Nicolás Acevedo Villena

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Education

Massachusetts Institute of Technology

PhD in Operations Research *2024 - Present*

- Advisor: Haihao Lu
- Research: Iterative refinement-based enhancements for first-order optimization methods. GPU-based solvers for large-scale machine learning problems

Universidad de Chile

Master in Operations Management *2022 - 2023*

- Advisor: Fernando Ordoñez
- Thesis: Column Generation-Based Decomposition for Large-Scale Feature Selection Problems
- Graduated with Highest Honors. Class

Universidad de Chile

Bachelor of Engineering Science in Industrial Engineering *2017 - 2021*

- Graduated with Highest Honors.

Interests

Convex/Non-convex Optimization, Large-Scale Optimization, and Machine Learning.

Research Experience

Universidad de Chile *Santiago, Chile*

Research Assistant. Advisor: Fernando Ordoñez. Co-Advisor: Renaud Chicoisne *Aug. 2022 - July 2024*

- Developed an efficient decomposition method to address large-scale feature selection problems. The proposed second-order cone formulation is proven to be equivalent to unconstrained LASSO, and its decomposition outperforms the state-of-the-art coordinate descent approach. Specifically, the method is faster for large instances where at least 50 to 75 of the original features are selected, with cases showing an almost 97% difference in execution time.

Complex Engineering Systems Institute *Santiago, Chile*

Research Assistant. Advisor: Ricardo Montoya. Co-Advisor: Charles Thraves *Jan. 2021 - Jan. 2022*

- Developed an online optimization approach for adaptive questionnaires, which aimed to select an optimal subset and sequence of socially polarized questions while maximizing the information obtained. Implemented an ensemble method of machine learning models, probabilistic approaches, and online optimization algorithms. Utilized the High-Performance Computing infrastructure provided by NLHPC.

Complex Engineering Systems Institute *Santiago, Chile*

Research Assistant. Advisor: Charles Thraves *Sept. 2020 - March 2022*

- Developed an outlier detection protocol for standardized tests, specifically applied to the Chilean university selection test, PSU (similar to the SAT). It involved creating an integrated model using statistical and machine learning techniques to identify scoring unfairness and potential cheating cases. Presented the protocol and its results to DEMRE, the institution responsible for the standardized test.

Work Experience

Web Intelligence Centre / ACHS *Santiago, Chile*

Researcher *Dec. 2023 - Apr. 2024*

- Joint work with Asociación Chilena de Seguridad (ACHS). Machine learning methods to forecast patient demand in various departments of Hospital del Trabajador. Methods include: ARIMA, Random Forest, Facebook's Prophet, and Neural Prophet.

Nezasa AG *Santiago, Chile*

Research Engineer *June 2022 - April 2023*

- Supervised the new model formulation of a Time-Dependent Traveling Salesman Problem (TDTSP) for a Travel Tech company. The objective of the problem was to select the best flight itinerary, based on different metrics like total price and flight time, across all possible combinations of departure/arrival times and destinations.
- Proposed various predictive models to reduce the size of the graph of the TDTSP to enhance model speed and cost efficiency. Achieved 20% reduction in the number of feasible edges while preserving the optimal solution in most instances.

Hogar de Cristo *Santiago, Chile*

Intern *Jan. 2020 - Feb. 2020*

- Designed an online beneficiary tracking process for different assistance programs within a non-profit organization. Implemented an automated web scraping process to check the status and requirements of funding application processes.

Teaching Experience

Teaching Assistant

Fall 2024	**Optimization Models and Algorithms**, M.Sc. Core, Universidad de Chile.
Fall 2023	**Optimization Models and Algorithms**, M.S. Core, Universidad de Chile.
	Modeling and Optimization, B.Sc. Core, Universidad de Chile.
Fall 2022	**Probability**, B.Sc. Core, Universidad de Chile.
	Marketing Engineering, B.Sc. Core, Universidad de Chile.
	Industrial Organization, B.Sc. Core, Universidad de Chile.
Spring 2021	**Decision Making Under Uncertainty**, B.Sc. Core, Universidad de Chile.
	Statistics, B.Sc. Core, Universidad de Chile.
Fall 2021	**Probability**, B.Sc. Core, Universidad de Chile.
	Applied Econometrics for Business and Economics, B.Sc. Core, Universidad de Chile.
Spring 2020	**Modeling and Optimization**, B.Sc. Core, Universidad de Chile.
	Operations Management I, B.Sc. Core, Universidad de Chile.

Grants & Awards

2022	**Beca de Magíster Nacional (Chilean grant for graduate studies)**, ANID, the Chilean research funding agency.
2022	**Beca de Excelencia Académica (Academic excellence scholarship)**, Master in Operations Management, Universidad de Chile.
2019, '20, '21, '22	**Outstanding Student**, FCFM & DII, Universidad de Chile. Top 10% GPA students.
2023	**Best Master Thesis Award**, Master in Operations Management, Universidad de Chile.

Presentations, Posters & Development

Talks

Acevedo, N., Thraves, C., Varas, M. 2022. On the Outlier Detection for Standardized Tests. *XIV Chilean Conference on Operations Research*, Universidad Católica del Maule, Talca, Chile.

Posters

Acevedo, N., Ordoñez, F. 2023. Column Generation-Based Decomposition for Large-Scale Feature Selection Problems. *Escuela de Verano en Inteligencia Computacional*, Facultad de Ciencias Físicas y Matemáticas, Santiago, Chile.

Development

XVIII Summer School in Discrete Mathematics. 2023. Instituto de Sistemas Complejos de Valparaíso, Valparaíso, Chile. Three courses: Graphs with high chromatic number, Provable Algorithms for Data Mining and Machine Learning, and Linear programming: the quest for strongly polynomial algorithms.