Michael Wallner

Curriculum Vitae

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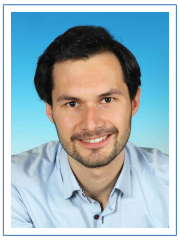

I am currently an Erwin Schrödinger-Fellow and Postdoctoral researcher at the Laboratoire Bordelais de Recherche en Informatique at the Université de Bordeaux working with Mireille Bousquet-Mélou.

Education

11/2013 – 01/2017 **PhD in Mathematics**, *TU Wien*, Austria, Analytic combinatorics, discrete mathematics, lattice paths, compacted trees.
Promotio sub auspiciis prasidentis rei publicae (Graduation with highest national distinction)

09/2011 – 09/2012 **Master of Science (MSc)**, *Brunel University London*, United Kingdom, Computational Mathematics with Modelling.
Focus: FEM- and BEM-Methods for PDEs, Variational Calculus, Perturbation Theory, Integral Equations, Monte Carlo Methods for Asset Pricing
Thesis Title: "Algebraic Multigrid Methods for Higher-Order Finite Element Discretization with Parallelization" supervised by Matthias Maischak
Graduated with highest distinction

07/2011 – 10/2013 **Master of Science (Dipl.-Ing.)**, *TU Wien*, Austria, Technical Mathematics in the Computer Sciences.
Focus: Discrete Mathematics, Calculus, Algebra, IT Security, Cryptography, Programming
Thesis Title: "Lattice Path Combinatorics" supervised by Michael Drmota
Graduated with highest distinction

10/2008 – 07/2011 **Bachelor of Science (BSc)**, *TU Wien*, Austria, Technical Mathematics in the Computer Sciences.

07/2007 – 01/2008 **Military service**, *Medic*, Austria.

09/2002 – 06/2007 **HTBL Pinkafeld – Höhere Lehranstalt für EDV und Organisation**, Austria.
Austrian Matura passed with distinction

PhD thesis

Title *Combinatorics of Lattice Paths and Tree-like Objects*

Supervisor Bernhard Gittenberger, TU Wien

Description The thesis is concerned with the enumerative and asymptotic analysis of directed lattice paths and tree-like structures. In the first part, several new models for lattice paths are introduced and some of their characterizing parameters, such as the number of returns to zero, or their average height and final altitude are analyzed. In the second part, enumerative and asymptotic results on compacted binary trees are solved. Such trees are a special class of directed acyclic graphs arising from a compressing method.

Work experience

02/2018 – present **Postdoctoral position**, *Université de Bordeaux, Laboratoire Bordelais de Recherche en Informatique (LaBRI), Bordeaux*.

09/2017 – 12/2017 **Postdoctoral position**, *Université Paris 13, Laboratoire d'Informatique de Paris Nord (LIPN), Paris*.

05/2017 – 07/2017 **Postdoctoral position**, *Academia Sinica, Institute of Statistical Science, Taipei*.

02/2017 – 04/2017 **Postdoctoral position**, *TU Wien, Institute of Discrete Mathematics and Geometry*, SFB F50-03: Combinatorics of Tree-Like Structures and Enriched Trees.

09/2015 – 01/2017 **External lecturer (side job)**, *FH Campus Wien – University of Applied Sciences*.
Small group tutoring in "Calculus 1" for electrical engineering students.

11/2013 – 04/2017 **Graduate teaching and research assistant**, *TU Wien, Institute of Discrete Mathematics and Geometry*.
Performed independent research towards obtaining a PhD, disseminated research results, undertook various teaching and grading duties.

10/2012 – 01/2013 **Undergraduate teaching assistant**, *TU Wien, Institute of Discrete Mathematics and Geometry*.
Small group tutoring in numerical mathematics.

2004 – 2011 **Internships**, (of 1–2 months).

2010/2011 AIT - Austrian Institute of Technologie, Donau-City-Str. 1, 1220 Wien.

