Jeroen Zuiddam

Curriculum vitae

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1. Contact information

Korteweg–de Vries Institute for Mathematics
University of Amsterdam
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1098 XG Amsterdam
The Netherlands
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2. Research interests

Algebraic complexity theory, amortized complexity, direct sum theorems, catalytic computation, quantum information theory, communication complexity, discrete mathematics and graph theory, Ramsey-type problems, applied representation theory and algebraic geometry

3. Education

2018   PhD, *cum laude*, Mathematics and Computer Science, University of Amsterdam

2014   MSc Mathematics, *cum laude*, University of Amsterdam

2012   BSc Mathematics, *cum laude*, University of Amsterdam
        BSc Computer Science, *cum laude*, University of Amsterdam

4. Professional appointment

2021 –   Assistant Professor, Korteweg–de Vries Institute for Mathematics, University of Amsterdam

2020 – 2021   Simons Junior Fellow, Courant Institute, New York University, NY hosted by Oded Regev

2018 – 2020   Postdoctoral member, School of Mathematics, Institute for Advanced Study, Princeton, NJ hosted by Avi Wigderson

2014 – 2018   Doctoral student, Centrum Wiskunde & Informatica, Amsterdam
              Centrum Wiskunde & Informatica (CWI) is the national research institute for mathematics and computer science in the Netherlands.

5. Scientific publication

5.1. PhD thesis

Algebraic complexity, asymptotic spectra and entanglement polytopes,
University of Amsterdam, October 2018

Advisors: Harry Buhrman and Matthias Christandl

`https://hdl.handle.net/11245.1/9a8030e9-f708-4c95-9d50-f2a5919e75ed`

5.2. Scientific journals

1. J. Zuiddam, *A note on the gap between rank and border rank*, Linear Algebra and its Applications, 2017
   `arxiv:1504.05597`, `doi:10.1016/j.laa.2017.03.015`

2. J. Briët and J. Zuiddam, *On the orthogonal rank of Cayley graphs and impossibility of quantum round elimination*, Quantum Information and Computation, 2017
   `arxiv:1608.06113`, `http://www.rintonpress.com/xxqic17/qic-17-12/0106-0116.pdf`

3. H. Buhrman, M. Christandl, C. Perry and J. Zuiddam, *Clean quantum and classical communication protocols*, Physical Review Letters, 2016
   `arxiv:1605.07948`, `doi:10.1103/PhysRevLett.117.230503`

4. M. Christandl, A.K. Jensen and J. Zuiddam, *Tensor rank is not multiplicative under the tensor product*, Linear Algebra and its Applications, 2018
   `arxiv:1705.09379`, `doi:10.1016/j.laa.2017.12.020`

5. M. Christandl and J. Zuiddam, *Tensor surgery and tensor rank*, Computational complexity, 2018
   `arxiv:1606.04085`, `doi:10.1007/s00037-018-0164-8`

6. K. Bringmann, C. Ikenmeyer and J. Zuiddam, *On algebraic branching programs of small width*, Journal of the ACM, 2018
   `arxiv:1702.05328`, `doi:10.1145/3209663`

7. M. Christandl, P. Vrana and J. Zuiddam, *Asymptotic tensor rank of graph tensors: beyond matrix multiplication*, Computational complexity, 2018
   `arxiv:1609.07476`, `doi:10.1145/3209663`

8. M. Bläser, M. Christandl and J. Zuiddam, *The border support rank of two-by-two matrix multiplication is seven*, Chicago Journal of Theoretical Computer Science, 2018
   `arxiv:1705.09652`, `doi:10.4086/cjtcs.2018.005`

9. J. Zuiddam, *The asymptotic spectrum of graphs and the Shannon capacity*, Combinatorica, 2019
   `arxiv:1807.00169`, `doi:10.1007/s00493-019-3992-5`

