

Isaac Oliva-González

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Summary

Graduate researcher in computer science with a chemical engineering background. My work focuses on integer and semidefinite programming, quantum algorithms, and symmetry reduction techniques for combinatorial optimisation. I develop and analyse mathematical programming models for large-scale problems, with applications in energy and process systems.

Research Interests

Optimization & Operations Research

Combinatorial Optimization, Integer & Semidefinite Programming, Algebraic Reformulations, Graph-Theoretic Approaches

Quantum Computing & Algorithms

Hybrid Quantum-Classical Methods, Quantum Machine Learning, Quantum Annealing

Applications

Energy Systems, Process Systems Engineering, Large-Scale Optimisation

Education

MSc in Computer Science

Universidad Autónoma de Querétaro

Aug 2023 - Aug 2025

Querétaro, MEX

- Dissertation on quantum annealing and simulated annealing for discrete-space route optimization.

BSc in Chemical Engineering

Universidad de Guanajuato

Jan 2017 - Dec 2021

Guanajuato, MEX

- Dissertation on modeling and design of intensified distillation sequences for renewable fuel separation.

Experience

Tecnológico de Monterrey

Visiting Research Scholar (Remote) | Supervisor: Dr. Ilse María Hernández-Romero

Jan 2025 - Aug 2025

Monterrey, MEX

- Conducted collaborative research on hybrid quantum-classical neural architectures using variational quantum circuits to model black carbon dynamics, benchmarking against classical models to assess the contribution of quantum-enhanced architectures in predictive performance and model expressiveness (*PennyLane*). See [J1].

Universidad Autónoma de Querétaro

MSc Student

Aug 2023 - Aug 2025

Querétaro, MEX

- Designed and benchmarked quantum and classical optimisation algorithms for discrete shortest-path problems, analysing performance trade-offs across solution quality and computational efficiency (*Julia*). See [J2].
- Designed and implemented finite automata for encoding alphabetic sequences and performing operations on deterministic finite automata (*Mathematica*).

Ingredion México

Process Technician

Feb 2022 - Dec 2022

San Juan del Río, MEX

- Operated and monitored industrial starch processing systems, performing on-site troubleshooting and real-time adjustments to ensure process reliability.

NOVARES México

Undergraduate Intern

Jan 2021 - Jun 2021

Silao, MEX

- Supported the implementation of health, safety, and environmental (HSE) programs in an automotive manufacturing environment.

Instituto Tecnológico de Villahermosa

Visiting Research Scholar | Supervisor: Dr. Francisco López-Villarreal

Summer 2019


Villahermosa, MEX

- Developed a computational interface for vapor-liquid equilibrium calculations in isothermal flash distillation, applying numerical methods to thermodynamic optimization problems (*MATLAB*).

Research Projects

Exploratory Study of Symmetry in Combinatorial Optimization

Julia, JuMP


Available [here](#) 

2026

- Exploratory study of symmetry reduction in combinatorial optimisation (ILP), including shortest path, graph coloring, max-cut, and TSP. Applied lexicographic constraints, variable fixing, and automorphism-based methods to reduce redundant solutions.

Symmetry-Aware CC Unit Commitment

Julia, JuMP

Available [here](#) 

2026

- Study of symmetry reduction applied to the *Combined Cycle Min-Up/Min-Down Unit Commitment Problem* (CC-MUCP). Derived demand-aware lexicographic constraints to break the two-level permutation symmetry from from identical packages and gas turbines.

Skills

Programming: Python, Julia**Optimisation & Modelling:** JuMP, GAMS, MATLAB**Quantum & Scientific Computing:** PennyLane, Qiskit, Mathematica, Aspen Plus, Jupyter Notebooks

Languages

Spanish: Native proficiency.**English:** Proficient (TOEFL ITP 562 | CEFR B2).**German:** Elementary proficiency (CEFR A2).

