

Natalie Malka Isenberg

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Education University of Pittsburgh – B.S. Chemical Engineering, GPA: 3.7 (August 2016)

Carnegie Mellon University – Ph.D Chemical Engineering, GPA: 3.5 (August 2016 - Present)

Research Interests & Expertise

Mathematical modeling, mathematical optimization, mixed-integer linear programming (MILP), materials design, catalysis, alternative energy technology, process systems engineering, robust optimization

Research Experience

Carnegie Mellon University, Department of Chemical Engineering, *Graduate Student Researcher* (Fall 2016 - Present)

- Formulating and solving **mathematical optimization models** to determine optimal **materials** for CO₂ adsorption
- **Robust optimization** techniques for large-scale, non-convex **nonlinear** process models

U.S. DOE Office of Science Graduate Student Research Fellow, *Graduate Student Researcher* (Spring 2020)

- Working with scientists while visiting at Sandia National Laboratories to develop sophisticated **robust optimization software**

DAAD Research Internship in Science and Engineering (RISE), *Research Intern* (Summer 2015)

- Awarded research internship in Germany to investigate effects of modified **ceramics** in energy storage processes

Swanson School of Engineering, Dr. C. Wilmer, *Undergraduate Researcher* (January 2015 – 2016)

- Developed computational methods for chemical **gas sensors** using **metal organic frameworks**

Swanson School of Engineering, Dr. G. Vesper, *Undergraduate Researcher* (May 2013 – August 2014)

- Studied effects of modified **nanoparticles** as oxygen carriers in **chemical looping combustion**

Mascaro Center for Sustainable Innovation (MCSI), Dr. G. Vesper, *Research Intern* (Summer 2014)

- Headed research project to test **dopants** in cerium dioxide **supports** for improved structural integrity and oxygen availability

Pitt Excel Summer Research Internship, Dr. G. Vesper, *Research Intern* (Summer 2013)

- Worked on optimizing oxygen utilization and stability of materials used in chemical looping combustion technology

Publications

- S. Bhavsar, **N.M. Isenberg**, A. More, G. Vesper, "Lanthana-doped ceria as active support for oxygen carriers in chemical looping combustion," *Applied Energy* 168 (2016): 236-247
- **N.M. Isenberg**, Z. Yan, M.G. Taylor, C.L. Hanselman, G. Mpourmpakis, C.E. Gounaris, "Identification of Optimally Stable Nanocluster Geometries via Mathematical Optimization and Density-Functional Theory", *Molecular Systems Design and Engineering* (2019)
- **N.M. Isenberg**, P. Akula, J.C. Eslick, D. Bhattacharyya, D.C. Miller, C.E. Gounaris, "A Generalized Robust Cutting-Set Algorithm for Nonlinear Robust Optimization in Process Systems Engineering Applications," (In preparation) (2020)
- **N.M. Isenberg**, J.D. Siirola, C.E. Gounaris, "PyROS: A Pyomo Robust Optimization Solver for Robust Process Design," (In preparation) (2020)

Oral Presentations

- INFORMS Annual Meeting (2019), *A Generalized Cutting Set Approach For Robust Process Design*, **N. M. Isenberg**, P. Akula, D. Bhattacharya, D.C. Miller, C.E. Gounaris
- AIChE Annual Meeting (2019), *Robust Optimization for Chemical Process Design and Applications to Carbon Capture Technology*, **N. M. Isenberg**, P. Akula, D. Bhattacharya, D.C. Miller, C.E. Gounaris
- AIChE Annual Meeting (2018), *Identification of Optimally Stable Nanocluster Geometries via Mathematical Optimization and Density-Functional Theory*, **N.M. Isenberg**, Z. Yan, M.G. Taylor, C.L. Hanselman, G. Mpourmpakis, C.E. Gounaris
- INFORMS Annual Meeting (2018), *Mathematical Optimization Based Approaches for the Design of Materials in Energy Applications* **C.E. Gounaris**, C.L. Hanselman, N.M. Isenberg

Relevant Coursework:

Linear Programming, Integer Programming, Constraint Programming, Introduction to Machine Learning, Defects in Materials, Special Topics: Process Systems Engineering, Modern Convex Optimization

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Volunteer and Leadership Experience

Carnegie Mellon University, Chemical Engineering Graduate Student Association, **Outreach Coordinator** (2017-2019)

- Coordinated and ran STEM related volunteer events for graduate students

Carnegie Mellon University, Chemical Engineering Graduate Student Association, **Symposium Chair**, (2018-2019)

- Organized annual student research symposium

Pennsylvania Junior Academy of Science Region 7, **Volunteer Judge** (2017, 2018, 2019)

- Judged elementary and middle school student science fair presentations and determined special award recipients

Carnegie Mellon University, Department of Chemical Engineering, **Teaching Assistant (TA)** (Fall 2017 - Present)

- Introduction to Chemical Engineering (Fall 2016)
- Optimization Modeling and Algorithms & Chemical Process Design (Spring 2017, Spring 2018, Spring 2019)

Propel EAST Middle School, **Volunteer Instructor** (2015 - 2016)

- Taught a weekly introductory creative programming course to elementary and middle school students

Awards

Research Awards:

- Presidential Fellowship, Carnegie Mellon University College of Engineering Awardee (2020)
- DOE Office of Science Graduate Student Research Fellowship Awardee (2019)
- Foundations of Computer-Aided Process Design (FOCAPD) Poster Award Winner (2019)
- 2nd Place, EQT Optimization Poster Award, CAPD Annual Review Meeting (2019)
- Bayer/Covestro Award for outstanding undergraduate students in chemical engineering (2016)
- 1st place poster presentation at "Chemical Engineering Research Day" at the University of Pittsburgh (2015)
- 1st place for undergraduate research in the Mascaro Center for Sustainable Innovation Internship (2014)

Outreach Awards:

- Gelfand Student Service Award, Carnegie Mellon University (2019)

Teaching Awards:

- Mark Dennis Karl Outstanding Graduate Teaching Assistant Award, Carnegie Mellon University (2018)

Technical Skills

Programming Languages: C++, Python, Java, MATLAB

Optimization Software/Packages: IBM ILOG CPLEX, Gurobi, IPOPTH, BARON, GAMS, Pyomo

Languages: Fluent in English and Hebrew, proficient in Spanish