Bartosz Naskręcki

Personal Data

Date of Birth:	11 May 1986
Place of Birth:	Poznań, Poland
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Address:	Collegium Mathematicum, Building B Uniwersytetu Poznańskiego 4, 61-614 Poznań
Nationality:	Polish

Employment

since Oct 2014	Assistant professor at Adam Mickiewicz University
2016–2017	Research Associate at University of Bristol
2014–2016	Postdoctoral Research Fellow at Universität Bayreuth

Education

2010–2014	Ph. D. student at Adam Mickiewicz University (AMU), Faculty of Mathematics and Computer Science (Scholarship Funded by EU)
Jun 2010	M. Sc., Faculty of Mathematics and Computer Science, AMU
2005–2010	M. Sc. Programme in Mathematics at AMU
2002–2005	VIII Secondary School in Poznań, mathematical and computer science profile

Research Experience

2013–2015	National Science Centre research grant PRELUDIUM *"Formy modularne i rangi krzywych eliptycznych."*, 2012/05/N/ST1/02871
2010–2014	*Ranks in families of elliptic curves and modular forms*, Ph.D. Thesis Advisor: Professor Wojciech Gajda
2009–2010	*On a certain diophantine equation*, M.Sc. Thesis Advisor: Professor Wojciech Gajda

Publications

1. *Arithmetic and geometry of a K3 surface emerging from virtual corrections to Drell-Yan scattering*, (with Marco Besier, Dino Festi and Michael Harrison), Communications in Number Theory and Physics (2020), Vol. 14, No. 4, 863-911
2. *Primitive divisors of elliptic divisiblity sequences over function fields with constant j-invariant*, (with Marco Streng), Journal of Number Theory (2020), Vol.213, 152-186
3. *The generalized Fermat equation with exponents 2, 3, n* (with Nuno Freitas and Michael Stoll), Compositio Mathematica, Vol. 156 (1) (2020), 77-113
4. *On higher congruences between cusp forms and Eisenstein series II*, Notes from the International Autumn School on Computational Number Theory: Izmir Institute of Technology 2017, Birkhäuser (2019), 331–353
5. *Divisibility sequences of polynomials and heights estimates*, New York J. Math. 22 (2016) 989–1020.
6. *Distribution of Mordell-Weil ranks of families of elliptic curves*, Banach Center Publications 108 (2016), 201–229.
7. *On higher congruences between cusp forms and Eisenstein series* , in volume Computations with Modular Forms, Springer, Contributions in Mathematical and Computational Sciences, 6 (2014) 257–277.
8. *Mordell-Weil ranks of families of elliptic curves associated to Pythagorean triples*, Acta Arithmetica, 160, No. 2 (2013), 159–183.
9. *Infinite family of elliptic curves of rank at least 4*, Involve, 3, No. 3 (2010), 297–316.

Preprints	10. *Geometry of the del Pezzo surface* $y^2 = x^3 + Am^6 + Bn^6$, with Julie Desjardins, submitted 11. *On a certain hypergeometric motive of weight 2 and rank 3*, submitted, 27 pp. 12. *Mordell-Weil ranks of families of elliptic curves parametrized by binary quadratic forms*, submitted, 24 pp.

Prizes and Awards

2017	STEM Bronze Award for Mathematical Sciences, UK Parliament, London
2014	*Young Mathematicians Prize of Polish Mathematical Society*
2013	Scholarship of *Adam Mickiewicz University Foundation*
2010	*J. Marcinkiewicz Award for the Outstanding Undergraduate Mathematical Paper (Distinction)*
2010	Medal for Outstanding Graduates "Sapere Aude", Adam Mickiewicz University
2009	Scholarship of Kulczyk Family Fund, Adam Mickiewicz University
2009	Ministry of Science and Higher Education Award (scholarship) for scientific achievements
2008	*Honourable Mention*, International Mathematics Competition, Blagoevgrad, Bulgaria
2008	Ministry of Science and Higher Education Award (scholarship) for scientific achievements
2007	*Third Prize*, International Mathematics Competition, Blagoevgrad, Bulgaria
2007	Ministry of Science and Higher Education Award (scholarship) for scientific achievements

