Dr. Rocío Mercado Oropeza

Curriculum Vitae

Contact info: Elektrogården 1 412 58 Göteborg, SE rocio.mercado@chalmers.se +46 (0)76 854-7752 Webpage: ailab.bio

ORCID: 0000-0002-6170-6088

Born: October 9, 1992 Nationality: American

RESEARCH INTERESTS

Dr. Mercado heads the AI Lab for Molecular Engineering (AIME) at Chalmers, where she and her team seek to bridge methods from machine learning, chemistry, and the life sciences to engineer molecular systems for therapeutic applications and sustainable materials, focusing on new AI method development. She and her team maintain active collaborations with industry researchers, including AstraZeneca, Intel, and Merck.

ACADEMIC EDUCATION

Doctor of Philosophy, Chemistry

Aug 2018

University of California, Berkeley, CA, USA

Thesis title: Computationally-driven investigations towards better gas adsorption materials

Bachelor of Science, Chemistry

Jun 2013

California Institute of Technology, Pasadena, CA, USA

Thesis title: Fluorinated cobaloximes for electrocatalytic proton reduction

PROFESSIONAL APPOINTMENTS

WASP AI/MLX Assistant Professor

Jan 2023 – present

Apr 2011 - Jul 2013

Al laboratory for Molecular Engineering (AIME)

Section for Data Science and AI, Department of Computer Science and Engineering

Chalmers University of Technology, Gothenburg, SE

Postdoctoral Associate Aug 2021 – Dec 2022

Coley Group, Department of Chemical Engineering

Massachusetts Institute of Technology, Cambridge, MA, USA

Postdoctoral Researcher Oct 2018 – Jul 2021

Molecular AI, Discovery Sciences R&D

AstraZeneca, Gothenburg, SE

Visiting PhD Researcher Jan 2018 – Aug 2018

Laboratoire de simulation moléculaire, Faculty of Basic Sciences & Aug 2016 – Nov 2016

École polytechnique fédérale de Lausanne, Sion, CH & Jul 2015 – Nov 2015

PhD Researcher Aug 2013 – Dec 2017

Molecular Simulation Group, Department of Chemical & Biomolecular Engineering

University of California, Berkeley, CA, USA

Undergraduate Researcher

Gray Group, Department of Chemistry & Chemical Engineering

California Institute of Technology, Pasadena, CA, USA

SELECT FUNDING AND AWARDS

Main applicant

- Swedish Research Council, Starting Grant, 4M SEK (equiv 1 PhD student fully-funded for four years), 2023
- Intel-Merck AWASES Award, Intel-Merck Joint Academic Research Center for Al-Aware Pathways to Sustainable Semiconductor Process and Manufacturing Technologies (AWASES), 6.4M SEK (equiv 1 PhD and 1 postdoctoral researcher fully-funded for three years), 2023
- Chalmers Health Engineering Area of Advance, Seed Funding, 50K SEK (MSc student summer research project), 2023
- Wallenberg Al, Autonomous Systems, and Software Program (WASP), Startup Funding, research group startup costs for five years, including funding for 2 PhD students, 2 postdocs, and 80% self salary, 2023
- Gender Initiative for Excellence (Genie), Startup Funding, 2M SEK (equiv 1 PhD student for two years), 2023
- National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP), \$34,000 stipend per Fellowship Year for three years, plus \$12,000 Cost of Education Allowance per year for three years; 12% acceptance rate in 2015, 2015

Co-applicant

- Data-Driven Life Sciences (DDLS), Industrial PhD Funding, with Erik Lindahl (main applicant, Stockholm University), Ola Engkvist (main applicant, AstraZeneca), and Werngard Czechtizky (AstraZeneca); funding for 1 industrial PhD student fully-funded for four years, 2024
- WASP-WISE, Pre-Project Grant, with Chao Zhang (Uppsala University); 500K SEK per partner, 2023
- WASP, Industrial PhD Funding, with Samuel Genheden (AstraZeneca) and Emma Rydholm (PhD applicant); funding for 1 industrial PhD student fully-funded for four years, 2023

