# MANUEL HAUKE

Mathematician - Number Theory

## PERSONAL DATA & CONTACT INFORMATION

- **Birthday:** 1996, in Austria.

- **Citizenship:** Austrian.

- **Working address:** University of York, Department of Mathematics, York YO10 5DD United Kingdom.

- **Mail adress:** manuel.hauke@ntnu.no

- **Language skills:** German (native), English (fluent), French (basics), Latin (basics), Spanish (basics)

## SCIENTIFIC DEVELOPMENT

**August 2024 -**
**Post-Doc, mentored by Prof. Sigrid Grepstad and Prof. Kristian Seip**

NTNU Trondheim

**Jan 2024 - Mar 2024**
**Junior Fellow**

Institut Mittag-Leffler, Stockholm
Program: "Analytic number theory".

**October 2023 - July 2024**
**Post-Doc, mentored by Prof. Victor Beresnevich and Prof. Sanju Velani**

University of York
EPSRC grant: "The inhomogeneous Duffin-Schaeffer conjecture".

**July 2023 - September 2023**
**Post-Doc, mentored by Prof. Christoph Aistleitner.**

Institute of Analysis and Number Theory, Graz University of Technology (Austria)
FWF grant: "Zufall und Determinismus in Analysis und Zahlentheorie".

**October 2020 - June 2023**
**Ph.D. in Mathematics, supervised by Prof. Christoph Aistleitner.**

Institute of Analysis and Number Theory, Graz University of Technology (Austria), graduation with distinction.
Thesis: "Analytic methods in Diophantine approximation and Poissonian correlations".

**2018 - 2020**
**Master studies Mathematics, Focus area: Discrete Mathematics and theory of algorithms**

Graz University of Technology (Austria), graduation with distinction.
Thesis: "Signature Gröbner bases: A comprehensive survey and a new algorithmic approach"

**2015 - 2018**
**Bachelor studies Mathematics, Focus area: Discrete Mathematics and theory of algorithms**

Graz University of Technology (Austria), graduation with distinction.

# RESEARCH INTERESTS

**Analytic number theory**, in particular in connection with:

- **Diophantine approximation** and **continued fractions**
- **Fine-scale statistics** (such as **Poissonian correlations**) and **Uniform distribution** of sequences.
- **Metric number theory**
- **Dynamics** of the **irrational circle rotation**.

Additionally, I am eager to learn about new areas of mathematics that are connected to number theory.

# TEACHING EXPERIENCE

**October 2018 - July 2020**
**Student assistant, University of Technology Graz (Austria)**

Teaching exercise classes (approx. 40 students each class) in analysis for undergraduate IT students

**October 2020 - July 2023**
**University assistant, University of Technology Graz (Austria)**

Teaching exercises classes for undergraduate engineer students, in analysis and linear algebra.
Several lectures (approx. 200-300 students each lecture) as a backup teacher in analysis
for electrical engineers and Analysis for mathematics undergraduates)

# GRANTS & AWARDS

**"Merit-Based Scholarship"**
**for above-average results during all my undergraduate years (2015-2020).**

**Best Paper Award 2022 Doctoral School Mathematics and Scientific Computing (KFU + TU Graz)**
**for the article "Metric density results for the value distribution of Sudler products".**

**Junior fellowship for the program "Analytic Number Theory", Jan 2024 - Mar 2024**
**Institut Mittag-Leffler, Stockholm.**

**Josef-Krainer-Förderungspreis 2024**
**awarded for my dissertation.**

**Studienpreis 2024 of the Austrian Mathematical Society (ÖMG)**
**awarded for my dissertation.**

# PUBLICATIONS

[1] **Poissonian correlations of higher orders (with A. Zafeiropoulos)**
**J. Number Theory 243 (2023), 202-240.**

[2] **On extreme values for the Sudler product of quadratic irrationals**
**Acta. Arith. 204 (2022), 41-82.**

[3] **Weak Poissonian Correlations (with A. Zafeiropoulos)**
**Ann. Mat. Pura Appl. (2024).**

[4] **On the metric theory of approximations by reduced fractions: a quantitative Koukoulopoulos-Maynard theorem (with C. Aistleitner and B. Borda)**
Compos. Math. 159(2) (2023), 207-231.

[5] **Metric density results for the value distribution of Sudler products**
Proc. Am. Math. Soc. 151 (2023), 2339-2351.

