

Gabriel David Patrón

Citizenship: Canadian, Colombian

Languages: English, Spanish

Modelling environments: Aspen Plus/HYSYS, GAMS, gPROMS, MATLAB, Python (Pyomo, Pytorch)

Department of Computing, Imperial College London

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302 Huxley Building, 180 Queen's Gate, South Kensington, London, UK, SW7 2AZ

Vision: Postdoctoral fellow in modelling, control, and optimization of process systems. Interests in sustainable processes, food production, carbon capture, and energy generation, as well as methods to deal with process uncertainty.

Academic Experience

Imperial College London, Department of Computing, London, UK

2024–

Research Associate

- Supervisor: Calvin Tsay (sponsored by BP)
- Research topics:
 - o Stochastic optimisation, energy systems, Bayesian optimisation.

University of Waterloo, Department of Chemical Engineering, Waterloo, CA

2023–2024

Postdoctoral Fellow

- Supervisor: Luis Ricardez-Sandoval (sponsored by Sinopec)
- Research topics:
 - o Chemical looping combustion/gasification, gross error detection, recirculating aquaculture systems, data-driven online economic optimization.

Education

University of Waterloo, Department of Chemical Engineering, Waterloo, CA

2019–2023

PhD, Chemical Engineering

- Supervisor: Luis Ricardez-Sandoval
- Thesis: *New approaches for the real-time optimization of process systems under uncertainty.*
 - o Passed with no corrections.
 - o Examiners: Prof. Hector Budman (Waterloo, Chemical Engineering), Prof. Alexander Penlidis (Waterloo, Chemical Engineering), Prof. Houra Mahmoudzadeh (Waterloo, Management Sciences), Prof. Prashant Mhaskar (McMaster, Chemical Engineering).

Imperial College London, Department of Chemical Engineering, London, UK

2017–2018

MSc, Advanced Chemical Engineering with Process Systems Engineering

- Supervisor: Amparo Galindo
- Thesis: *An Application of Residual Entropy Scaling to Calculate and Predict Viscosity Using the SAFT- γ Mie Equation of State.*

National University of Singapore, Department of Chemical and Biomolecular Engineering, Singapore, SG

2016

Research Exchange

- Supervisors: Ning YAN, Jianguang ZHANG (now at the University of Lincoln, UK)
 - o Thesis: *Formic Acid-Mediated Pyrolysis of Woody Biomass.*

University of Toronto, Department of Chemical Engineering and Applied Chemistry, Toronto, CA

2013–2017

BASc, Chemical Engineering

- Minor in sustainable energy.

Peer-Reviewed Publications

Patrón, G.D., Ricardez-Sandoval, L., 2024. Bootstrapped gross error detection for efficient and fault-tolerant real-time optimization. (Accepted). In press: American Controls Conference.

Patrón, G.D., Ricardez-Sandoval, L., 2024. Economically optimal operation of recirculating aquaculture systems under uncertainty. Computers and Electronics in Agriculture 220, 108856.

Patrón, G.D., Toffolo, K., Ricardez-Sandoval, L., 2024. Economic model predictive control for packed bed chemical looping combustion. Chemical Engineering and Processing – Process Intensification 198, 109731.

Patrón, G.D., Ricardez-Sandoval, L., 2023. Economic Model Predictive Control of a Recirculating Aquaculture System. IFAC-PapersOnLine 56(2); 6156–6161.

Patrón, G.D., Ricardez-Sandoval, L., 2023. Robust real-time optimization and parameter estimation of post-combustion CO₂ capture under economic uncertainty. Chemical Engineering Science 281, 119124.

Patrón, G.D., Ricardez-Sandoval, L., 2023. Directional modifier adaptation based on input selection for real-time optimization. Computers & Chemical Engineering 177, 108351.

Patrón, G.D., Ricardez-Sandoval, L., 2022. Low-Variance Parameter Estimation Approach for Real-Time Optimization of Noisy Process Systems. Industrial & Engineering Chemistry Research 61(45), 16780–16798.

Patrón, G.D., Ricardez-Sandoval, L., 2022. An integrated real-time optimization, control, and estimation scheme for post-combustion CO₂ capture. Applied Energy 308, 118302.

Patrón, G.D., Ricardez-Sandoval, L., 2020. A robust nonlinear model predictive controller for a post-combustion CO₂ capture absorber unit. Fuel 265, 116932.