RECENT PUBLICATIONS

- 1. A comprehensive review of emerging approaches in machine learning for de novo PROTAC design. Yossra Gharbi, **R.M.**[†] *arXiv*, 2024. (preprint, under review at Digital Discovery)
- 2. Contrastive learning for robust cell annotation and representation from single-cell transcriptomics. Leo Andrekson, **R.M.**† bioRxiv, 2024. (preprint, under review at Nature Machine Intelligence)
- 3. *Modeling PROTAC degradation activity with machine learning.* Stefano Ribes, Eva Nittinger, Christian Tyrchan, **R.M.**[†] *Artificial Intelligence in the Life Sciences*, 2024, *6*, 100104.
- Do Chemformers dream of organic matter? Evaluating a transformer model for multi-step retrosynthesis. Annie M. Westerlund, Siva Manohar Koki, Supriya Kancharla, Alessandro Tibo, Lakshidaa Saigiridharan, Mikhail Kabeshov, R.M., Samuel Genheden. J. Chem. Inf. Model., 2024, 64, 8, 3021–3033.
- 5. Data sharing in chemistry: lessons learned and a case for mandating structured reaction data. **R.M.**, Steven Kearnes, Connor W. Coley. *J. Chem. Inf. Model.*, 2023, 63, 14, 4253–4265.
- 6. De novo PROTAC design using graph-based deep generative models. Divya Nori, Connor W. Coley, **R.M.**[†] Al4Science Workshop, NeurlPS, 2022.
- 7. De novo drug design using reinforcement learning with graph-based deep generative models. Sara Romeo Atance, Juan Viguera Diez, Ola Engkvist, Simon Olsson, **R.M.**[†] *J. Chem. Inf. Model.*, 2022, 62, 20, 4863–4872.
- 8. Amortized tree generation for bottom-up synthesis planning and synthesizable molecular design. Wenhao Gao, **R.M.**, Connor W. Coley. *ICLR*, 2022. (conference paper)
- 9. Exploring graph traversal algorithms in graph-based molecular generation. **R.M.**, Esben J. Bjerrum, Ola Engkvist. *J. Chem. Inf. Model.*, 2022, 62, 9, 2093–2100.

- 10. A transferable Boltzmann Generator for small molecules. Juan Viguera Diez, Sara Romeo Atance, Ola Engkvist, **R.M.**, Simon Olsson. *ELLIS Machine Learning for Molecule Discovery Workshop*, 2021. (workshop paper)
- 11. De novo drug design using reinforcement learning with graph-based deep generative models. Sara Romeo Atance, Juan Viguera Diez, Ola Engkvist, Simon Olsson, **R.M.**† *RL4RealLife Workshop*, ICML, 2021.
- 12. Comparative study of deep generative models on chemical space coverage. Jie Zhang, **R.M.**, Ola Engkvist, Hongming Chen. J. Chem. Inf. Model., 2021, 61, 6, 2572–2581.
- 13. *Molecular representations in Al-driven drug discovery: a review and practical guide.* Laurianne David, Amol Thakkar, **R.M.**, Ola Engkvist. *J. Cheminf.*, 2020, 12, 56.
- 14. *Practical notes on building graph generative models.* **R.M.**, Tobias Rastemo, Edvard Lindelöf, Günter Klambauer, Ola Engkvist, Hongming Chen, Esben J. Bjerrum. *Applied AI Letters*, 2020.
- 15. *Graph networks for molecular design.* **R.M.**, Tobias Rastemo, Edvard Lindelöf, Günter Klambauer, Ola Engkvist, Hongming Chen, Esben J. Bjerrum. *Mach. Learn.: Sci. Tech.*, 2020.

PUBLICATION STATISTICS

Based on Google Scholar:

publications in total
 in peer-reviewed international journals
 Total citations: 2377
 h-index: 16

