Harold Nieuwboer

Curriculum Vitae

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Personal details

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Date of birth	January 16th, 1999
Citizenship	Dutch
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Positions

- Postdoctoral researcher, 01/01/2024 – ongoing, University of Copenhagen, advised by Matthias Christandl and Laura Mančinska:
- Researcher, 01/10/2023 – 31/12/2023, University of Amsterdam, Korteweg-de Vries Institute for Mathematics and QuSoft, Amsterdam:
- PhD student in Mathematics, 01/10/2019 – 31/09/2023, University of Amsterdam, Korteweg-de Vries Institute for Mathematics and QuSoft, Amsterdam, advised by prof. Michael Walter and prof. Eric Opdam. Thesis title: "Classical and quantum algorithms for scaling problems".
- Teaching assistant, 01/09/2018 – 31/07/2019, Vrije Universiteit Amsterdam, Faculty of Science, Amsterdam:
- Student research assistant: 01/10/2014 – 30/09/2016, Vrije Universiteit Amsterdam, Faculty of Behavioural and Movemental Sciences, Amsterdam, advised by prof. Dorret Boomsma:

Education

- 01/10/2019 – 31/08/2023: PhD in Mathematics, University of Amsterdam. Degree awarded on 31/01/2024. Thesis title: "Classical and quantum algorithms for scaling problems".
  Advisors: prof. M. Walter and prof. E. Opdam.
  Committee members: prof. Peter Bürgisser, prof. Harry Buhrman, dr. Daniel Dadush, dr. Omar Fawzi, prof. Christian Schaffner, prof. Ronald de Wolf, and dr. Jeroen Zuiddam.
- 01/09/2018 – 31/08/2019: MSc in Mathematics, cum laude, Vrije Universiteit Amsterdam. Thesis title: "Differential topology of symplectic toric manifolds". Advisor: dr. Thomas Rot. Degree awarded on 31/08/2019.
- 01/10/2017 – 31/08/2018: Master of Advanced Study in Pure Mathematics, University of Cambridge. Degree awarded on 21/07/2018.
- 01/09/2014 – 31/08/2017: BSc in Mathematics, cum laude, Vrije Universiteit Amsterdam. Thesis title: "On the equivalence between Morse homology and singular homology". Advisor: dr. O. Fabert. Degree awarded on 31/07/2017.

Publications in journals and peer-reviewed conferences:

Selected publications:

- 2023, Interior-point methods on manifolds: theory and applications.
  H. Hirai, H. Nieuwboer, M. Walter

IEEE 64th Annual Symposium on Foundations of Computer Science (FOCS)
DOI: 10.1109/FOCS57990.2023.00123

- 2023, The minimal canonical form of a tensor network
A. Acuaviva, V. Makam, H. Nieuwboer, D. Pérez-García, F. Sittner, M. Walter, F. Witteveen
IEEE 64th Annual Symposium on Foundations of Computer Science (FOCS)
DOI: 10.1109/FOCS57990.2023.00027

Also appeared as a short plenary talk at Quantum Information Processing in 2023.

Publications on quantum algorithms:

- 2024, Basic quantum subroutines: finding multiple marked elements and summing numbers
J. van Apeldoorn, S. Gribling, H. Nieuwboer
Quantum 8, 1284
DOI: 10.22331/q-2024-03-14-1284
- 2022, Improved Quantum Lower and Upper Bounds for Matrix Scaling
S. Gribling, H. Nieuwboer
39th International Symposium on Theoretical Aspects of Computer Science, STACS 2022.
DOI: 10.4230/LIPIcs.STACS.2022.35
- 2021, Quantum Algorithms for Matrix Scaling and Matrix Balancing J. van Apeldoorn, S. Gribling, Y. Li, H. Nieuwboer, M. Walter, and R. de Wolf 48th International Colloquium on Automata, Languages, and Programming, ICALP 2021. DOI: 10.4230/LIPIcs.ICALP.2021.110

Publications in statistical genetics:

