Frederik Broucke

Curriculum Vitae

Personal Data

Name	Frederik Broucke
Date of birth	10 August 1996
Nationality	Belgian
Affiliation	Ghent University, Department of Mathematics: Logic, Analysis and Discrete Mathematics
address	Krijgslaan 281, building S8, 9000 Ghent, Belgium
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Current Appointment

2022–Present Junior postdoctoral fellow of the Research Foundation-Flanders (FWO)

Education

2018–2022 **Doctor of Science in Mathematics**, *Ghent University*
Thesis: Asymptotic methods in number theory and analysis
Advisors: Prof. Dr. Jasson Vindas, Dr. Gregory Debruyne

2016–2018 **Master of Science in Mathematics**, *Ghent University*, Graduated with greatest distinction
Thesis: Exponential sums and applications in number theory and analysis
Advisor: Prof. Dr. Jasson Vindas

2013–2016 **Bachelor of Science in Mathematics**, *Ghent University*, Graduated with greatest distinction

Grants and Fellowships

2022–2025 Research Foundation Flanders junior postdoctoral fellowship (12ZZH23N)
Project: *Advances in the theory of Beurling generalized primes*

Awards

2018 *Award Prof. Frans Wuytack* - awarded to the graduating Master in Mathematics with the highest grades during his/her education.

Preprints

- F. Broucke, T. Hilberdink, *A mean value theorem for general Dirichlet series*, 19 pages.
- F. Broucke, G. Debruyne, Sz. Révész, *Some examples of well-behaved Beurling number systems*, 22 pages, Preprint: arXiv:2309.01567.
- F. Broucke, J. Vindas, *A new generalized prime random approximation procedure and some of its applications*, 15 pages, Preprint: arXiv:2102.08478.

Published Articles

[12] F. Broucke, S. Weishäupl, *On the Lindelöf hypothesis for general sequences*, to appear in Mathematika, 24 pages, Preprint: arXiv:2307.00239.

[11] F. Broucke, T. Hilberdink, *An Omega-result for Beurling generalized integers*, to appear in Acta Arith. 10 pages.

[10] F. Broucke, A. Kouroupis, K.-M. Perfekt, *A note on Bohr's theorem for Beurling integer systems*, to appear in Math. Ann., 11 pages, Preprint: arXiv:2301.11782

[9] F. Broucke, J. Vindas, *The pointwise behavior of Riemann's function*, J. Fractal Geom. **10** (2023), no. 3/4, 333-349.

[8] F. Broucke, G. Debruyne, *On zero-density theorems and the PNT in short intervals for Beurling generalized numbers*, Acta Arith. **207** (2023), 365-391.

[7] F. Broucke, Lj. Oparnica, *Distributed-order time-fractional wave equations*, Z. Angew. Math. Phys. **74**:1 article 19 (2023).

[6] F. Broucke, G. Debruyne, J. Vindas, *The optimal Malliavin-type remainder for Beurling generalized integers*, J. Inst. Math. Jussieu. **23**(1) (2024), 249–278.

[5] F. Broucke, Lj. Oparnica, *Micro-local and qualitative analysis of the fractional Zener wave equation*, J. Differ. Equ., **321** (2022), 217-257.

[4] F. Broucke, *Note on a conjecture of Bateman and Diamond concerning the abstract PNT with Malliavin-type remainder*, Monatsh. Math. **196** (2021), no. 3, 456-470.

[3] F. Broucke, G. Debruyne, J. Vindas, *On the absence of remainders in the Wiener-Ikehara and Ingham-Karamata theorems: a constructive approach*, Proc. Amer. Math. Soc. **149** (2021), 1053-1060.

[2] F. Broucke, G. Debruyne, J. Vindas, *An asymptotic analysis of the Fourier-Laplace transforms of certain oscillatory functions*, J. Math. Anal. Appl. **494** (2021), article number 124450.

[1] F. Broucke, G. Debruyne, J. Vindas, *Beurling integers with RH and large oscillation*, Adv. Math. **370** (2020), article number 107240.

Selected Talks

20/12/2023 *Bohr's theorem for Beurling integer systems*
Young Scholar Day of the Belgian Mathematical Society

7/12/2023 *Examples of well-behaved Beurling number systems*
Number theory seminar, University of British Columbia (online)

2/10/2023 *On the Lindelöf hypothesis for general sequences*
Analysis seminar, NTNU, Trondheim, Norway.

4/07/2023 *Zero-density estimates for Beurling generalized numbers*
Journées Arithmétiques, Nancy, France.

2/06/2023 *On the Lindelöf hypothesis for general sequences*
Analysis seminar, University of Reading, UK.