4 in computer science conferences or workshops i10-index: 17

9 with PhD supervisor

16 as first and/or corresponding author

RECENT INVITED TALKS

- 1. Al in Drug Discovery and Biomedicine. Barcelona, ES. Mar 31-Apr 02, 2025. Engineering molecules to specification with generative AI.
- 2. 2nd Nordic Computational Chemistry Conference. Gothenburg, SE. Mar 18-19, 2025. Engineering molecules to specification with generative AI.
- 3. Science Fika, Department of Chemistry, Chalmers. Gothenburg, SE. Dec 11, 2024. Engineering molecules with AI.
- 4. Workforce for Inclusive SciencE (WISE) Lunch Seminar, Department of Electrical Engineering, Chalmers. Gothenburg, SE. Nov 21, 2024. Engineering molecules to specification with AI.
- 5. Intel-Merck AWASES Program Kick-off Event. Virtual. Apr 17, 2024. An integrated molecular dynamics and deep learning framework for multi-modal materials data.
- 6. Generative AI in Life Science (GenLife). Copenhagen, DN. Apr 16, 2024. Next-gen drug design with machine learning.
- 7. WISE Dialogue 2024. Gotheburg, SE. Mar 15, 2024. Machine learning-accelerated electrolyte modelling and design. Joint presentation with collaborator Chao Zhang.
- 8. International Symposium on Machine Learning in Quantum Chemistry. Uppsala, SE. Nov 29, 2023. Deep generative models for biomolecular engineering. link to recording
- 9. † DDLS Annual Conference, Karolinska Institutet. Stockholm, SE. Nov 16, 2023. Transforming biomolecular engineering through Al.
- 10. Chemistry and Materials Science Department(s). Aalto University. Helsinki, Fl. Nov 13, 2023. Deep generative models for biomolecular engineering.

3

[†] indicates corresponding author, * indicates co-first authors

[†] keynote presentation

CURRENT STUDENTS AND POSTDOCS

Yaochen Rao PhD Computer Science & Engineering (Dec 2024 – present)

Chalmers University of Technology Assistant advisor: Dr. Fredrik Johansson

Frederik Lizak Johansen Guest PhD Researcher (Sep 2024 – present)

PhD Machine Learning University of Copenhagen

Pablo Martínez Crespo PhD Computer Science & Engineering (Sep 2024 – present)

Chalmers University of Technology

Assistant advisors: Dr. Simon Olsson, Dr. Santiago Miret (Intel), Dr. Vijay Narasimhan (EMD Electronics)

Dr. Richard BeckmannPostdoctoral Researcher (Aug 2024 – present)

Chalmers University of Technology

Assistant advisors: Dr. Santiago Miret (Intel), Dr. Vijay Narasimhan (EMD Electronics)

Dr. Farzaneh JalalypourPostdoctoral Researcher (May 2024 – present)

Chalmers University of Technology

Stefano Ribes PhD Computer Science & Engineering (Mar 2024 – present)

Chalmers University of Technology Assistant advisor: Dr. Moa Johansson

Dr. Philip John HarrisonPostdoctoral Researcher (Jan 2024 – present)

Chalmers University of Technology

Emma Grangvist Industrial PhD Computer Science & Engineering (Oct 2023 – present)

Chalmers University of Technology & AstraZeneca

Co-advisor: Dr. Samuel Genheden (AstraZeneca); assistant advisor: Dr. Fredrik Johansson

Télio CropsalPhD Computer Science & Engineering (Sep 2023 – present)

Chalmers University of Technology Assistant advisor: Dr. Simon Olsson

Yossra Gharbi PhD Computer Science & Engineering (Sep 2023 – present)

Chalmers University of Technology Assistant advisor: Dr. Simon Olsson

CO-ADVISED STUDENTS AND POSTDOCS

Camille Penot PhD Biophysics (Oct 2024 – present)

Stockholm University & AstraZeneca

Co-advisors: Prof. Erik Lindahl, Dr. Ola Engkvist (AstraZeneca), Dr. Marco Klähn (AstraZeneca), Dr.

Werngard Czechtizky (AstraZeneca)

Valter Schütz PhD Computer Science & Engineering (Sep 2024 – present)

Chalmers University of Technology Main advisor: Prof. Morteza Chehreghani

Selma Mogvist PhD Computer Science & Engineering (Sep 2024 – present)

Chalmers University of Technology Main advisor: Dr. Simon Olsson **Zhan-Yun Zhang**

Postdoctoral Researcher (Jan 2024 – present)

Uppsala University

Main advisor: Prof. Chao Zhang

Ross Irwin

Industrial PhD Computer Science & Engineering (Oct 2023 – present)

Chalmers University of Technology & AstraZeneca

Main advisors: Dr. Simon Olsson, Dr. Alessandro Tibo (AstraZeneca), Dr. Jon-Paul Janet (AstraZeneca)