- 2018, An Extended Twin-Pedigree Study of Neuroticism in the Netherlands Twin Register
D. I. Boomsma, Q. Helmer, H. A. Nieuwboer, J. J. Hottenga, M. H. de Moor, S. M. van den Berg, G. E. Davies, J. M. Vink, M. J. Schouten, C. V. Dolan, G. Willemsen, M. Bartels, T. C. E. M. van Beijsterveldt, L. Ligthart, and E. J. de Geus
Behavior Genetics, 48.
DOI: 10.1007/s10519-017-9872-0
- 2016, GWIS: Genome-Wide Inferred Statistics for Functions of Multiple Phenotypes
H. A. Nieuwboer, R. Pool, C. V. Dolan, D. I. Boomsma, and M. G. Nivard
American Journal of Human Genetics, 99 (4).
DOI: 10.1016/j.ajhg.2016.07.020
- 2016, The Computerized Neurocognitive Battery: Validation, aging effects, and heritability across cognitive domains
S. C. Swagerman, E. J. C. de Geus, K.-J. Kan, E. van Bergen, H. A. Nieuwboer, M. M. G. Koenis, H. E. Hulshoff Pol, R. E. Gur, R. C. Gur, and D. I. Boomsma
Neuropsychology, 30 (1).
DOI: 10.1037/neu0000248

Preprints

- 2024, Asymptotic tensor rank is characterized by polynomials
M. Christandl, K. Hoeberechts, H. Nieuwboer, P. Vrana, J. Zuiddam
arXiv preprint arXiv:2411.15789
- 2020, Interior-point methods for unconstrained geometric programming and scaling problems
P. Bürgisser, Y. Li, H. Nieuwboer, M. Walter
arXiv preprint arXiv:2008.12110

Awards

- 2021: Oberwolfach Leibniz Graduate Student. Awarded to financially support participation in the workshop "Geometry and Optimization in Quantum Information".
- 2015: Young Talent Encouragement Award 2015, Royal Dutch Society of Sciences. Awarded for being the best first-year BSc student in Mathematics at the Vrije Universiteit Amsterdam.
- 2014: University Research Fellow, Vrije Universiteit Amsterdam. Appointed by prof. Dorret Boomsma. This allowed me to perform research in statistical genetics for two years and to attend the International Twin Workshop in Boulder, Colorado, US in 2015.

Scientific talks:

Peer-reviewed conference talks:

- Interior-point methods on manifolds: theory and applications, Foundations of Computer Science 2023 (FOCS '23), Santa Cruz, CA, USA, November 9th, 2023.
- The minimal canonical form of a tensor network, Foundations of Computer Science 2023 (FOCS '23), Santa Cruz, CA, USA, November 6th, 2023.
- Improved quantum lower and upper bounds for matrix scaling, 30th International Sympsosium on Theoretical Aspects of Computer Science (STACS '22), Marseille, France (Online), March 17th, 2022.
- Quantum algorithms for matrix scaling and matrix balancing, International Colloquium on Automata, Languages and Programming (ICALP), Glasglow (online), July 2021.
- Quantum algorithms for matrix scaling and matrix balancing, Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC), Riga (online), July 2021.

Invited talks:

- Stability and moment polytopes of tensors, Mathematics and Computation: Tensor Ranks and Tensor Invariants, Ruhr University Bochum, Bochum, Germany, June 13th, 2024
- Moment polytopes in action, Summer Research School on Applications of Representation Theory in Topological Data Analysis & Geometric Invariant Theory, UQAM, Montreal, QC, Canada, June 3rd, 2024.
- Interior-point methods on manifolds: theory and applications, Algorithms and Complexity seminar, University of Waterloo, Waterloo, ON, Canada, November 15th, 2023.
- The minimal canonical form of a tensor network, SIAM Conference on Applied Algebraic Geometry (SIAM AG23), TU Eindhoven, Eindhoven, The Netherlands, July 12th, 2023.
- Interior-point methods on manifolds: theory and applications, Optimization at Bernoulli Institute, Universiteit Groningen, Groningen, The Netherlands, June 20th, 2023.
- Interior-point methods on manifolds: theory and applications, AlgoComp Seminar, Institut de recherche en informatique fondamentale (IRIF), Paris, France, April 12th, 2023.
- What is… a scaling problem? Workshop on Algebra, Geometry and Computation, CWI, Amsterdam, The Netherlands, March 9th, 2023.
- Quantum algorithms for matrix scaling and balancing, 36th Mini-Workshop Theoretical Computer Science'' at TU Dortmund and Ruhr University Bochum (online), November 21st, 2022.
- The minimal canonical form of a tensor network, Algebraic geometry and complexity theory workshop, part of Algebraic Geometry with Applications to TEnsors and Secants (AGATES). Institute of Mathematics of Polish Academy of Sciences, Warsaw, Poland, November 17th, 2022.

- Quantum algorithms for matrix scaling, Oberwolfach Research Institute for Mathematics,

Workshop on Geometry and Optimization in Quantum Information, October 2021.