2009 T-Systems Austria, Rennweg 97-99, 1030 Wien.

2008 Marriott Vacation Club International, 4700 Kinsale Road, Cork, Ireland.

2006 Telekom Austria AG, Lasallestr. 9, 1020 Wien.

2005 Kapsch Carrier.Com, Am Euro-Platz 5, 1120 Wien.

2004 Raiffeisen Bank International, Mooslackeng. 25, 1190 Wien.

Teaching

All courses were taught in German and were exercise classes (German: Übung).

TU Wien

2015/2016 Discrete Methods (Diskrete Methoden)

Analysis for Computer Science (Analysis für Informatik und Wirtschaftsinformatik)

2014/2015 Discrete Methods (Diskrete Methoden)

Analysis for Computer Science (Analysis für Informatik und Wirtschaftsinformatik)

Algebra and Discrete Mathematics (Algebra und Diskrete Mathematik für Informatik und Wirtschaftsinformatik)

2013/2014 Discrete Methods (Diskrete Methoden)

Algebra and Discrete Mathematics (Algebra und Diskrete Mathematik für Informatik und Wirtschaftsinformatik)

2012/2013 Numerical Analysis (Numerische Mathematik)

FH Campus Wien – University of Applied Sciences

2016/2017 Analysis 1

2015/2016 Analysis 1

Lectures

2015 Invited course "An Invitation to Analytic Combinatorics and Lattice Path Counting", 3^{rd} ALEA in Europe Young Researchers' Workshop, University of Bath, UK

Research areas

My main interest lies within (analytic) combinatorics, with an emphasis both on exact and asymptotic results for the enumeration of labeled and unlabeled structures and on probabilistic limit laws for combinatorial parameters. In line with this interest, my main focus areas are lattice path combinatorics and tree-like structures, but I am also interested in the application of methods from analytic combinatorics to number theory.

Lattice paths	Kernel method, new "unconventional" models (e.g. catastrophes, reflection, absorption, etc.), limit laws, applications
Trees	Compacted trees, directed acyclic graphs, Pólya trees, parameters
Number theory	Divisibility by prime numbers, applications of generating functions

Scientific activity

Publications	12 peer-reviewed publications, 4 additional scientific articles submitted, see Publications on page 4 for details
Talks	27 talks at international events
Reviews	Article reviewing for international journals and conferences

Computer skills

Programming	Java, C++, Fortran, Matlab, Maple
Database	Oracle, MySQL, SAP
Network	Cisco CCNA-Education
Publishing	Latex, Microsoft Office, LibreOffice, HTML

Languages

German	**Mother tongue**
English	**Proficiency (C2)**
Hungarian	**Independent user (B1)**
French	**Basic user (A1)**

Interests

Guitar	17 years of attending the music school Oberwart, member of different ensembles, participation at several concerts, ongoing member of the church ensemble Unterwart
Climbing	Member of Alpenverein Edelweiss (Austrian climbing society)
Other	Hiking, skiing, gym, board games, books

Organizational skills

2017 Member of organizing committee of the ALEA in Europe Workshop, Vienna, Austria

2017 Member of organizing committee of the European Conference on Combinatorics, Graph Theory and Applications, Vienna, Austria

2016 Member of organizing committee of the 4^{th} ALEA in Europe Young Researcher's Workshop, Vienna, Austria

2015 Member of organizing committee of AofA'15, Strobl, Austria.

2014 – present Administrator of the website of the seminar of the Arbeitsgemeinschaft Diskrete Mathematik, TU Wien, Austria.

2013 – 2017 Teaching support at the Institute of Discrete Mathematics and Geometry, TU Wien, Austria.

