Bruno Pasqualotto Cavalar

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http://brunopc.github.io

EMPLOYMENT

Research Associate *July 2024 - now*
University of Oxford
Department of Computer Science
Host: Dr. Ján Pich

EDUCATION

Ph.D. in Computer Science *2020 - 2024*
University of Warwick
Department of Computer Science
Advisor: Igor Carboni Oliveira
Thesis: *Complexity Theory of Classical and Quantum Computational Devices*

M.Sc. in Computer Science *2018 - 2020*
University of Sao Paulo
Institute of Mathematics and Statistics (IME-USP)
Advisor: Yoshiharu Kohayakawa
Thesis: *Sunflower theorems in monotone circuit complexity*

B.Sc. in Computer Science (with honours) *2014 - 2017*
University of Sao Paulo (IME-USP) *Average: 9.1/10*
Ranked 1st among 37 Computer Science students
Advisor: Yoshiharu Kohayakawa
Thesis: *Ramsey-type problems in orientations of graphs*

FUNDING, DISTINCTIONS AND AWARDS

Best Master Thesis Award: Winner of the Latin American Master Thesis Contest (CLTM - XXVII) at the Latin American Computing Conference (CLEI 2021). *2021*

Best Master Thesis Award: Winner of the Contest of Theses and Dissertations (CTD - XXXIV) at the Congress of the Brazilian Computer Society (CSBC 2021). *2021*

Alejandro Lópes-Ortiz Best Paper Award: For the paper *Monotone Circuit Lower Bounds from Robust Sunflowers* at the LATIN 2020 conference, joint work with Benjamin Rossman and Mrinal Kumar. *2021*

Chancellor's International Scholarship: Awarded to the 30 most outstanding international PhD applicants to the University of Warwick. *2020*

Computational Complexity and extremal combinatorics *September 2018 - August 2020*
FAPESP Grant for M.Sc. research

Computational Complexity and extremal combinatorics *January 2019 - July 2019*
FAPESP Grant for research internship abroad (University of Toronto)

Best student award of IME-USP: Awarded to the best student among all students graduating at IME-USP in a given year, including all majors in Mathematics, Applied Mathematics, Statistics and Computer Science. *2017*

Bridges in Mathematics and Computing *April 2016 - December 2017*
FAPESP Grant for undergraduate research

Second place, in the admission exam of the University of Sao Paulo for undergraduate studies in Computer Science (over 3,500 applicants). *2014*

PUBLICATIONS

9. **A Meta-Complexity Characterisation of Quantum Cryptography** *2025*
Bruno P. Cavalar, Eli Goldin, Matthew Gray, Peter Hall
Accepted to **EUROCRYPT** 2025
Available at https://arxiv.org/abs/2410.04984

8. **Boolean Circuit Complexity and Two-Dimensional Cover Problems** *2025*
Bruno P. Cavalar, Igor C. Oliveira
Accepted to ACM Transactions on Computation Theory (ACM ToCT)
Available at https://brunopc.github.io/files/CO24.pdf

7. **On the Computational Hardness of Quantum One-wayness** *2024*
Bruno P. Cavalar, Eli Goldin, Matthew Gray, Peter Hall, Yanyi Liu, Angelos Pelecanos
Submitted
Available at https://arxiv.org/abs/2312.08363

6. **Constant-Depth Circuits vs. Monotone Circuits** *2023*
Bruno P. Cavalar, Igor Carboni Oliveira
Proc. 38th Computational Complexity Conference (**CCC**), LIPIcs, Vol. 264, 29:1–29:37
Available at https://arxiv.org/abs/2305.06821

5. **Algorithms and Lower Bounds for Comparator Circuits from Shrinkage** *2022*
Bruno P. Cavalar, Zhenjian Lu
Proc. 13th Innovations in Theoretical Computer Science Conference (**ITCS**), LIPIcs, Vol. 215, 34:1–34:21
Algorithmica, 85(7):2131–2155, 2023
Available at https://arxiv.org/abs/2111.14974

4. **Directed graphs with lower orientation Ramsey thresholds** *2021*
Gabriel Ferreira Barros, Bruno P. Cavalar, Yoshiharu Kohayakawa, Guilherme Oliveira Mota, Tássio Naia
Extended Abstracts **EuroComb**, Trends in Mathematics, Vol. 14, 799–804
RAIRO-Oper. Res. 58 (2024) 3607–3619
Available at https://arxiv.org/abs/2211.07033

