Manuel Ariel **Cáceres Reyes**

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About me

I am an HIIT Postdoctoral Fellow at Aalto University. I work in the Combinatorics of Efficient Computations group led by Parinya Chalermsook. My research focuses on developing faster algorithms for problems known to be in P but whose current solution is non-optimal or impractical. I enjoy learning new skills and I am always in search of new knowledge that I can apply to my job and life.

Education

University of Helsinki — *Helsinki, Finland*

PhD. in Computer Science — *2020 - 2023*

- Thesis Title: Parameterized and Safe & Complete Graph Algorithms for Bioinformatics.
  The thesis is publicly available at `http://urn.fi/URN:ISBN:978-951-51-9433-6`.

University of Chile — *Santiago, Chile*

MSc. in Computer Science, dual degree program with Computer Science Engineering. — *2012 - 2019*

- Thesis Title: Compressed Suffix Trees using Block Trees.
  The thesis is publicly available at `https://repositorio.uchile.cl/handle/2250/172755`.

Awards

Best student paper award at **ICALP** 2023, Paderborn, Germany — *2023*

Best paper award at **CPM** 2023, Paris, France — *2023*

Researcher of the year award for junior researchers, Department of Computer Science, University of Helsinki, Finland — *2021*

Third place in the *Contest of Master Thesis in Computer Science of Latin America* 2020, Ecuador — *2020*

Outstanding International Research, Department of Computer Science, University of Chile, Chile — *2019*

Community Service

Program Committee

- Part of the program committee on the following conferences
  - CPM 2025, SPIRE 2024, WABI 2024, CPM 2024

Conference Reviewer

- Reviewer on the following conferences
  - CPM 2025, SODA 2025, SPIRE 2024, WABI 2024, MFCS 2024, ESA 2024, CPM 2024, ICALP 2024, RECOMB 2024, LATIN 2024, SODA 2024, WABI 2023, ESA 2023, CPM 2023, ALENEX 2023, SODA 2023, MFCS 2022, SEA 2022, DCC 2022, WABI 2021, RECOMB 2021, DCC 2021, WABI 2020, ALENEX 2020, ESA 2018

Journal Reviewer

- Reviewer for the following journals
  - AMB, HEUR, JEA, TCS, GEREFS, Frontiers in Bioinformatics, DMKDFD, Inf. Comput., Acta Inf., Computers, Comput. J.

Student Supervision

Co-supervision (Master thesis)

- Eliel Ingervo, Safety in flow decompositions with subpath constraints, 2024.
- Jun Ma, Co-linear chaining on graphs with cycles, 2021.

Research Interns

- Antti Paraoanu, Generalized Sorting, 2024.
- Santeri Toivonen, Practical Minimum Path Cover, 2022-2023.
- Milla Kortelainen, Safe and Complete paths for flow decompositions, 2021.
- Juho Kesälä, Random path in a DAG, 2021.

Teaching

Aalto University
Helsinki, Finland

Lecturer — *2024*

- Prepared and taught five lectures on the following course.
  - Introduction to Mathematical Reasoning for Computer Scientists

University of Helsinki
Helsinki, Finland

Lecturer — *2023*

- Prepared and taught two lectures on each of the following courses.
  - Models of Computation, Data Compression Techniques

University of Helsinki
Helsinki, Finland

Teaching Assistant — *2020-2023*

- Prepared and presented model solutions to typical problems, graded exams, exercises and assignments, guided students with their projects or assignments, and took exams of the following courses:
  - *Elements of Bioinformatics*, *Design and Analysis of Algorithms*

University of Chile
Santiago, Chile

Lecturer — *2019*

- Undergraduate course *Computer Tools for Engineering & Science*, including text processors, spreadsheets, Matlab, R, Maple and basic Python. Prepared and taught classes and helped students with in-class exercises.

University of Chile
Santiago, Chile

Teaching Assistant — *2014 - 2018*

- Prepared and presented model solutions to typical problems, graded exams, exercises and assignments, guided students with their projects or assignments, and took exams of the following graduate and undergraduate level courses:
  - *Design and Analysis of Algorithms*, *Algorithms and Data Structures*, *Theory of computation*, *Advanced Analysis of Algorithms*, *Computer Tools for Engineering & Science*, *Introduction to Programming*, *Development of Software for Lego Robots*

Research Visits & Workshop Participation

Visits

- (2 weeks, 2022) Research group AlgoLoG, Technical University of Denmark, Denmark.
- (2 weeks, 2022) Professor Nicola Prezza, University of Venice, Italy.
- (1 month, 2018) Professor Susana Ladra, University of A Coruña, Spain.
- (2 months, 2018) Professor Simon Puglisi, University of Helsinki, Finland.