2011 – 2012 Student representative of course "Computational Mathematics with Modelling" at Brunel University London

2007 Team leader during final year project "Vienna Online Diabetes Education" at HTBL Pinkafeld, First prize at school competition "Jugend Innovativ", category ICT

2007 Quality management technician after ISO 9001

2005 Driving license category B (Austria)

Publications

submitted *The Tu–Deng conjecture holds almost surely*
with Lukas Spiegelhofer, 19 pages, preprint available at `arxiv.org/abs/1707.07945`.

submitted *A bijection of plane increasing trees with relaxed binary trees of right height at most one*
15 pages, preprint available at `arxiv.org/abs/1706.07163`.

submitted *Asymptotic enumeration of compacted binary trees*
with Antoine Genitrini, Bernhard Gittenberger, Manuel Kauers, 43 pages, preprint available at `arxiv.org/abs/1703.10031`.

submitted *A half-normal distribution scheme for generating functions*
24 pages, preprint available at `arxiv.org/abs/1610.00541`.

Peer-reviewed Journals and Book Series

accepted *Divisibility of binomial coefficients by powers of two*
with Lukas Spiegelhofer, Journal of Number Theory, Elsevier, 2018, preprint available at `arxiv.org/abs/1710.10884`.

accepted *Explicit formulas for enumeration of lattice paths: basketball and the kernel method*
with Cyril Banderier, Christian Krattenthaler, Alan Krinik, Dmitry Kruchinin, Vladimir Kruchinin and David Nguyen, Developments in Mathematics Series, Springer, 2017, preprint available at `arxiv.org/abs/1609.06473`.

accepted *The kernel method for lattice paths below a line of rational slope*
with Cyril Banderier, Developments in Mathematics Series, Springer, 2017, preprint available at `arxiv.org/abs/1606.08412`.

2018 *On the shape of random Pólya structures*
with Bernhard Gittenberger and Emma Yu Jin, Discrete Mathematics, Volume 341, Issue 4, April 2018, Pages 896âĂŞ911, preprint available at `arxiv.org/abs/1707.02144`.

2017 *Lattice paths with catastrophes*
with Cyril Banderier, Discrete Mathematics and Theoretical Computer Science, 2017, preprint available at `arxiv.org/abs/1707.01931`.

2017 *An explicit generating function arising in counting binomial coefficients divisible by powers of primes*
with Lukas Spiegelhofer, Acta Arithmetica 181 (2017), 27-55, preprint available at `arxiv.org/abs/1604.07089`.

Peer-reviewed Proceedings

submitted *Periodic Pólya Urns and an Application to Young Tableaux*
with Cyril Banderier and Philippe Marchal, 12 pages.

2017 *Lattice paths with catastrophes*
with Cyril Banderier, Electronic Notes in Discrete Mathematics, 59:131-146, 2017.

2017 *A note on the scaling limits of random Pólya trees*
with Bernhard Gittenberger and Emma Yu Jin, 2017 Proceedings of the Fourteenth Workshop on Analytic Algorithmics and Combinatorics (ANALCO), 85-93, 2017, preprint available at `arxiv.org/abs/1606.08769`.

2016 *A half-normal distribution scheme for generating functions and the unexpected behavior of Motzkin paths*
in Proceedings of the 27th International Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms (`http://www.aofa2016.meetings.pl/`), Krakow, pages 341-352, preprint available at `arxiv.org/abs/1605.03046`.

2016 *The reflection-absorption model for directed lattice paths*
with Cyril Banderier, in Proceedings of the Vienna Young Scientists Symposium (`http://vss.tuwien.ac.at/home/`), Vienna, pages 98-99.

2015 *Lattice paths of slope 2/5*
with Cyril Banderier, in Proceedings of the Twelfth Workshop on Analytic Algorithmics and Combinatorics (ANALCO), San-Diego, pages 105-113, preprint available at `arxiv.org/abs/1605.02967`.

2014 *Some reflections on directed lattice paths*
with Cyril Banderier, in Proceedings of the 25th International Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms (AofA 2014) (`http://www.aofa14.upmc.fr/`), Paris, pages 25-36, preprint available at `arxiv.org/abs/1605.01687`.

Theses

2017 *Combinatorics of lattice paths and tree-like structures*
PhD thesis, TU Wien, Vienna.

2013 *Lattice path combinatorics*
Master's thesis, TU Wien, Vienna.

2012 *Algebraic multigrid methods for higher-order finite element discretization with parallelization*
Master's thesis, Brunel University, London.