PAST STUDENTS AND POSTDOCS

Cristian-Catalin Pop 2024 MSc Bioinformatics

Uppsala University

Main advisors: Prof. Ola Spjuth, Dr. Philip John Harrison

• Thesis title: Using ADME/PK models to improve generative molecular design with reinforcement learning

Philip Ivers Ohlsson 2024 MSc Data Science & Al

Chalmers University of Technology & AstraZeneca Co-advisor: Dr. Vignesh Subramanian (AstraZeneca)

• Thesis title: Refining permeability forecasts in drug discovery

Jin Ahmad 2024 BSc Chemistry

Karlstad University

Co-advisor: Dr. Angela Grommet (Chalmers)

• Thesis title: Engineering coordination cages with generative AI

Pär Aronsson & 2024 MSc Data Science & Al Amanda Dehlén 2024 MSc Algorithms, Languages & Logic

Chalmers University of Technology & AstraZeneca Co-advisor: Dr. Filip Miljković (AstraZeneca)

• Thesis title: Prediction of drug metabolites using a deep learning language model

Leo Andrekson 2024 MSc Biotechnology

Chalmers University of Technology

• Thesis title: Learning meaningful representations of cells

Anders Källberg 2024 MSc Biotechnology

Chalmers University of Technology & AstraZeneca

Co-advisors: Dr. Eva Nittinger (AstraZeneca), Dr. Christian Tyrchan (AstraZeneca)

• Thesis title: Machine learning for structural predictions of PROTACs

Elaheh Kazemi Khasragh

Guest PhD Researcher (Feb 2024 – May 2024)

Guest PhD Researcher (Oct 2023 – Feb 2024)

PhD Materials Science & Engineering

Polytechnic University of Madrid & IMDEA Materials Institute

• Project title: Molecular dynamics and machine learning for copolymer property prediction

María Nuria Peralta Moreno
PhD Theoretical Chemistry and Computational Modelling

University of Barcelona

Project title: Machine learning for binding site identification

Mert Yurdakul 2023 MSc Data Science & AI

Chalmers University of Technology & AstraZeneca

Co-advisors: Dr. Martin Priessner (AstraZeneca), Dr. Anna Tomberg (AstraZeneca)

• Thesis title: Automating molecular structure elucidation using machine learning

Kinga Jenei 2023 MSc Data Science & Al

University of Gothenburg & AstraZeneca

Co-advisor: Dr. Vignesh Subramanian (AstraZeneca)

Thesis title: Machine learning for molecular property prediction and drug safety

Stefano Ribes 2023 MSc Computer Science & Engineering

Chalmers University of Technology & AstraZeneca

Co-advisors: Dr. Eva Nittinger (AstraZeneca), Dr. Christian Tyrchan (AstraZeneca)

• Thesis title: Machine learning for predicting targeted protein degradation

Edwin Holst & Preetha Mutharasu

2023 MSc Computer Science & Engineering

Chalmers University of Technology & AstraZeneca

Co-advisor: Dr. Jon Paul Janet (AstraZeneca)

• Thesis title: Human-in-the-loop control of molecular reinforcement learning with online adaptive classifiers

Siva Manohar & Supriya Kancharla

2023 MSc Data Science & Al

University of Gothenburg & AstraZeneca

Co-advisors: Dr. Samuel Genheden (AstraZeneca), Dr. Annie Westerlund (AstraZeneca)

• Thesis title: Evaluating and optimizing Transformer models for predicting chemical reactions

Christian Ulmer

2023 MSc Computer Simulations for Science & Engineering

KTH Royal Institute of Technology & Technical University Berlin (dual degree)

Co-advisors: Wenhao Gao (MIT), Dr. Connor Coley (MIT), Prof. Elias Jarlebring (KTH)

• Thesis title: SynNet 2.0: Improved Synthesizable Molecular Design

Divya Nori 2025 BSc Electrical Eng. & Computer Science, Minor Mathematics (exp.)