Workshops

- Helsinki CS Theory Seminar, 2025, Finland. Participation with talk.
- Dagstuhl seminar “Regular Expressions: Matching and Indexing”, 2024, Germany.
- Czech Summer School on Discrete Mathematics, 2024, Czech Republic, Participation as tutor.
- Helsinki CS Theory Seminar, 2023, Finland. Participation with talk.
- Workshop on Compression, Text, and Algorithms 2022. Participation with talk.
- Workshop Data Structures in Bioinformatics 2022, Germany. Participation with talk.
- Workshop Data Structures in Bioinformatics 2021, Italy. Participation with talk.
- Bioinformatics Research and Education Workshop 2020, Estonia. Participation with talk.
- Workshop Biotechnology, Metabolic Engineering, Bioinformatics, and Important Applications 2019, Chile. Participation with talk.
- Workshop Biotechnology, Metabolic Engineering, Bioinformatics, and Important Applications 2018, Chile. Participation with poster.

Publications

Conference Proceedings

- *Practical Minimum Path Cover*, **Manuel Cáceres**, Brendan Mumey, Santeri Toivonen and Alexandru I. Tomescu. Accepted to **SEA**. Open Acess publication: `https://doi.org/10.4230/LIPIcs.SEA.2024.3`.
- *Chaining of Maximal Exact Matches in Graphs*, Nicola Rizzo, **Manuel Cáceres**, Veli Mäkinen. Accepted to the *String Processing and Information Retrieval* (**SPIRE**) 2023. A preliminary version can be found at `https://arxiv.org/abs/2302.01748`.
- *Finding Maximal Exact Matches in Graphs*, Nicola Rizzo, **Manuel Cáceres**, Veli Mäkinen. Accepted to the *Workshop on Algorithms in Bioinformatics (**WABI**) 2023*. Open Access publication: `https://doi.org/10.4230/LIPIcs.WABI.2023.10`.
- *Sorting Finite Automata via Partition Refinement*, Ruben Becker, **Manuel Cáceres**, Davide Cenzato, Sung-Hwan Kim, Bojana Kodric, Francisco Olivares and Nicola Prezza. Acccepted to *European Symposium on Algorithms (**ESA**) 2023*. Open Access publication: `https://doi.org/10.4230/LIPIcs.ESA.2023.15`.
- *Minimum Chain Cover in Almost Linear Time* , **Manuel Cáceres**. Accepted to the *EATCS International Colloquium on Automata, Languages and Programming (**ICALP**) 2023*. Best student paper award in track A. Open Access publication: `https://doi.org/10.4230/LIPIcs.ICALP.2023.31`.
- *Parameterized Algorithms for String Matching to DAGs: Funnels and Beyond*, **Manuel Cáceres**. Accepted to the *Annual Symposium on Combinatorial Pattern Matching (**CPM**) 2023*. Best paper. Open Access publication: `https://doi.org/10.4230/LIPIcs.CPM.2023.7`.
- *Width Helps and Hinders Splitting Flows*, **Manuel Cáceres**, Massimo Cairo, Andreas Grigorjew, Shahbaz Khan, Brendan Mumey, Romeo Rizzi, Alexandru I. Tomescu and Lucia Williams. Accepted to the *European Symposium on Algorithms (**ESA**) 2022*. Open Access publication: `https://doi.org/10.4230/LIPIcs.ESA.2022.31`.
- *Safety and Completeness in Flow Decompositions for RNA Assembly*, Shahbaz Khan, Milla Kortelainen, **Manuel Cáceres**, Lucia Williams and Alexandru I. Tomescu. Accepted to the *International Conference on Research in Computational Molecular Biology (**RECOMB**) 2022*. DOI: `https://doi.org/10.1007/978-3-031-04749-7_11`. A preliminary version can be found at `https://arxiv.org/abs/2201.10372`.
- *Sparsifying, Shrinking and Splicing for Minimum Path Cover in Parameterized Linear Time*, **Manuel Cáceres**, Massimo Cairo, Brendan Mumey, Romeo Rizzi and Alexandru I. Tomescu. Accepted to the *ACM-SIAM Symposium on Discrete Algorithms (**SODA**) 2022*. Open Access publication `https://epubs.siam.org/doi/pdf/10.1137/1.9781611977073.18`.
- *A linear-time parameterized algorithm for computing the width of a DAG*, **Manuel Cáceres**, Massimo Cairo, Brendan Mumey, Romeo Rizzi and Alexandru I. Tomescu. Accepted to the *International Workshop on Graph-Theoretic Concepts in Computer Science* (**WG**) 2021. DOI: `https://doi.org/10.1007/978-3-030-86838-3_20`. A preliminary version can be found at `https://arxiv.org/abs/2007.07575`.
- *Fast Indexes for Gapped Pattern Matching*, **Manuel Cáceres**, Simon J. Puglisi and Bella Zhukova. Accepted to the *International Conference on Current Trends in Theory and Practice of Informatics* (**SOFSEM**) 2020 conference. DOI: `https://doi.org/10.1007/978-3-030-38919-2_40`. A preliminary version can be found at `https://arxiv.org/abs/2002.12662`.
- *Faster Repetition-Aware Compressed Suffix Trees based on Block Trees*, **Manuel Cáceres** and Gonzalo Navarro. Accepted to the *String Processing and Information Retrieval* (**SPIRE**) 2019 conference. DOI: `https://doi.org/10.1007/978-3-030-32686-9_31`. A preliminary version can be found at `https://arxiv.org/abs/1902.03274`.

