

Elvis Eugene

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PROFESSIONAL SUMMARY

- Computational researcher studying chemical engineering systems using machine learning, mathematical optimisation, and statistical inference.
- Proficient at physics-informed machine learning and Bayesian hybrid models.
- Background in process engineering including detailed design, HAZOP, and plant commissioning.
- Adept at blending academic research insights with industrial innovation to enhance value via scalable, impactful solutions.

EDUCATION

University of Notre Dame

Notre Dame, IN

Ph.D., Chemical Engineering & Computational Science

April 2022

M.S., Chemical Engineering

May 2020

Dissertation: Foundations of molecular-to-systems design: Frameworks for data-driven process systems engineering

Ramaiah Institute of Technology

Karnataka, India

B. E., Chemical Engineering

May 2012

RESEARCH EXPERIENCE

Senior Scientist, Computational Process Design and Optimization

July 2022 – June 2025

Pfizer Research and Development

Groton, CT

- Developed dynamic models using first-principles and machine learning to scale-up active pharmaceutical ingredient synthesis from laboratory to manufacturing scales resulting in 20% faster timelines.
- Defined advanced temperature control strategies using nonlinear and mixed integer programming to limit impurities below 1.5% during commercial manufacturing.
- Commissioned a prototype continuous reactor utilising data analytics for troubleshooting and risk aversion which enabled 30% faster deployment.
- Accelerated process design using innovations in data science via Bayesian optimization, gray-box hybrid modeling, machine learning, and mathematical programming.

Graduate Research Assistant

Aug. 2017 – April 2022

Dowling Lab, University of Notre Dame

Notre Dame, IN

- Created a novel framework for decision-making under model-form uncertainty using Bayesian hybrid models (BHM) which uses machine learning to determine unknown process dynamics, reducing data requirements more than 50%.
- Designed novel flowsheets and filter fabrication techniques using superstructure optimisation and data analytics to utilize membranes for green energy applications such as lithium-ion battery recycling, accelerating workflows by 5x.
- Grew the group from four to 15+ members and mentored the team to win two grants and publish four articles.
- Proposed integrated vision of data science to revolutionize molecular-to-systems engineering.

TEACHING EXPERIENCE

Teaching Assistant

Aug. 2017 – May 2019

Dept. of Chemical and Biomolecular Engineering, University of Notre Dame

Notre Dame, IN

- Nurtured the academic curiosity of the students while firmly rooting fundamental principles by running tutorial sessions and office hours to elucidate concepts from lectures.
- Developed tutorials to train undergraduate students in the use of software and programming languages.
- Courses: Numerical and Statistical Analysis (Spring 2018, Spring 2019), Thermodynamics II (Fall 2018), Senior Chemical Engineering Laboratory (Fall 2017).

PROFESSIONAL EXPERIENCE

Senior Process Engineer

Simon India Limited

Sep. 2012 – May 2017

New Delhi, India

- Designed (detailed engineering), supervised construction, and commissioned a 2000 metric ton per day sulphuric acid plant with heat recovery system and captive power plant, the first of its kind in India.
- Collaborated with project management to increase project revenue by 17% through contract change-orders.
- Ensured safety compliance as a member of the hazard and operability (HAZOP) studies team for three plants.
- Certified quality compliance for subcontracted units like turbine driven pumps and distributed control systems (DCS).
- Delivered design documents such as P&IDs, PFDs, equipment and instrumentation specifications, and control logics within stipulated deadlines.
- Calculated line hydraulics, equipment sizes, and mass and energy balances for the main plant and offsite utilities.
- Partnered with customers through technical discussions and site visits to build long-term relationships which lead to winning additional contracts.

PEER REVIEWED PUBLICATIONS

Elvis A. Eugene, Kyla Jones, Xian Gao, Jialu Wang, and Alexander W. Dowling. Learning and Optimization Under Epistemic Uncertainty with Bayesian Hybrid Models. *Computers & Chemical Engineering*, **179**, 108430 (2023). <https://doi.org/10.1016/j.compchemeng.2023.108430>.

Jialu Wang, **Elvis A. Eugene**, and Alexander W. Dowling. Scalable Stochastic Programming with Bayesian Hybrid Models. *Computer Aided Chemical Engineering*, **49**, 1309-1314 (2022). [10.1016/B978-0-323-85159-6.50218-9](https://doi.org/10.1016/B978-0-323-85159-6.50218-9).

Noah P. Wamble, **Elvis A. Eugene**, William A. Phillip, and Alexander W. Dowling. Optimal Diafiltration Membrane Cascades Enable Green Recycling of Spent Lithium-Ion Batteries. *ACS Sustainable Chemistry & Engineering*, **10**, 37, 12207-12225 (2022). [10.1021/acssuschemeng.2c02862](https://doi.org/10.1021/acssuschemeng.2c02862).

Joanthan Ouiment, Xinhong Liu, David J. Brown, **Elvis A. Eugene**, Tylar Popps, Zachary W. Muetzel, Alexander W. Dowling, and William A. Phillip. DATA: Diafiltration Apparatus for high-Throughput Analysis. *Journal of Membrane Science*, **641**, 119743 (2022). [10.1016/j.memsci.2021.119743](https://doi.org/10.1016/j.memsci.2021.119743).

Elvis A. Eugene, William A. Phillip, and Alexander W. Dowling. Material Property Targets to Enable Adsorptive Water Treatment and Resource Recovery Systems. *ACS ES&T Engineering*, **1**, 1171-1182 (2021). [10.1021/acsestengg.0c00046](https://doi.org/10.1021/acsestengg.0c00046).