Patrón, G.D., Ricardez-Sandoval, L., 2020. Real-Time Optimization and Nonlinear Model Predictive Control for a Post-Combustion Carbon Capture Absorber. IFAC-PapersOnLine 53(2), 11595–11600.

Book Chapters

Patrón, G.D. and Ricardez-Sandoval, L., 2024. Online control and optimization for conventional and emerging carbon capture systems. Encyclopedia of Systems of Systems and Control Engineering, Elsevier.

Conference Presentations

Patrón, G.D. and Ricardez-Sandoval, L. (2024). Bootstrapped gross error detection for efficient and fault-tolerant real-time optimization. 2024 American Control Conference, WeC14.3.

Patrón, G.D. and Ricardez-Sandoval, L. (2023). Robust real-time optimization for the long-term economical and sustainable operation of post-combustion carbon capture under uncertainty. 11th International Freiberg Conference, Poster 25.

Patrón, G.D. and Ricardez-Sandoval, L. (2023). Economic Model Predictive Control of a Recirculating Aquaculture System. 22nd IFAC world congress, WeB16.4.

Patrón, G.D. and Ricardez-Sandoval, L. (2022). Partial Modifier Adaptation for Economic Optimization of Process Systems Under Frequent Disturbances and Structural Model Uncertainty. AIChE annual meeting 2022, 434d.

Patrón, G.D. and Ricardez-Sandoval, L. (2022). Parameter Estimation for Real-Time Optimization Under Model Uncertainty and Measurement Noise. AIChE annual meeting 2022, 434g.

Patrón, G.D. and Ricardez-Sandoval, L. (2020). Towards an integrated approach for real-time economic optimization, state estimation, and control for a post-combustion carbon capture absorber section. AIChE annual meeting 2020, 596c.

Patrón, G.D. and Ricardez-Sandoval, L. (2020). Real-Time Optimization and Nonlinear Model Predictive Control for a Post-Combustion Carbon Capture Absorber. 21st IFAC world congress, VI161-09.9.

Awards and Grants

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| Doctoral Thesis Completion Award <i>University of Waterloo</i> | 2022 |
| Faculty of Engineering Domestic Doctoral Student Award <i>University of Waterloo</i> | 2018–2022 |
| Graduate Research Studentship <i>University of Waterloo</i> | 2018–2022 |
| Dean's List <i>University of Toronto</i> | 2013–2017 |
| Centre for International Experience Award <i>University of Toronto</i> | 2016 |
| Cross-Disciplinary Program Summer Grant | 2016 |

University of Toronto

University of Toronto Entrance Scholarship

2013

University of Toronto

Teaching and Mentoring

Undergraduate teaching assistantship

2019, 2020

University of Waterloo, CHE420: Introduction to Process Control with Prof. Hector Budman

Undergraduate student supervision

University of Waterloo, undergraduate thesis, Zhen Ye:

2022

Modifier adaptation for real-time optimization of the Williams-Otto CSTR.

University of Waterloo, final year design project:

2021

Design of a Chemical Looping Combustion Model for Reducing Carbon Footprint.

University of Waterloo, final year design project:

Modelling and Optimization of Chemical Looping Combustion (CLC) Process.

2020

Professional Membership

American Institute of Chemical Engineers (AIChE): Post-doctoral Researcher Member

2022–

Canadian Society for Chemical Engineering (CSCHE): Postdoctoral Fellow Member

2022–

International Federation of Automatic Control (IFAC): Affiliate Member

2022–

Academic Service

Journal reviewer: AIChE Journal, Applied Intelligence, The Canadian Journal of Chemical Engineering, Industrial & Engineering Chemistry Research, Journal of Process Control

Conference reviewer: American Controls Conference (ACC), Dynamics and Control of Process Systems (DYCOPS)

Industrial Experience

EllisDon Corporation

2015

M.E.I.T. Intern, New Oakville Trafalgar Memorial Hospital

- Worked with specialty teams - Mechanical, Electrical, and Information Technology - during the commissioning of the project.
- Performed calibration, testing, and troubleshooting for hospital communications and emergency systems - to meet strict hospital regulations and standards.
- Identified system deficiencies and liaised with subcontractors to find solutions.
- Modified drawings for hoarding permit applications using Autodesk.

EllisDon Corporation

2014

Estimating Intern

- Was a part of the proposal team that formed an estimate and won the Eglinton Light Rail Transit (ELRT) project.
- Management of several project-specific tender packages, including assessment of requirements based on specifications, qualification process, management of quotes, quantity takeoffs, and estimates.