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**   *2024*
   Bruno P. Cavalar, Eli Goldin, Matthew Gray, Peter Hall
   Submitted
   Available at https://arxiv.org/abs/2410.04984

8. **Boolean Circuit Complexity and Two-Dimensional Cover Problems**   *2024*
   Bruno P. Cavalar, Igor C. Oliveira
   Submitted
   Available at https://brunopc.github.io/files/CO24.pdf

7. **On the Computational Hardness of Quantum One-wayness**   *2023*
   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 Lópes-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 ($\sim$ 10 students).
  1st year course for Discrete Mathematics undergraduates.

- *Quantum Computing* *2021, 2022*
  Marking and teaching of seminars ($\sim$ 40 students).
  Undergraduate and graduate students of Computer Science.

- *Computational Learning Theory* *2021*
  Marking and teaching of seminars ($\sim$ 20 students).
  Undergraduate and graduate students of Computer Science.

- *Algorithms* *2020*
  Teaching of seminars ($\sim$ 40 students).
  2nd year course for Computer Science undergraduates.

University of São Paulo

- *Introduction to Graph Theory* *2020*
  Marking and teaching of seminars ($\sim$ 20 students).
  Undergraduate/graduate course.

- *Foundations of Data Science* *2019*
  Marking and teaching of seminars ($\sim$ 20 students).
  Undergraduate/graduate course.

- *Combinatorial Optimization* *2018*
  Marking and teaching of seminars ($\sim$ 20 students).
  Undergraduate course.

- *Languages, Automata and Computability*   *2018*
  Marking and teaching of seminars (~ 80 students).
  Graduate course.

- *Introduction to Computer Science*   *2015*
  Marking and teaching of seminars (~ 40 students).
  1st year undergraduate course.

- *Mathematical Foundations for Computer Science*   *2015*
  Marking and teaching of seminars (~ 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)