Elvis A. Eugene, Xian Gao, and Alexander W. Dowling. Learning and Optimization with Bayesian Hybrid Models. *Proceedings of the American Controls Conference*, 3997-4002 (2020). [10.23919/ACC45564.2020.9148007](https://doi.org/10.23919/ACC45564.2020.9148007).

Elvis A. Eugene, William A. Philip, and Alexander W. Dowling. Data Science-Enabled Molecular-to-Systems Engineering for Sustainable Water Treatment. *Current Opinion in Chemical Engineering*, **26**, 122-130 (2019). [10.1016/j.coche.2019.10.002](https://doi.org/10.1016/j.coche.2019.10.002).

Elvis A. Eugene, William A. Philip, and Alexander W. Dowling. Material Property Goals to Enable Continuous Diafiltration Membrane Cascades for Lithium-ion Battery Recycling. *Computer Aided Chemical Engineering*, **47**, 469-474 (2019). [10.1016/B978-0-12-818597-1.50075-8](https://doi.org/10.1016/B978-0-12-818597-1.50075-8).

INVITED TALKS

Elvis A. Eugene, Xian Gao, and Alexander W. Dowling. Decision-Making Under Epistemic Uncertainty Using Bayesian Hybrid Models, *AIChE Annual Meeting, 2021*, Boston, MA.

Elvis A. Eugene. Molecules to System Design of Advanced Membrane Materials and Technologies, *University of Notre Dame Chemical and Biomolecular Engineering Seminar Series, Spring 2021*, Notre Dame, IN.

CONFERENCE PRESENTATIONS

Elvis A. Eugene, Jialu Wang, and Alexander W. Dowling. Optimization Under Uncertainty with Bayesian Hybrid Models, *AIChE Annual Meeting, 2022*, Phoenix, AZ.

Elvis A. Eugene, William A. Philip, and Alexander W. Dowling. Material Property Targets for Emerging Adsorptive Water Treatment and Resource Recovery Systems, *AIChE Annual Meeting, 2021*, Boston, MA.

Noah Wamble, **Elvis A. Eugene**, William A. Philip, and Alexander W. Dowling. Superstructure Optimization Enabled Design Heuristics and Material Property Targets for Continuous Diafiltration Membrane Cascades, *AIChE Annual Meeting, 2021*, Boston, MA.

Elvis A. Eugene. Multiscale Systems Engineering for the Development of Sustainable Technologies. (Poster). *AIChE Annual Meeting, 2021*, Boston, MA.

Elvis A. Eugene, Noah Wamble, Xinhong Liu, Jonathan Ouimet, William A. Phillip, and Alexander W. Dowling. Molecules to System Design of Advanced Membrane Materials and Technologies, *AIChE Annual Meeting, 2020*.

Elvis A. Eugene, Xian Gao, and Alexander W. Dowling. Bayesian Learning from Hybrid Models and their Applications in Reaction Engineering, *AIChE Annual Meeting, 2020*.

Elvis A. Eugene, Xian Gao, and Alexander W. Dowling. Learning and Optimization with Bayesian Hybrid Models, *American Control Conference, 2020*.

Elvis A. Eugene, Xinhong Liu, William A. Philip, and Alexander W. Dowling. Model Based Optimization and Bayesian Learning from Dynamic Membrane Characterization Experiments, *Conference on Data Analytics (CoDA) 2020*, Santa Fe, NM.

Elvis A. Eugene, William A. Philip, and Alexander W. Dowling. Mathematical Optimization and Process Intensification of Diafiltration Membrane Systems, *AIChE Annual Meeting, 2019*, Orlando, FL.

Elvis A. Eugene, William A. Philip, and Alexander W. Dowling. Material Property Goals to Enable Continuous Diafiltration Membrane Cascades for Lithium-ion Battery Recycling (poster), *9th International Conference on Foundations of Computer-Aided Process Design*, Copper Mountain, CO.

Elvis A. Eugene, William A. Philip, and Alexander W. Dowling. Optimizing Materials Discovery and Novel Membrane Systems: Mathematical Frameworks, *2019 AIChE Midwest Regional Conference*, Chicago, IL.

HONORS & AWARDS

Finalist, American Institute of Chemical Engineers (AIChE) Computing and Systems Technology Division (CAST) Directors' Student Presentation Awards	2021
Best Poster Award, Notre Dame Chemical and Biomolecular Engineering Graduate Student Organization (CBEGSO) Research Symposium	2021
Notre Dame Chemical and Biomolecular Engineering Exemplary Candidacy Award	2020
Notre Dame Learning Outstanding Graduate Student Teacher Award	2020
American Control Conference Travel Award	2020
Conference on Data Analytics Travel Award	2020
Notre Dame Graduate School Professional Development Award	2019
Foundations of Computer Aided Process Design (FOCAPD) Travel Award	2019

GRANTS & FELLOWSHIPS

The Patrick and Jana Eiler's Graduate Student Fellowship for Energy Related Research	2020
Notre Dame Graduate Student Government Conference Presentation Grant	2019

SERVICE, LEADERSHIP & OUTREACH

Session Chair, Modeling & Data analytics, Pfizer Chemistry Connect	2024
Volunteer, Rise Against Hunger, Groton, CT	2023
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Volunteer, Rise Against Hunger, Groton, CT	2022
Tutor, Robinson Community Learning Center, Notre Dame, IN	2021
Session Chair, Decision-making for Industrial Process Systems, AIChE Spring Meeting	2020
Chair, Academic Affairs Committee, Notre Dame Graduate Student Government	2019
President, Research Symposium Committee, CBEGSO	2018
Secretary, Research Symposium Committee, CBEGSO	2017