Selected Talks

Dec 2019	*Applications of Shioda-Inose structures in arithmetic*, December Workshop, Padova, Italy
Sep 2019	*Hypergeometric differential equations and hypergeometric motives*, Jubileuszowy Zjazd Matematyków Polskich w 100-lecie PTM, Kraków, Poland
Jun 2019	*Hypergeometric differential equations and hypergeometric motives*, Representation Theory XVI, Inter-University Centre, Dubrovnik, Croatia
Jun 2019	*Discussion panel on higher congruences Eisenstein ideal and Iwasawa theory*, Morningside Center of Mathematics, Beijing, China
Jun 2018	*Point counts on elliptic surfaces inspired by the theory of motives*, ALANT 5, Będlewo, Poland
Jun 2018	*Elliptic surfaces*, Lectures on computational aspects of algebraic geometry, Zagreb, Croatia
May 2018	*Motivic decomposition of K3 surfaces with high Picard rank*, Research Group: Motives of Calabi-Yau manifolds, Kraków, Poland
Apr 2018	*Elliptic and hyperelliptic realisations of low degree hypergeometric motives*, Periods in Number Theory, Algebraic Geometry and Physics, Bonn, Germany
Sep 2017	*Introduction to Computer Algebra System*, Izmir Autumn School on Computational Number Theory, Izmir, Turkey
Oct 2016	*Generalized Fermat's equation of type (2,3,n)*, Linfoot seminar, University of Bristol, UK

Nov 2015	*Zeta functions, Weil conjectures and how to apply them*, Workshop on Modern Applied Mathematics PK 2015, Kraków, Poland
Oct 2015	*Generalized Fermat equations x2+y3=zp – a progress report*, Jahrestagung SPP 1489, Osnabrück, Germany
Sept 2014	*Mordell-Weil ranks in families of elliptic curves parametrized by binary quadratic forms*, DMV-PTM Joint Meeting, Poznań, Poland
Jun 2014	*Mordell-Weil ranks in families of elliptic curves parametrized by binary quadratic forms*, ALANT 2014, Będlewo, Poland
Jul 2013	*Mordell-Weil ranks of families of elliptic curves associated to Pythagorean triples*, Journées Arithmétiques 2013, Grenoble, France
Jun 2013	*On higher congruences between cusp forms and Eisenstein series*, Workshop on Galois representations modulo prime powers, Luxembourg
May 2013	*Mordell-Weil ranks of families of elliptic curves associated to Pythagorean triples*, Heilbronn seminar, Bristol, UK
Mar 2013	*On higher congruences between cusp forms and Eisenstein series*, "Explicit Methods for Modular Forms", Warwick, UK
Jun 2012	*Mordell-Weil ranks of families of elliptic curves associated to Pythagorean triples*, Algebraic and Arithmetic Geometry, Kraków, Poland
Jul 2011	*Sphere packings and codes*, 14th International Workshop for Young Mathematicians "Algebra", Kraków, Poland
Sep 2010	*A computer can do more than the mathematician?*, 13th International Workshop for Young Mathematicians "Logic and Foundations of Mathematics", Kraków, Poland
Nov 2009	*Infinite family of elliptic curves*, Workshop on Ranks, Faculty of Mathematics and Computer Science, AMU, Poznań
Sep 2009	*Enchained in Markov Chains*, 12th International Workshop for Young Mathematicians "Probability Theory and Statistics", Kraków, Poland
Sep 2008	*Elliptic curves cryptography*, 11th International Workshop for Young Mathematicians "Number Theory", Kraków, Poland

Workshops and Conferences

May 2017	Modular forms are everywhere, Bonn, Germany
Mar 2017	New Trends in Arithmetic and Geometry of Algebraic Surfaces, Banff, Canada
Sep 2016	Recent Developments on Elliptic Curves, Oxford, UK
Jun 2016	Arithmetic statistics and the Cohen-Lenstra heuristics Warwick, UK
May 2016	*LMFDB Workshop*, San Jose, California, USA
Apr 2016	*Explicit Methods in Number Theory: Conference in Honour of John Cremona's 60th Birthday*, Warwick, UK
Mar 2016	*British Mathematical Colloqium*, Bristol, UK
Nov 2015	*Workshop on Modern Applied Mathematics PK 2015*, Kraków, Poland
Nov 2014	*Workshop on Galois representations*, Luxembourg
Sept 2014	*DMV-PTM Joint Meeting*, Poznań, Poland
Jun 2014	*Alant 2014*, Będlewo, Poland
Oct 2013	*Kosmos Summer School: MZV in Mathematics and Physics*, Berlin, Germany
Jul 2013	*Sage Days: Algorithms in Arithmetic Geometry*, Leiden, Netherlands
Jul 2013	*Journées Arithmétiques 2013*, Grenoble, France
Jun 2013	*Workshop on Galois representations modulo prime powers*, Luxembourg
Mar 2013	*Explicit Methods for Modular Forms*, Warwick, UK
Jun 2012	*6th European Congress of Mathematics*, Kraków, Poland
Feb 2012	*Winter School on Galois Theory*, University of Luxembourg, Luxembourg
Aug 2011	*Summer School and Conference "Computations with Modular Forms 2011"*, University of Heidelberg, Heidelberg, Germany
Jun 2011	*Abelian Varieties & Galois Actions*, Adam Mickiewicz University, Poznań, Poland
Mar 2011	*Spring School on higher dimensional class field theory*, University of Mainz, Mainz, Germany