[6] **A Signature-Based Gröbner Basis Algorithm with Tail-Reduced Reductors (M5GB) (with L. Lamster, R. Lüftenegger and C. Rechberger)**
submitted, arXiv:2208.00844.

[7] **On the distribution of partial quotients of reduced fractions with fixed denominator (with C. Aistleitner and B. Borda)**
Trans. Am. Math. Soc. 377(2) (2024), 1371–1408.

[8] **On the asymptotic behaviour of Sudler products for badly approximable numbers**
J. Math. Anal. Appl. 531(1) (2024), 127737.

[9] **On the metric upper density of Birkhoff sums for irrational rotations (with L. Frühwirth)**
Nonlinearity 36 (2023), 7065.

[10] **On Birkhoff sums that satisfy no temporal distributional limit theorem for almost every irrational (with L. Frühwirth)**
Ann. H. Lebesgue, to appear; arXiv:2308.11286.

[11] **Limit laws for cotangent and Diophantine sums (with B. Borda and L. Frühwirth)**
submitted, arXiv:2308.12085.

[12] **Quantitative inhomogeneous Diophantine approximation for systems of linear forms**
submitted, arXiv:2312.01986.

[13] **Hausdorff dimension estimates for Sudler products with positive lower bound (with D. Gayfulin)**
submitted, arXiv:2312.06548.

[14] **On sequences with exponentially distributed gaps (with C. Aistleitner and A. Zafeiropoulos)**
submitted, arXiv:2312.08289.

[15] **The Duffin-Schaeffer conjecture for multiplicative Diophantine approximation (with L. Frühwirth)**
submitted, arXiv:2403.11257.

[16] **Proving the Duffin-Schaeffer conjecture without GCD graphs (with S. Vazquez and A. Walker)**
submitted, arXiv:2404.15123.

[17] **On inhomogeneous Poissonian Pair Correlations (with A. Zafeiropoulos)**
submitted, arXiv:2404.16542.

[18] **Borel-Cantelli, zero-one laws and inhomogeneous Duffin-Schaeffer (with V. Beresnevich, and S. Velani)**
submitted, arXiv:2406.19198.

[19] **The Duffin-Schaeffer conjecture with a moving target (with F. A. Ramírez)**
submitted, arXiv:2407.05344.

# ATTENDED CONFERENCES

**Genova - Graz Number Theory Workshop**
Genova, Italy, 2022

**MCQMC 2022**
Linz, Austria, 2022

**Excursions in Analysis**
Trondheim, Norway, 2022

**Diophantine Analysis, Dynamics and Related Topics**
Haifa, Israel, 2023

**Journée d'Arithmétique 2023**
Nancy, France, 2023

**Heidelberg Laureate Forum 2023**
Heidelberg, Germany, 2023

**Analytic Number Theory**
Institute Mittag-Leffler (Stockholm), Sweden, 2024

**Diophantine Approximation, Fractal Geometry and Related topics**
Paris, France, 2024

**Distribution of orbits: Arithmetics and Dynamics**
Sachseln, Switzerland, 2024

# SCIENTIFIC TALKS

**MCQMC 2022, Linz**
The metric theory of approximations by reduced fractions: Quantifying the Duffin-Schaeffer conjecture.

**One World Numeration seminar (OWNS) 2022 (online)**
The asymptotic behaviour of Sudler products

**Workshop at Diophantine Analysis, Dynamics and Related Topics 2023, Haifa**
The metric theory of approximations by reduced fractions: Quantifying the Duffin-Schaeffer conjecture.

**Journée d'Arithmétique 2023, Nancy**
The distribution of partial quotients of reduced fractions with fixed denominator.

**Number Theory seminar 2023, University of York**
On Birkhoff sums and metric Diophantine Approximation.

**Number Theory seminar 2023, University of Warwick (invited speaker)**
On Birkhoff sums and metric Diophantine Approximation.

**Institut Mittag-Leffler 2024, Stockholm**
The Duffin-Schaeffer conjecture and beyond

**London Number Theory Seminar 2024, King's College London (invited speaker)**
Duffin-Schaeffer meets Littlewood and related topics

**Oxford Junior Number Theory seminar 2024 (invited speaker)**
Duffin-Schaeffer meets Littlewood and related topics

**Number Theory seminar 2023, University of York**
Proving Duffin–Schaeffer in one hour: An argument without quality.