Massachusetts Institute of Technology

Co-advisor: Dr. Connor Coley

• Project title (UROP): De novo design PROTAC design using graph-based deep generative models

Sara Romeo Atance & Juan Viguera Diez

2021 MSc Complex Adaptive Systems

Chalmers University of Technology & AstraZeneca

Co-advisor: Dr. Simon Olsson (Chalmers)

• Thesis title: Towards molecular design with desired property profiles and 3D conformer generation using deep generative models

Julio Ponte Hernández

2021 MSc Computer Science & Engineering

Chalmers University of Technology & AstraZeneca

Co-advisor: Dr. Simon Olsson (Chalmers)

• Thesis title: Deep learning a transferable model for drug-receptor binding-energy

Tobias Rastemo

2020 MSc Computer Science & Engineering

Chalmers University of Technology & AstraZeneca

Co-advisor: Dr. Shirin Tavara (Chalmers)

Thesis title: Sampling a subset of chemical space with GNN-based generative models

Rueih-Sheng (Ray) Fu

2018 BSc Chemical Engineering

University of California, Berkeley

Molecular Simulation Group

• Thesis title: In silico design of covalent organic frameworks for applications in methane storage

RECENT TEACHING EXPERIENCE

Course Responsible & Examiner, DAT565 – Introduction to Data Science & Al
Computer Science & Engineering (CSE) Department
Chalmers University of Technology, Gothenburg, SE

Aug 2023 – Nov 2023
& Aug 2024 – Nov 2024

• Course responsible, examiner, and principal lecturer for a 200-student introductory data science course for bachelors and masters students from various Chalmers programs

Guest Lecturer, SK00037 – Artificial Intelligence in Healthcare Gothenburg University & Sahlgrenska Academy, Gothenburg, SE Feb 2024 – Apr 2024

- PhD course led by Robert Feldt, Eric Hamrin Senorski, Justin Schneiderman, and Linn Söderholm
- Prepared a 3 hr lecture delivered on Mar 7, 2024 on generative models in drug discovery

REVIEWING SERVICE

Chemical Science, RSC Digital Discovery, Al4Science Workshop (NeurIPS, ICML), ML4Mat Workshop (NeurIPS), ML4Molecules Workshop, DGM4HSD (ICLR), Journal of Cheminformatics, Communications Chemistry*, Machine Learning: Science and Technology*, Nature Communications, Nature Machine Intelligence, Nature Computational Science, IEEE Transactions on Neural Networks and Learning Systems, Journal of Chemical Information and Modeling, Journal of Computer-Aided Molecular Design, ACS Industrial & Engineering Chemical Research, Wiley Chemistry Select, WIREs Computational Molecular Science, NDiSTEM Session Proposals (SACNAS), Research Presentations and Travel Scholarship Abstracts (SACNAS), WASP Academic PhD Call 2023, WASP Academic PhD Call 2024, ICML 2023 Workshop Selection, ERC 2023 StG, BOKU Al4Mat-Vienna-2024, NeurIPS 2024, Al4Mat (NeurIPS 2024 Workshop) Area Chair, ICLR 2025, AISTATS 2025, ELLIS ML4Molecules 2024

RECENT PROFESSIONAL SERVICE

PhD, Lic., and MSc Defenses

- Nedra Mekni, PhD Computational Chemistry, University of Vienna, Jan 2024
- Juan Inda Diaz, PhD Mathematical Sciences, Gothenburg University and Chalmers, Nov 2023
- Giulia Lo Dico. PhD Material Science & Engineering, Universidad Carlos III de Madrid. Jun 2023
- David Hagerman, Lic. Electrical Engineering, Chalmers, Jun 2024
- Filip Ekström Kelvinius, Lic. Computer & Information Science, Linköping University, Feb 2024
- Eric Anttila Ryderup & Yu-Ping Hsu, MSc Data Science & Al, Chalmers, Jun 2024

Academic Service and Appointments

- Profile Leader, Health Engineering Area of Advance, Chalmers, Feb 2024 present (link)
- Organizer, Al for Materials (Al4Mat) Workshop, ICLR 2025, *Oct 2024 present*; *Role:* Co-organizer (with 5 international researchers); ~1-3 hrs/mo
- **Organizer**, CHAIR Theme on Structured Learning, Chalmers, *Oct 2022 present*; *Role:* Co-organizer (with 3 other faculty from Chalmers CSE & MATH); ~1-3 hrs/mo (2023 event page; 2024 event page); Ongoing organization of Al4Science Seminar and fika; ~2-6 hrs/mo (seminar page)
- Organizer, CSE Department Colloquium, Chalmers, Dec 2023 present; Role: Co-organizer (with 4 other faculty from Chalmers CSE) and DSAI representative, organized Apr 2024 colloquium titled "Entrepreneurship in Academia" with speakers Per Stenström, Devdatt Dubhashi, and Yinan Yu; co-ordinated Apr 2024 colloquium with speaker Ricardo Baeza Yates; coordinated Nov 2024 colloquium with Kenny Smith; ∼1-2 hrs/mo
- Selection Committee, Marie Skłodowska-Curie Actions (MSCA) COFUND Doctoral Training Program in Human-centric AI (HAIF), University of Turku, Expected activity Fall 2024 Sep 2025