Mar 2011	*School and Conference on Modular Forms and Mock Modular Forms and their Applications in Arithmetic, Geometry and Physics*, ICTP, Trieste, Italy
Feb 2011	*MSRI Arithmetic Statistics: Introductory Workshop*, MSRI, Berkeley, California, USA
Jan 2011	*MSRI Arithmetic Statistics: Connections for Women*, MSRI, Berkeley, California, USA
Jun 2010	*Advanced Courses on Modularity*, Universitat Autonoma de Barcelona, Barcelona, Spain
Feb 2010	*Advanced Course on Arithmetic Geometry for Function Fields of Positive Characteristic*, Universitat Autonoma de Barcelona, Barcelona, Spain
Oct 2009	*Advanced Course on Shimura Varieties and L-functions*, Universitat Autonoma de Barcelona, Barcelona, Spain
Jun 2009	*Clay Institute Summer School 2009 "Galois representations"*, Honolulu, Hawaii, USA

Experience

2016–	Contributions to L-functions Modular Forms Database project, mod ℓ modular forms section (joint work with Samuele Anni and Anna Medvedovsky).
2008	Coauthor of interactive presentation module for Calculus courses (Computer Science programme) created in Mathematica system: Module 1 (pl), Module 2 (pl)
Wolfram Demonstration Project applets:	
	1. *Motion of a Simple Pendulum with Damping* from The Wolfram Demonstrations Project
	2. *Work in an Attractive Inverse-Square Field* from The Wolfram Demonstrations Project
	3. *Driven Damped Oscillator with Resonance Effect* from The Wolfram Demonstrations Project
	4. *Numerical Integration using Rectangles, the Trapezoidal Rule, or Simpson's Rule* from The Wolfram Demonstrations Project

Teaching Experience

Teaching at University of Bristol:

Fall/Winter 2016–2017	*Maths Single Honours Tutorial* (Analysis and Foundations and Proof)

Teaching at Adam Mickiewicz University:

Fall/Winter 2014–2015	*Computer assisted mathematics*, Exercise classes, undergraduate course
Fall/Winter 2014–2015	*Introduction to algebra and number theory*, Exercise classes, undergraduate course
Fall/Winter 2014–2015	*Introduction to mathematics*, Exercise classes, undergraduate course
Fall/Winter 2011–2012	*Linear algebra*, Exercise classes, undergraduate course
Fall/Winter 2011–2012	*Galois theory*, Exercise classes, undergraduate course

Research statement

My research focuses mainly on the arithmetic aspects of algebraic geometry. This is a varied field with many applications, even outside of mathematics. The most important work in my list is [3]. We prove in this paper the generalized Fermat theorem for three different exponents $2, 3, n$ with $n = 11$ and some

partial information about higher n. This work is only the second known case of application of the modularity method to the equation of type $x^p + y^q + z^r = 0$ with three different exponents (p, q, r).

Papers [2] and [5] address the question of existence of a uniform Zgimondy bound on the elliptic divisibility sequences. The topic of divisibility sequences is well-known and full of interesting results about Fibonacci and Lucas sequences. In my work I address the classic questions in the function field context. The first paper [5] proves the first known uniform bound which works for most elliptic curves with a fixed point. This is a breakthrough which allows to completely characterise the Zsigmondy bound in practice. Our paper [2] address the search of optimal Zsigmondy bounds (least possible) in the constant j-invariant case.

Papers [6], [8], [9],[10] and [11] study Mordell-Weil groups of various elliptic curves over function fields. I provide in each paper a different application of the general theory of Mordell-Weil lattices. The strongest application comes in the paper [10] which explains how to detect new examples of del Pezzo surfaces of degree 1 with a Zariski dense set of rational points.

Papers [1] and [9] are related by the use of the Shioda-Inose structures of K3 surfaces . Our paper [1] addresses a very difficult question of non-rationality of a certain master integral related to the Drell-Yan scattering in quantum physics. We study deeply all the geometric and arithmetic properties of the surface and speculate about further physical applications of these. In the paper [11] we construct realizations of the so-called hypergeometric motives. This is a difficult and rather technical construction which allows one to prove some interesting identities over finite fields.

Finally, papers [4] and [7] are dedicated to the study of congruences between certain modular forms. Apart from some theoretical results I have constructed an extensive database of such congruences which allowed other researchers to verify some auxiliary claims.