

Elvis Eugene

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EDUCATION

University of Notre Dame

Notre Dame, IN

Ph.D., Chemical Engineering, *Minor:* Computational Science and Engineering

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

Graduated 2nd in a class of 75

RESEARCH EXPERIENCE

Senior Scientist, Computational Process Design and Optimization

July. 2022 – Present

Pfizer Worldwide Research, Development, and Medicine

Groton, CT

- Developing dynamic models using first-principles and sparse machine learning for active pharmaceutical ingredient synthesis across the laboratory to manufacturing scales.
- Investigating artificial intelligence for automated and self-optimizing experimentation.
- Augmenting decision-making for economic resource management using optimal experiment design.
- Key research tools include Bayesian optimization, gray-box hybrid modeling, machine learning, probabilistic programming, nonlinear programming, and model-based design of experiments.

Graduate Research Assistant

Aug. 2017 – April 2022

Dowling Lab, University of Notre Dame

Notre Dame, IN

- Created a framework for data-driven decision-making under model-form uncertainty based on gray-box Bayesian hybrid models (BHM).
- Demonstrated that novel polymer membranes are promising for the sustainable recovery of lithium using predictive mathematical models for structure property relationships, superstructure optimization for system design, and nonlinear parameter estimation to define transport phenomena.
- Proposed integrated vision of data science to revolutionize molecular-to-systems engineering.
- Directly mentored 1 graduate student and 1 undergraduate researcher resulting in 2 journal articles and 1 successful fellowship grant.

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

Sep. 2012 – May 2017

Simon India Limited

New Delhi, India

- Designed (detailed engineering), supervised construction, and commissioned a 2000 metric ton per day sulphuric acid plant with heat recovery system, the first of its kind, at Paradeep Phosphates Ltd., Odisha, India.
- Increased project revenue by 17% by compiling technical documentation for change-order negotiations.
- Negotiated technical issues with client and licensor and served as the junior technical liaison for the caprolactam distillation project at Gujarat State Fertilizer Corporation, Gujarat, India.
- Demonstrated technical mastery and attention to detail as a part of several teams responsible for hazard and operability (HAZOP) studies of the plant as well as factory and site acceptance tests of critical plant subsystems.

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). [†]Authors contributed equally.

Joanhan Ouimet, Xinhong Liu, David J. Brown, **Elvis A. Eugene**, Tylar Popp, 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, Decision-making for Industrial Process Systems, AIChE Spring Meeting	2020
Tutor, Robinson Community Learning Center	2021
Chair, Academic Affairs Committee, Notre Dame Graduate Student Government	2019
President, Research Symposium Committe, CBEGSO	2018
Secretary, Research Symposium Committe, CBEGSO	2017