Journal Articles

- *Finding Maximal Exact Matches in Graphs*, Nicola Rizzo, **Manuel Cáceres**, Veli Mäkinen. Accepted to **AMB**. Open Access publication: `https://doi.org/10.1186/s13015-024-00255-5`.
- *Width Helps and Hinders Splitting Flows*, **Manuel Cáceres**, Massimo Cairo, Andreas Grigorjew, Shahbaz Khan, Brendan Mumey, Romeo Rizzi, Alexandru I. Tomescu and Lucia Williams. Accepted to *ACM Transaction on Algorithms* (**TALG**). Open Access publication: `https://doi.org/10.1145/3641820`.
- *A Safety Framework for Flow Decomposition Problems via Integer Linear Programming*, Fernando H. C. Dias, **Manuel Cáceres**, Lucia Williams, Brendan Mumey and Alexandru I. Tomescu. Accepted to **Oxford Bioinformatics**. Open Access publication: `https://doi.org/10.1093/bioinformatics/btad640`.
- *Chaining for Accurate Alignment of Erroneous Long Reads to Acyclic Variation Graphs*, Jun Ma, **Manuel Cáceres**, Leena Salmela, Veli Mäkinen and Alexandru I. Tomescu. Accepted to **Oxford Bioinformatics**. Open Access publication: `https://doi.org/10.1093/bioinformatics/btad460`.
- *Improving RNA Assembly via Safety and Completeness in Flow Decompositions*, Shahbaz Khan, Milla Kortelainen, **Manuel Cáceres**, Lucia Williams and Alexandru I. Tomescu. Accepted to the *Journal of Computational Biology* (**JCB**). Open Access publication: `https://doi.org/10.1089/cmb.2022.0261`.
- *Safety in multi-assembly via paths appearing in all path covers of a DAG*, **Manuel Cáceres**, Brendan Mumey, Edin Husić, Romeo Rizzi, Massimo Cairo, Kristoffer Sahlin and Alexandru I. Tomescu. Accepted to the *IEEE/ACM Transactions on Computational Biology and Bioinformatics* (**TCBB**). Open Access publication: `https://doi.org/10.1109/TCBB.2021.3131203`.
- *Faster Repetition-Aware Compressed Suffix Trees based on Block Trees*, **Manuel Cáceres** & Gonzalo Navarro. Accepted to the *Information and Computation* (**I&C**). Open Access publication: `https://doi.org/10.1016/j.ic.2021.104749`.
- *Block Trees*, Djamal Belazzougui, **Manuel Cáceres**, Travis Gagie, Pawel Gawrychowski, Juha Kärkkäinen, Gonzalo Navarro, Alberto Ordóñez, Simon J. Puglisi, and Yasuo Tabei. Accepted to the *Journal of Computer and System Sciences* (**JCSS**) 2021. A preliminary version can be found at `https://me.ariel.computer/files/jcss20.pdf`.

Preprints/Submitted

- *Maximum Coverage k-Antichains and Chains: A Greedy Approach*, **Manuel Cáceres**, Andreas Grigorjew, Wanchote Po Jiamjitrak, Alexandru I. Tomescu. A preliminary version can be found at `https://arxiv.org/abs/2502.06459`.
- *Exploiting uniqueness: seed-chain-extend alignment on elastic founder graphs*, Nicola Rizzo, **Manuel Cáceres**, Veli Mäkinen. A preliminary version can be found at `https://doi.org/10.1101/2024.11.24.625039`.
- *Minimum Path Cover in Parameterized Linear Time*, **Manuel Cáceres**, Massimo Cairo, Brendan Mumey, Romeo Rizzi and Alexandru I. Tomescu. A preliminary version can be found at `https://arxiv.org/abs/2211.09659`.