10. S. Arunachalam, P. Vrana and J. Zuiddam, *The asymptotic induced matching number of hypergraphs: balanced binary strings*, Electronic Journal of Combinatorics, 2020
    `arxiv:1905.03148`, `doi:10.37236/9019`

11. M. Christandl, P. Vrana and J. Zuiddam, *Barriers for fast matrix multiplication from irreversibility*, Theory of Computing, 2020
    `arxiv:1812.06952`

12. Y. Li and J. Zuiddam, *Quantum asymptotic spectra of graphs and non-commutative graphs, and quantum Shannon capacities*, IEEE Transactions on Information Theory, 2021
    `arxiv:1810.00744`, `doi:10.1109/TIT.2020.3032686`

13. M. Christandl, F. Gesmundo, M. Michałek, J. Zuiddam, *Border rank non-additivity for higher order tensors*, SIAM Journal on Matrix Analysis and Applications
    `arxiv:2007.05458`, `doi.org/10.1137/20M1357366`

14. M. Christandl, P. Vrana and J. Zuiddam, *Universal points in the asymptotic spectrum of tensors*, Journal of the AMS, 2021
    `arxiv:1709.07851`, `doi:10.1090/jams/996`

15. S. Kopparty, G. Moshkovitz and J. Zuiddam, *Geometric rank of tensors and subrank of matrix multiplication*, Discrete Analysis, to appear
    `arxiv:2002.09472`

5.3. Refereed conference proceedings

The full version of items 17, 18 and 19 appeared in a journal.

16. H. Buhrman, M. Christandl and J. Zuiddam, *Nondeterministic quantum communication complexity: the cyclic equality game and iterated matrix multiplication*, Proceedings of Innovations in Theoretical Computer Science Conference (ITCS), 2017
    `arxiv:1603.03757`, `doi:10.4230/LIPIcs.ITCS.2017.24`

17. K. Bringmann, C. Ikenmeyer and J. Zuiddam, *On algebraic branching programs of small width*, Proceedings of Computational Complexity Conference (CCC), 2017
    `doi:10.4230/LIPIcs.CCC.2017.20`

18. M. Christandl, P. Vrana and J. Zuiddam, *Universal points in the asymptotic spectrum of tensors*, Proceedings of the 50th Annual ACM SIGACT Symposium on Theory of Computing (STOC), 2018
    `arxiv:1709.07851`, `doi:10.1145/3188745.3188766`
    Invited to submit a full version of the paper to the journal Theory of Computing

19. M. Christandl, P. Vrana and J. Zuiddam, *Barriers for fast matrix multiplication from irreversibility*, Proceedings of Computational Complexity Conference (CCC), 2019
    `arxiv:1812.06952`, `doi:10.4230/LIPIcs.CCC.2019.26`
    Invited to submit a full version of the paper to the journal Theory of Computing

20. S. Kopparty, G. Moshkovitz and J. Zuiddam, *Geometric rank of tensors and subrank of matrix multiplication.* Proceedings of Computational Complexity Conference (CCC), 2020
`arxiv:2002.09472`, `doi:10.4230/LIPIcs.CCC.2020.35`

21. R. Robere and J. Zuiddam, *Amortized Circuit Complexity, Formal Complexity Measures, and Catalytic Algorithms*, Proceedings of 62nd Annual IEEE Symposium on Foundations of Computer Science (FOCS), 2021
`eccc:2021/035`

22. M. Christandl, O. Fawzi, H. Ta and J. Zuiddam, *Larger Corner-Free Sets from Combinatorial Degenerations*, Proceedings of Innovations in theoretical computer science (ITCS), 2022
`arxiv:2111.08262`

5.4. Manuscripts in submission to a scientific journal

23. M. Christandl, F. Le Gall, V. Lysikov and J. Zuiddam, *Barriers for rectangular matrix multiplication*, Computational complexity
`arxiv:2003.03019`

24. M. Christandl, V. Lysikov and J. Zuiddam, *Weighted slice rank and a minimax correspondence to Strassen's spectra*
`arxiv:2012.14412`