^{*}indicates received reviewer award from publisher

- **Guest Editor**, 'Good Practices in AI: Democratization of Open Science' Themed Article Collection, Artificial Intelligence in the Life Sciences, Dec 2023 – present (link)
- Organizer, Broad Institute Machine Learning in Drug Discovery (MLinDD) Symposium, Virtual, Dec 2022 Sep 2024; Role: Co-organizer (with 10 other scientists, mainly Broadies) for MLinDD Symposium Oct 2023 and Nov 2024; speaker, sponsorship, and poster sub-committees; ∼1-3 hrs/mo (2024 event page)
- **Host**, Health Engineering Area of Advance FoAss* Recruitment, Chalmers LIFE, *Sep 2024*; *Role:* Faculty candidate host to Dr. Patrick Sandoz; ~6 hrs
- Recruitment Committee, DDLS FoAss* Recruitment, Chalmers CSE & LIFE, *Jun 2023 Mar 2024*; *Role:* Recruitment committee, and faculty candidate host to Dr. Sreekanth Manikandan; ~0-6 hrs/mo
- Recruitment Committee, WASP AI/MATH FoAss* Recruitment, Chalmers CSE, Feb 2023 Mar 2024; Role: Recruitment committee; ~0-1 hrs/mo
- Organizer, WASP/WISE Machine Learning for Molecular and Materials Discoveries (ML2MD) Symposium, Gothenburg, SE, *Jan 2024 Sep 2024*; *Role:* Co-organizer with Chao Zhang (Uppsala University); ~8 hrs/mo (2024 event page)
- **Organizer**, NeurIPS 2023 Al4Science Workshop, *Jan 2023 Dec 2023 Role:* Faculty co-organizer, provided feedback on workshop application, nominated potential speakers; ∼2 hrs (event page)
- **Organizer**, Wallenberg Advanced Scientific Forum 2023, *Feb 2023 Oct 2023*; *Theme:* Nobel-Turing Grand Challenge Workshop; *Role:* Co-organizer (with 3 other faculty from Chalmers & OIST), nominated and invited attendees, with a focus on gender balance and diversity; ~4 hrs (event page)

*FoAss: Swedish equivalent of assistant professor ("forskarassistent")

IN THE MEDIA

Interviews and news articles

- "A double win for AI in this year's Noble prize" by Natalija Sako. Chalmers News. Oct 2024. link
- "Department Interview: Meet Assistant Professor Rocío Mercado." Chalmers CSE. link
- "Artificial Intelligence of Drug Discovery with Rocío Mercado." Skype a Scientist LIVE. link
- "Constructing an Edifice of Life and Science with Rocío Mercado." Random Walks Podcast. link
- "Mentorship creates lasting bonds" by Lisa Muñoz. Scholar News (Amgen Scholars Program). link

Scientific talks

- "Deep generative models for biomolecular engineering." 2nd International Symposium in Machine Learning in Quantum Chemistry. link
- "Lightning talks from selected poster presenters; Joshua Meier, Divya Nori, Rocío Mercado, Xuetao Shi." *Broad Institute MLinDD Symposium*. link
- "Accelerating molecular design using graph-based deep generative models." *Graph Machine Learning in Industry.* link
- "Discovering New Molecules Using Graph Neural Networks by Rocío Mercado." GAIA 2020 Conference. link
- "Applying graph neural networks to molecular design." NeurIPS 2020 ML4Molecules Workshop. link
- "Disrupting the pharma industry with AI." GAIA Meet-up. link

Miscellaneous

Recorded talks for the Chalmers Al4Science Seminar. YouTube. link

LANGUAGES

English (fluent), Spanish (fluent), and Swedish (C1)

Last updated December 4, 2024