3. **Orientation Ramsey thresholds for cycles and cliques** *2021*
Gabriel Ferreira Barros, Bruno P. Cavalar, Yoshiharu Kohayakawa, Tássio Naia
SIAM Journal on Discrete Mathematics (**SIDMA**), 35(4):2844– 2857, 2021
Available at https://arxiv.org/abs/2012.08632

2. **Monotone circuit lower bounds from robust sunflowers** *2020*
Bruno P. Cavalar, Mrinal Kumar, Benjamin Rossman
Proc. 14th Latin American Theoretical Informatics Symposium (**LATIN**), LNCS Vol. 12118, 311-322
Winner of the *Alejandro López-Ortiz Best Paper Award* at LATIN
Algorithmica, 84(12):3655–3685, 2022
Available at https://arxiv.org/abs/2012.03883

1. **Anti-Ramsey threshold of cycles** *2019*
Gabriel Ferreira Barros, Bruno P. Cavalar, Guilherme Oliveira Mota, Olaf Parczyk

Proc. 10th Latin American Algorithms, Graphs and Optimization Symposium (**LAGOS**) 2019, ENTCS Vol. 346, 89-98
Discrete Applied Mathematics (**DAM**), 323:228–235, 2022
Available at https://arxiv.org/abs/2006.02079

ACADEMIC VISITS

Lund University and University of Copenhagen *October 2023*
Visiting Graduate Student
Host: Susanna Rezende

École Polytechnique Fédérale de Lausanne (EPFL) *May 2023 - June 2023*
Visiting Graduate Student
Host: Mika Göös

Simons Institute for the Theory of Computing (UC Berkeley) *Jan 2023 - March 2023*
Visiting Graduate Student
Program: Meta-Complexity

University of Toronto *Jan 2019 - Jul 2019*
International Visiting Graduate Student (IVGS)
Host: Benjamin Rossman

TEACHING ACTIVITIES

University of Warwick

- *Discrete Mathematics and its Applications 1* *2022*
  Marking and teaching of seminars (∼ 10 students).
  1st year course for Discrete Mathematics undergraduates.
- *Quantum Computing* *2021, 2022*
  Marking and teaching of seminars (∼ 40 students).
  Undergraduate and graduate students of Computer Science.
- *Computational Learning Theory* *2021*
  Marking and teaching of seminars (∼ 20 students).
  Undergraduate and graduate students of Computer Science.
- *Algorithms* *2020*
  Teaching of seminars (∼ 40 students).
  2nd year course for Computer Science undergraduates.

University of São Paulo

- *Introduction to Graph Theory* *2020*
  Marking and teaching of seminars (∼ 20 students).
  Undergraduate/graduate course.
- *Foundations of Data Science* *2019*
  Marking and teaching of seminars (∼ 20 students).
  Undergraduate/graduate course.
- *Combinatorial Optimization* *2018*
  Marking and teaching of seminars (∼ 20 students).
  Undergraduate course.

- *Languages, Automata and Computability* *2018*
  Marking and teaching of seminars ($\sim$ 80 students).
  Graduate course.
- *Introduction to Computer Science* *2015*
  Marking and teaching of seminars ($\sim$ 40 students).
  1st year undergraduate course.
- *Mathematical Foundations for Computer Science* *2015*
  Marking and teaching of seminars ($\sim$ 60 students).
  1st year undergraduate course.

SELECTED TALKS AND SEMINARS

Constant-depth Circuits vs. Monotone Circuits

MIAO Seminar (University of Copenhagen) *2023*

EPFL Theory Coffee Seminar (EPFL) *2023*

Computational Complexity Conference (CCC) *2023*

39th British Colloquium for Theoretical Computer Science (BCTCS) *2023*

Simons Institute for the Theory of Computing *2023*

Complexity Network UK (Imperial College London) *2022*

Algorithms and Lower Bounds for Comparator Circuits from Shrinkage

13th Innovations in Theoretical Computer Science (ITCS) *2022*

Complexity Network UK *2022*

Monotone circuit lower bounds from robust sunflowers

37th British Colloquium for Theoretical Computer Science (BCTCS) *2021*

14th Latin American Theoretical Informatics Symposium (LATIN) *2021*

LEADERSHIP AND SCIENTIFIC SERVICE

Organisation of events:

- *Warwick-Imperial-Oxford Complexity Network*
  Online and Local Events. Running since December 2021
- Complexity Lunches at Warwick.

Journal reviewing: Journal of Graph Theory, Theory of Computing, Random Structures and Algorithms

Conference reviewing: Computational Complexity Conference (CCC), Innovations in Theoretical Computer Science (ITCS), Symposium on Theory of Computing (STOC)