- Efficient Algorithms for Torus Actions, SIAM Conference on Applied Algebraic Geometry (AG21), MS10 Optimization and Invariant Theory, August 2021.
- Interior-point methods for unconstrained geometric programming and commutative scaling, Kolloquium, Algorithmische Algebra, Technische Universität Berlin, February 2021.

Seminars:

- Asymptotic tensor rank is characterized by polynomials, QLunch, University of Copenhagen, Copenhagen, Denmark, December 11th, 2024.
- Entanglement polytopes of multipartite quantum states, QLunch, University of Copenhagen, Copenhagen, Denmark, March 27th, 2024.
- Computational problems & GIT setup, Algebra, Algorithms, Complexity, Ruhr University Bochum, Bochum, Germany, May 2nd, 2023.
- Faster algorithms for basic quantum subroutines, Quantum Information Colloquium, Ruhr University Bochum, Bochum, Germany, April 17th, 2023.
- Interior-point methods on manifolds, Contributed PhD talk at Dutch Optimization Seminar (online), March 30th, 2023.
- Quantum Catch-Em-All, QuSoft Junior Meeting, Amsterdam, The Netherlands, March 15th, 2023.
- Convex optimization and the quantum scientist, QuSoft Junior Meeting, Amsterdam, The Netherlands, February 16th, 2022
- First-order algorithms, Reading group: From Euclidean to Geodesic Convex Optimization, Amsterdam, July 2021.
- Quantum algorithms for matrix scaling and matrix balancing, Dutch Optimization Seminar, Lightning Talks, February 2021.
- Norm minimization and scaling algorithms, QuSoft Junior meeting, Centrum Wiskunde & Informatica, Amsterdam, February 2020.
- Morse homology, Part III seminars, Department of Pure Mathematics and Mathematical Statistics, Cambridge, November 2017.

Supervision

- 2022, Kornelis Dekinga and Dylan Goudberg, second-year BSc project, University of Amsterdam. Jointly supervised with Galina Pass. Title: "Quantum Multi-Armed Bandit Algorithm
- 2022, Simon Jonker and Lois de la Mar, second-year BSc project, University of Amsterdam. Jointly supervised with Galina Pass. Title: "Finding triangles in graphs"
- 2021, Quirijn Boeren and Alex Hanrath, second-year BSc project, University of Amsterdam. Title: "A Quantum Walk Algorithm for Unstructured Search"

Teaching activity

- 2022, Topology, University of Amsterdam, Teaching assistant with Jo Ellis-Monaghan.
- 2022, Quantum Information Theory, University of Amsterdam and MasterMath, Teaching assistant with Jonas Helsen and Maris Ozols.
- 2021, Topology, University of Amsterdam, Teaching assistant with Jo Ellis-Monaghan.
- 2021, Analyse 4, University of Amsterdam, Teaching assistant with Han Peters.

- 2020, Quantum Information Theory, University of Amsterdam and MasterMath, Teaching assistant with Maris Ozols and Michael Walter.
- 2019, Vector Calculus, Amsterdam University College, Co-lecturer with Steffen Löbrich.
- 2019, Mathematical Analysis, Vrije Universiteit Amsterdam, Teaching assistant with Joost Hulshof.
- 2019, Introduction to Mathematical Modelling, LaTeX and Mathematica, Vrije Universiteit Amsterdam, Teaching assistant with Thomas Rot and Sophia de Jong.
- 2018, Stochastic Modelling, Vrije Universiteit Amsterdam, Teaching assistant with Wouter Kager.
- 2018, Basic Concepts in Mathematics, Vrije Universiteit Amsterdam, Teaching assistant with Bob Rink and Sophia de Jong.

Refereeing activities

Refereed for: Annual ACM Symposium on the Theory of Computing (STOC), Quantum Information Processing (QIP), Theory of Quantum Computation, Communication and Cryptography (TQC), ACM-SIAM Symposium on Discrete Algorithms (SODA), Journal of Optimization Theory and Applications, NeurIPS, SIAM Journal on Computing, IEEE Transactions on Quantum Engineering, Quantum.

Other activities

- Co-organized "Minisymposium on Quantum Optimization and Geometry", at CWI, Amsterdam, The Netherlands on February 1st, 2024, with M. Walter.
- Co-organized QuSoft "Junior meeting" from 2021 to 2023, first with A. Cornelissen and later with L. Engelberts.
- Co-organized reading group "From Euclidean to Geodesic Convex Optimization", Spring-Fall 2020, with Y. Li and M. Walter.
- Language: Fluency in Dutch and English, and basic skills in French, German, Spanish and Danish.
- Strong familiarity with Linux, Git and Github, LaTeX, Java, Python, Julia, SageMath, and NumPy.