8/02/2023 *Zero-density estimates for Beurling numbers*
Oberseminar Zahlentheorie, Julius-Maximilians Universität Würzburg, Germany.

21/10/2022 *Beurling's function and generalizations*
Ghent-HFUT Analysis Workshop (online), Ghent, Belgium.

13/10/2022 *Zero-density estimates for Beurling numbers*

Séminaire de l'équipe Algèbre, Dynamique et Arithmétique, Université Littoral Côte d'Opale, Calais, France.

23/08/2022 *Well-behaved Beurling number systems*
ELAZ 2022, Poznań, Poland.

5/07/2022 *Malliavin's problems for Beurling generalized primes*
Number Theory Conference 2022, Debrecen, Hungary.

29/06/2022 *An introduction to Beurling generalized prime numbers*
Early Number Theory Researchers Seminar (online).

22/06/2022 *Well-behaved Beurling number systems*
Séminaire de Théorie des Nombres de Nancy-Metz, Nancy, France.

13/05/2022 *An introduction to Beurling generalized primes*
PhD day of the Belgian Mathematical Society, Liège, Belgium.

12/04/2022 *Malliavin's problems for Beurling generalized primes*
Analysis seminar, University of Reading, UK.

29/03/2022 *Pointwise analysis of Riemann's other function*
Young Scholars in the Analytic Theory of Numbers and Automorphic Forms, Mathematical Institute, Bonn, Germany.

4/08/2021 *Analysis of the fractional Zener wave equation*
13th international ISAAC congress (online), Ghent, Belgium.

1/09/2020 *Beurling integers with RH and large oscillation*
International Conference on Generalized Functions, Ghent, Belgium.

29/07/2019 *Absence of remainders in the Wiener-Ikehara theorem*
12th international ISAAC congress, Aveiro, Portugal.

Conferences, Workshops, and Research visits

Conferences

- Journées Arithmétiques 2023, Nancy, France, 3–7 July 2023.
- ELAZ 2022, Poznań, Poland, 22–26 August 2022.
- Number Theory Conference 2022, Debrecen, Hungary, 4–8 July 2022.
- Young Scholars in the Analytic Theory of Numbers and Automorphic Forms, Mathematical Institute, Bonn, Germany, 28–29 March 2022.
- 13-th ISAAC congress, Ghent, Belgium, 2–6 August 2021.
- International Conference on Generalized Functions, Ghent, Belgium, 31 August–4 September 2020.
- 12-th ISAAC congress, Aveiro, Portugal, 29 July–2 August 2019.

Workshops

- Hausdorff Summer School: the circle method, on line, 10–21 May 2021.
- Specialist course on inverse spectral and scattering problems, Ghent, 27 Februari–9 March 2020.

Research visits

- Visit to Prof. Lj. Oparnica and Prof. D. Zorica at the University of Novi Sad, Novi Sad, Serbia, 20–29 November 2023.

- Visit to Prof. K.-M. Perfekt and A. Kouroupis at the Norwegian University of Science and Technology, Trondheim, Norway, 2–6 October 2023.
- Visit to Prof. T. Hilberdink at the University of Reading, UK, 25 May–2 June 2023.
- Visit to Prof. J. Steuding and S. Weishäupl at the Julius-Maximilians Universität Würzburg, Würzburg, Germany, 7–9 February 2023.
- Visit to Prof. Sz. Gy. Révész at the Alfréd Rényi Institute of Mathematics, Budapest, Hungary, 11–15 July 2022.
- Visit to Prof. G. Tenenbaum at the Institut Élie Cartan de Lorraine, France, 20–24 June 2022.
- Visit to Prof. T. Hilberdink at the University of Reading, UK, 4–12 April 2022.

Teaching Experience

Ghent university

- Differential Geometry: lecturer in charge (2023–present, 2 times).
- Functional Analysis: co-lecturer (2023, 1 time).
- Differential Geometry I: teaching assistent (2018–2022, 4 times).
- Analysis II: teaching assistent (2018–2021, 3 times).
- Supervisor of Bachelor thesis: Lisa De Troy (2024).
- Co-supervisor of three Bachelor theses: Morgan Callewaert (2021), Aäron Roex (2021), Laure Roelant (2022).
- Jury member of two Master theses defenses: Nathan Steyaert (2021) and Yarne Tranoy (2023).

Memberships

I am a member of the following mathematical societies:

- Belgian Mathematical Society (BMS).
- International Society for Analysis, its Applications and Computation (ISAAC).

Community service

Reviewer for MathSciNet.

Reviewer for Analysis Mathematica.

2023–Now Organizer of the local analysis seminar.

2021–Now Member of the department council of the department of Mathematics: Analysis, Logic and Discrete Mathematics.

Language Skills

Dutch	Mother language
English	Fluent
French	Good command