5.5. Manuscripts

25. M. Christandl, O. Fawzi, H. Ta and J. Zuiddam, *Communication Complexity, Corner-Free Sets and the Symmetric Subrank of Tensors*
`arxiv:2104:01130`

26. A. Wigderson, J. Zuiddam, *Asymptotic spectra: Theory, applications and extensions*
`https://staff.fnwi.uva.nl/j.zuiddam/papers/convexity.pdf`

6. Grants and Fellowships

- Simons Junior Fellowship ($409.179), Simons Foundation, 2020

- Veni Grant (€280.000 ≈ $314.000), Dutch Research Council NWO, 2021

- CRM–Simons Professor at the Centre de Recherches Mathématiques, Simons Foundation, November 2022

7. Scientific conferences organized

Symmetries: Algebras and Physics – A thematic program in the Summer/Fall 2022, Centre de Recherches Mathématiques, co-organizer.

8. Scientific talks

8.1. Talks in refereed conferences

Feb 2022   Symposium on Foundations of Computer Science (FOCS), Denver, 2021
           Talk: Amortized Circuit Complexity, Formal Complexity Measures, and Catalytic Algorithms

Feb 2022   Innovations in Theoretical Computer Science (ITCS), Berkeley, 2022
           Talk: Larger Corner-Free Sets from Combinatorial Degenerations

July 2020 Computational Complexity Conference (CCC), Saarbrücken, 2020
           Talk: Geometric rank of tensors and subrank of matrix multiplication

July 2019 Computational Complexity Conference (CCC), New Brunswick, 2019
           Talk: Barriers for fast matrix multiplication from irreversibility

Jun 2018   Symposium on the Theory of Computing (STOC), Los Angeles, 2018
           Talk: Universal points in the asymptotic spectrum of tensors

Jan 2018   Conference on Quantum Information Processing (QIP), Delft, 2018
           Talk: Universal points in the asymptotic spectrum of tensors

July 2017 Computational complexity conference (CCC), Riga, 2017
           Talk: On algebraic branching programs of small width

Jan 2017   Innovations in theoretical computer science (ITCS), Berkeley, 2017
           Talk: Nondeterministic quantum communication complexity

8.2. Invited talks

Nov 2021   Oberwolfach, Complexity Theory workshop
           Talk: Asymptotic spectra: Theory, applications and extensions

Sep 2021   Applied Algebra Seminar, UW Madison
           Talk: Geometric rank of tensors and applications

May 2021   Workshop on Efficient Tensor Representations for Learning and Computational Complexity, Institute for Pure & Applied Mathematics, UCLA
           Talk: Subrank, slice rank and partition rank

May 2021   Spring 2021 Virtual Meeting of the AMS Western Section
           Talk: Subrank, slice rank and partition rank

Jan 2021   UCSD Theory seminar
           Talk: Tensor tools for problems in Combinatorics and Complexity

Dec 2020   2020 Junior Theorists Workshop, Northwestern University, Chicago
           Talk: Tensor Tools for Problems in Combinatorics and Complexity

Oct 2020   Centrum Wiskunde & Informatica, From Euclidean to Geodesic Convex Optimization online reading group, Amsterdam
           Talk: Extremal Combinatorics, Tensor scaling, Moment Polytopes

