
- MA7303 *Statistics* (CT3 Actuarial Science MSc course). Linear regression, estimation, probability, hypothesis testing including ANOVA.

Project supervision: computational number theory and cryptography including Pollard's Rho and variants, RSA, GNFS, the current state-of-the-art factoring algorithm.

Imperial College London — *Teaching fellow in pure mathematics* 2014 – 2016
First year tutor with pastoral responsibility for all first year maths students (enhanced DBS check). Student-nominated for a Student Academic Choice Award. Module leader for:

- M3P12 *Group Representation Theory*. Representations and modules, tensor products, Maschke's Theorem, character tables.
- M1J1 and M1J2. Linear algebra, group theory, and real analysis for students of mathematics and computer science.

Project supervision: non-standard analysis, the RSK correspondence, A_∞-algebras.

University of Kent — *Postdoctoral research associate; Lecturer* 2011 – 2014
Research in quantum algebras, on Stéphane Launois' EPSRC First Grant EP/I018549/1. Outreach sessions for schoolchildren on combinatorics and polytopes, including University of Kent masterclasses, UKMT Summer School for Girls 2013, UKMT Senior Mentoring Scheme. Module leader for:

- MA576 *Groups and Representations*. Representations, modules, Maschke's theorem, character tables.
- MA024 Additional Mathematics. Complex numbers, matrices, proof by induction.

Project supervision: quantum calculus, game theory, regular solids in four dimensions.

St Hugh's College, University of Oxford — *Stipendiary lecturer* 2007 – 2011
Tutorial and class teaching for undergraduate maths students, in subjects including real and complex analysis, multivariable calculus, topology, group theory, Lie algebras, Lebesgue integration, geometry, field theory.

Education and Professional Qualifications

University of Oxford

DPhil — Doctorate in pure mathematics, funded by an EPSRC award. *2002 – 2006*
Supervised by Karin Erdmann.

MMath — First class undergraduate masters degree in mathematics. *1998 – 2002*

Fellow of the Higher Education Academy, PR114014 2016

Online courses

Udacity, *PyTorch Scholarship Challenge*. Passed. 2018
Coursera, *Machine Learning* (Andrew Ng). Grade: 100% 2017
Coursera, *Cryptography I* (Dan Boneh) Grade: 99.4% 2015
Coursera, *Cryptography* (Jonathan Katz) Grade: 95.1% 2015

Interests

Keen cyclist, proficient on bass, guitar, and piano, Leicester City fan, student of French and Italian.

Publications

1. *Hochschild cohomology of $U(\mathfrak{sl}_2(k))$*, in *Communications in Algebra* 47 issue 4 (2019), pp.1408–1422.
2. *Singular blocks of restricted $\mathfrak{sl}_3$*, in *Journal of Algebra* 471 (2017), pp.176–192.
3. *Poisson and Hochschild cohomology and the semiclassical limit*, in *Journal of Noncommutative Geometry* vol. 9, issue 3, pp.665–696, 2015.
4. *Cohomology of products and coproducts of augmented algebras*, in *Algebras and Representation Theory* February 2013, vol. 16, issue 1, pp. 251–274
5. *Rank varieties for Hopf algebras*, with Sarah Scherotzke, in *Journal of Pure and Applied Algebra* vol. 215 issue 5, pp.829–838, 2011.
6. *Endomorphism algebras of transitive permutation modules for p-groups*, in *Archiv der Mathematik* vol. 92 no. 3, pp.215–227, 2009.
7. *Periodic modules of dimension p*, in *The Quarterly Journal of Mathematics* vol. 61 no. 3, pp.381–399, 2010.

References

On request.