David Alemán Espinosa

Contact Information

Email: dalemanespinosa@uwaterloo.ca Phone: (+1) 226 606 1496

Contacts for Reference Letters

Prof. Chaitanya Swamy, University of Waterloo. Email: cswamy@uwaterloo.ca

Prof. Bruce Shepherd, University of British Columbia. Email: fbrucesh@cs.ubc.ca

Prof. Nikhil Kumar, Tata Institute of Fundamental Research. Email: kumar.nikhil@tifr.res.in

Dr. Sharat Ibrahimpur, ETH Zürich. Email: sharat.ibrahimpur@inf.ethz.ch

Education

Department of Combinatorics and Optimization, University of Waterloo, Canada

PhD. in Combinatorics and Optimization (2020 - 2026).
Advisor: Chaitanya Swamy.
Thesis: On Unsplittable Multicommodity Flows and Norm-Budgeted Packing Problems.

Department of Mathematics, ETH Zürich, Switzerland

M.Sc. in Applied Mathematics (2020).
Advisors: Rico Zenklusen and Angelidakis Charalampos.
Thesis: Algorithms for Matroid Secretary Problems and Online Matching.

Department of Mathematics and Department of Physics, Universidad de los Andes, Colombia

B.Sc. in Mathematics (2015).
Advisor: Luis Jorge Ferro.
Undergraduate thesis: Kernel and Shapley Function in Fuzzy Games.

B.Sc. in Physics (2015).
Advisor: Alonso Botero.
Undergraduate thesis: Physics of the Riemann Hypothesis.

Publications

D. Alemán Espinosa and N. Schlomberg. *Pinning on tight cuts: improved algorithm and bounds for unsplittable multicommodity flows in outerplanar graphs.* To appear in: The 53rd EATCS International Colloquium on Automata, Languages, and Programming - ICALP 2026 (Track A).

D. Alemán Espinosa, N. Garg, S. Ibrahimpur, N. Olver, and C. Swamy. *Stochastic load balancing with machine reservations.* To appear in: The 27th Conference on Integer Programming and Combinatorial Optimization - IPCO 2026.

D. Alemán Espinosa, N. Kumar, J. Poremba, and B. Shepherd. *Unsplittable flow cut gap in undirected graphs.* In: Proceedings of the 2026 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA). 2026, pp. 1570-1605.

D. Alemán Espinosa and N. Kumar. *Unsplittable multicommodity flows in outerplanar graphs.* In: Proceedings of the International Conference on Integer Programming and Combinatorial Optimization (IPCO). Springer. 2025, pp. 385–399. (To appear in the

journal Mathematical Programming)

D. Alemán Espinosa and C. Swamy. *Approximation algorithms for correlated knapsack orienteering.* In: Proceedings of Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques (APPROX), Volume 317, pages 29:1–29:24, 2024. (To appear in a special issue of the journal Theory of Computing devoted to selected papers from APPROX 2024 and RANDOM 2024)

Papers under submission

D. Alemán Espinosa, Sharat Ibrahimpur, and Chaitanya Swamy. *Approximation algorithms for norm-budgeted packing problems.* Submitted (FOCS 2026).

Unfinished manuscripts

D. Alemán Espinosa and Joseph Poremba. *Cost-preserving unsplittable flows for fully planar instances.*

D. Alemán Espinosa and Niklas Schlomberg. *Cost-preserving unsplittable flows for outerplanar instances.*

Languages

English (fluent); German (intermediate); Spanish (native)

Talks

Unsplittable flow-cut gap in undirected graphs. ACM-SIAM Symposium on Discrete Algorithms (SODA). Vancouver, Canada. 2026.

Unsplittable flows in planar graphs. Oberseminar Discrete Optimization. Research Institute for Discrete Mathematics, University of Bonn, Bonn, Germany. 2025.

Unsplittable multicommodity flows in outerplanar graphs. International Conference on Integer Programming and Combinatorial Optimization (IPCO). Johns Hopkins University, Baltimore, USA. 2025.

Approximation algorithms for correlated knapsack orienteering. International Conference on Approximation Algorithms for Combinatorial Optimization Problems (APPROX). London School of Economics, London, United Kingdom. 2024.

Teaching Experience

University of Waterloo

Instructor

CO 250 – Introduction to Optimization	(2023)

Teaching Assistant

CO 250 – Introduction to Optimization	(2026, 2025, 2022)
CO 255 – Introduction to Optimization (Advanced)	(2023)
CO 351 – Network Flow Theory	(2025, 2024, 2022)
CO 370 – Deterministic Operations Research Models	(2024)
CO 454 – Scheduling	(2024, 2023)
CO 481 – Intro. to Quantum Information Processing	(2024, 2022)
CO 650 – Combinatorial Optimization	(2021)
MATH 235 – Linear Algebra 2 for Honours	(2025)

Conferences Attended

ACM-SIAM Symposium on Discrete Algorithms (SODA), Vancouver, Canada. 2026.

International Conference on Integer Programming and Combinatorial Optimization (IPCO), Baltimore, Maryland, USA. 2025.

International Conference on Approximation Algorithms for Combinatorial Optimization Problems (APPROX), London, United Kingdom. 2024.

International Symposium on Mathematical Programming (ISMP), Montreal, Canada. 2024.

International Conference on Integer Programming and Combinatorial Optimization (IPCO), Madison, Wisconsin, USA. 2023.

Workshops and Summer Schools

IPCO 2025 Summer School, Johns Hopkins University, USA. 2025.

Fulkerson 100, University of Waterloo, Canada. 2024.

IPCO 2023 Summer School, University of Wisconsin-Madison, USA. 2023.

Algorithms, Combinatorics and Optimization Research Network (ACORN) Meeting 2023, Georgia Tech University, USA. 2023.

Cargese Workshop on Combinatorial Optimization, Institut d'Études Scientifiques de Cargèse (IESC), Corsica, France. 2022.

Summer School on Random Graphs, Simons Laufer Mathematical Sciences Institute (formerly MSRI), Berkeley, California, USA. 2022.

Programming Skills

Languages:	C++, Python, R, Java, MATLAB.
Tools / Libraries:	Gurobi, NumPy, SciPy, Pandas, Matplotlib, LaTeX, Git

Service and Volunteering

2024 - 2026	Reviewer for FOCS, SODA, and IPCO.
2022 - 2026	Co-organizer, Combinatorial Optimization Reading Group, University of Waterloo.
2023 - 2025	Mentor for undergraduate research assistants, Department of Combinatorics & Optimization, University of Waterloo.
2016	Volunteer, AIESEC – Educational outreach with children at a public school in Florianópolis, Brazil.
2016	Volunteer, Volunteer Southern Africa – Conservation work focused on endangered species (rhinoceroses, cheetahs) in South Africa.