Aug 2020	Mathematics Department, Texas A&M University Talk: Combinatorics, Tensors and Geometry
Jun 2020	Chennai Mathematical Institute, seminar on Recent Connections to GCT and Progress in GCT Talk: Geometric Rank of Tensors
May 2020	Centrum Wiskunde & Informatica, Amsterdam Talk: Geometric Rank of Tensors
Jan 2020	Department of Mathematics, University of Copenhagen Talk: The asymptotic spectrum of tensors and barriers for fast matrix multiplication
Oct 2019	Rutgers/DIMACS Theory of Computing Seminar Talk: The asymptotic spectrum of tensors and barriers for fast matrix multiplication
Oct 2019	Simons Collaboration on Algorithms & Geometry, New York City Talk: The asymptotic spectrum of tensors and barriers for fast matrix multiplication
May 2019	NYU Theoretical computer science seminar Talk: The asymptotic spectrum of graphs: duality for Shannon capacity
May 2019	Lorentz center Leiden, Mathematics of quantum information theory workshop Talk: Asymptotic spectra
April 2019	Rutgers discrete mathematics seminar Talk: The asymptotic spectrum of graphs: duality for Shannon capacity
March 2019	Princeton discrete mathematics seminar Talk: The asymptotic spectrum of graphs: duality for Shannon capacity
Nov 2018	Oberwolfach, Complexity Theory workshop, special session on matrix multiplication Talk: Asymptotic spectra
Jul 2018	Facets of complexity, Technische Universität Berlin Talk: Asymptotic spectra of tensors and graphs: matrix multiplication exponent and Shannon capacity
Apr 2018	Dutch Mathematical Congress, Royal Dutch Mathematical Society Talk: The asymptotic spectrum of tensors
Jan 2017	Stanford Institute for Theoretical Physics Seminar, Stanford University Talk: On the tensor rank of graph tensors
Nov 2016	Department of Mathematics, QMATH conference, University of Copenhagen Talk: On the tensor rank of graph tensors
Oct 2016	Algorithms and complexity seminar, Max-Planck-Institut für Informatik, Saarbrücken Talk: On the tensor rank of graph tensors

Jan 2015   Department of Mathematics, University of Copenhagen
Talk: Finding large gaps between tensor rank and border rank via algebras

8.3. Departmental talks

Sep 2019   Computer science and discrete math seminar, Institute for Advanced Study
Talk: The asymptotic spectrum of graphs
Talk: Asymptotic spectra and applications

Sep 2018   Computer science and discrete math seminar, Institute for Advanced Study
Talk: The asymptotic spectrum of tensors
Talk: Asymptotic spectra and applications

June 2018   Algorithms and Complexity group seminar, Centrum Wiskunde & Informatica
Talk: The asymptotic spectrum of tensors

9. Student supervision

2017 – 2018   Pjotr Buys, University of Amsterdam, co-advised with Guus Regts.
MSc Thesis: *Asymptotic combinatorial subrank: applications and computations*

2016 – 2017   Jana Wagemaker, University of Amsterdam, co-advised with Harry Buhrman.
BSc Research project: *Close to clean communication complexity*

10. Teaching

Computational Complexity, University of Amsterdam, teaching assistant and co-instructor with Harry Buhrman, 2015. `http://complexity.buhrman.nl/2015/index.html`

Computer algebra and Latex, University of Amsterdam, teaching assistant and co-instructor with Chris Zaal, 2012, 2013, 2014. `http://uva-fnwi.github.io/LaTeX/`

Algorithms and complexity, University of Amsterdam, teaching assistant and co-instructor with Leen Torenvliet, 2014

11. Refereeing

11.1. Academic funding agencies

Israel Science Foundation

11.2. Scientific journals

Communications in Mathematical Physics, Linear and Multilinear Algebra, Theory of Computing, Discrete Mathematics, SIAM Review (SIREV), Computational Complexity, Journal of the ACM, Algebra & Number Theory

11.3. Scientific conferences

Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC), International Colloquium on Automata, Languages and Programming (ICALP), Quantum Information Processing (QIP), Computational Complexity Conference (CCC), Foundations of Computer Science (FOCS), Innovations in Theoretical Computer Science (ITCS), IEEE International Symposium on Information Theory (ISIT)

12. Departmental service

Member of the committee for the preparation of the government accreditation of the mathematics programmes, University of Amsterdam, 2012–2013

Member of the Editorial Board of *Amsterdam Science*, University of Amsterdam, 2015

13. References

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