Research & Publications

PUBLICATIONS

- [J1] **A Hybrid Quantum-Classical Machine Learning Framework for Black Carbon Forecasting** *EPJ Quantum Technol.*
I. Oliva-González, L. T. González, O. D. Lara-Montaña, A. I. Ramirez, A. Mendoza, I. M. Hernández-Romero 2026
EPJ Quantum Technology (accepted)
- [J2] **QUBO-based simulated annealing approach for the shortest path problem with applications to urban transportation networks** *Algorithms*
I. Oliva-González and H. Jiménez-Hernández 2026
Algorithms (under review). Preprint available. DOI: [10.20944/preprints202511.0578.v1](https://doi.org/10.20944/preprints202511.0578.v1)

BOOK CHAPTERS

- [B1] **Integrating Quantum Computing into Sustainable Carbon-Capture Materials Research: Opportunities and Perspectives** *Hand. Carbon Neg. Footpr. Mater.*
I. M. Hernández-Romero, **I. Oliva-González**, O. D. Lara-Montaña, K. Hernández-Romero, G. G. Ezquivel-Patiño, 2026
O. Kharissova, A. I. Ramirez, L. T. González
Handbook of Carbon Negative Footprint Materials, Springer Nature (*accepted*)

CONFERENCE PROCEEDINGS

- [C1] **Síntesis de columnas con múltiples paredes divisorias para la separación de combustible sustentable de aviación** *Av. Ing. Quím.*
I. Oliva-González, A. G. Romero-Izquierdo, C. Gutiérrez-Antonio, F. I. Gómez-Castro, and S. Hernández 2024
Avances en Ingeniería Química, vol. 3, no. 1, pp. 265–270, AMIDIQ 2024. Available [online](#)
- [C2] **Computer-aided design of intensified separation sequences for a complex mixture of renewable hydrocarbons** *Comput. Aided Chem. Eng.*
I. Oliva-González, A. G. Romero-Izquierdo, C. Gutiérrez-Antonio, F. I. Gómez-Castro, and S. Hernández 2024
ESCAPE34/PSE2024, Elsevier, vol. 53, pp. 1483–1488, DOI: [10.1016/B978-0-443-28824-1.50248-9](https://doi.org/10.1016/B978-0-443-28824-1.50248-9)

- [C3] **Síntesis de columnas con múltiples paredes divisorias para la separación de combustible sustentable de aviación** *Av. Ing. Quím.*
I. Oliva-González, C. Gutiérrez-Antonio, F. I. Gómez-Castro, S. Hernández, and A. G. Romero-Izquierdo 2023
Avances en Ingeniería Química, vol. 2, no. 1, pp. 402–407, AMIDIQ 2023. Available [online](#)

- [C4] **Síntesis de secuencias intensificadas de destilación para la separación de una mezcla multicomponente de hidrocarburos renovables** *Av. Ing. Quím.*
I. Oliva-González, C. Gutiérrez-Antonio, F. I. Gómez-Castro, E. Quiroz Pérez, S. Hernández, and A. G. Romero-Izquierdo 2022
Avances en Ingeniería Química, vol. 1, no. 4, pp. 218–223, AMIDIQ 2022. Available [online](#)

CONFERENCE PRESENTATIONS

- [P1] **Síntesis de columnas con múltiples paredes divisorias para la separación de combustible sustentable de aviación** 2023
I. Oliva-González, A. G. Romero-Izquierdo, C. Gutiérrez-Antonio, F. I. Gómez-Castro, and S. Hernández
Retos y Oportunidades al Net-Zero 2030, Querétaro, México (Oral presentation)

- [P2] **Synthesis of alternative intensified sequences for the separation of a multicomponent renewable hydrocarbons mixture** 2022
I. Oliva-González, A. G. Romero-Izquierdo, C. Gutiérrez-Antonio, F. I. Gómez-Castro, and S. Hernández
12th International Conference Distillation & Absorption 2022 (DA2022), Toulouse, France (Poster presentation)