

# Bruno Abreu Calfa

## Curriculum Vitae

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### Education

- 2010–2015 **Ph.D. in Chemical Engineering**, *Carnegie Mellon University*, Pittsburgh, PA.  
Thesis Title: Data Analytics Methods for Enterprise-wide Optimization under Uncertainty.
- 2004–2009 **B.S. in Chemical Engineering**, *Pontifical Catholic University of Rio de Janeiro*, Rio de Janeiro, Brazil.  
Final-Year Project: Chemical Processes Data Treatment Through Data Reconciliation and Parameter Estimation

### Professional Experience

- 2017–present **Senior Research Scientist at the United Technologies Research Center**, East Hartford, CT, USA.
- 2015–2017 **Postdoctoral Fellow in the Department of Chemical and Biological Engineering at the University of Wisconsin-Madison**, Madison, WI, USA.  
Performed systems-level analysis on the production of solar fuels with chemical storage considerations (with Dr. Christos T. Maravelias). Created simulation cases and coordinated the development of an educational website (<http://uwchembussim.che.wisc.edu>) that combines engineering and business best practices to enhance the chemical engineering curriculum (with Dr. William F. Banholzer).
- 2016 **Volunteer Tutoring at the Undergraduate Learning Center (ULC)**, Madison, WI, USA.  
Weekly, 2.5-hour drop-in tutoring sessions for freshman through junior undergraduate students at UW-Madison. Courses/Topics: Process Synthesis (Material and Energy Balances), Chemical Process Modeling, Thermodynamics (I and II), Transport Phenomena, and MATLAB.
- 2014 **Summer Internship at The Dow Chemical Company**, Midland, MI, USA.  
Advanced Analytics group. Data mining and modeling to integrate historical and forecast data in the development of plausible planning scenarios.
- 2013 **Summer Internship at The Dow Chemical Company**, Midland, MI, USA.  
R&D and Supply Chain intern in the Process Optimization group. Developed scenario tree generation methods that incorporate historical and forecast data.

### Academic Experience

- 2007–2008 **Exchange Undergraduate Student (EAP)**, *University of California at Berkeley*, CA, USA.  
Took Upper Level courses in Chemical Engineering, Nuclear Engineering, Corrosion, and MATLAB Programming from Fall 2007 to Spring 2008.
- 2004–2007 **Scientific Project Scholarship: Use of Biomass in Biosorption/Flotation Combined Process for Heavy Metals Removal**, *Pontifical Catholic University of Rio Janeiro*, Brazil.  
Project funded by CNPq (National Council for Scientific and Technological Development).

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## Certificates and Awards

- 2017 **“Best Paper” Initiative**, *AIChE Journal*, AIChE, Award given for the “Best Presentation” in the session, paper [777g](#), at the 2016 Annual AIChE Meeting in San Francisco, CA.  
Invitation to submission of a Research Article to the AIChE Journal.
- 2016 **Materials Science and Engineering Data Challenge Award**, *Challenge.gov*, Air Force Research Lab (AFRL), In this challenge, the AFRL sought novel uses of accessible digital data to advance Materials Science and Engineering knowledge to accelerate the transition to industrial applications (see announcements by the [MGI](#) or the [WPAFB](#)).  
The award includes \$5,000 and an invitation to present the solution at the 2016 Materials Science & Technology conference in Salt Lake City, UT (October 23-27, 2016).
- 2015 **Ken Meyer Award for Excellence in Graduate Research**, *Pittsburgh, PA*, Carnegie Mellon University, Award given by the Department of Chemical Engineering at CMU in which the faculty base their selection of the student on research quality, productivity, recognition, and impact.
- 2015 **Future Faculty Program (FFP)**, *Pittsburgh, PA*, Carnegie Mellon University, Conclusion of the FFP developed by the Eberly Center for Teaching Excellence & Educational Innovation.  
Attended seminars and workshops on teaching, had teaching observations, developed a course syllabus and teaching project (MATLAB tutorials).
- 2012 **Mark Dennis Karl Outstanding Graduate Teaching Award**, *Pittsburgh, PA*, Carnegie Mellon University, Award given by the Department of Chemical Engineering at CMU to a student judged by the faculty to have done an outstanding job as a teaching assistant.
- 2009 **Chemical Engineering Learning Incentive in Brazil Award**, *São Paulo, Brazil*, Brazilian Association of Chemical Engineering (ABEQ in Portuguese), Award given by PETROBRAS and ABEQ to the best student in Chemical Engineering of the Pontifical Catholic University of Rio de Janeiro in 2009.

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## Professional Memberships

- 2010–present **American Institute of Chemical Engineers (AIChE)**.
- 2012–present **Institute for Operations Research and the Management Sciences (INFORMS)**.

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## Teaching Assistant Experience

- Chemical Engineering Thermodynamics, Fall 2014
- Mathematical Methods of Chemical Engineering, Spring 2014
- Introduction to Chemical Engineering, Fall 2013
- MS Excel and VBA Tutorials, Spring 2012
- MATLAB Tutorials, Fall 2011
- Chemical Engineering Process Control, Spring 2011
- Chemical Process Systems Design, Fall 2010

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## Computer Skills

Languages	C, C++, Java, Fortran, VBA, C#, Python, R	Databases	MS Access, MS SQL Server
Platforms	UNIX, Windows		
Software	MATLAB, Maple, Mathematica, AIMMS, GAMS, Aspen Plus, MS Office		

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## Community Service

- 2009 **Mathematics, Physics, and Chemistry Tutoring to Underprivileged Children, Rio de Janeiro, Brazil**, Center for Study and Action on Minors (NEAM, in Portuguese) at PUC-Rio, Taught middle- and high-school students from Rocinha and other favelas.

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## Languages

Portuguese	Native	<i>My mother language.</i>
English	Fluent	<i>Speaking, reading, and writing.</i>

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## Conference Presentations

- 2016 **2016 AIChE Annual Meeting, Hilton San Francisco and Parc 55 Wyndham San Francisco – Union Square, San Francisco, CA.**  
Talk: Property Prediction of Crystalline Solids from Composition and Crystal Structure.
- 2016 **2016 AIChE Annual Meeting, Hilton San Francisco and Parc 55 Wyndham San Francisco – Union Square, San Francisco, CA.**  
Talk: Conceptual Analysis of Process Alternatives for Solar Thermochemical Methanol Production: The Role of Chemical Storage.
- 2016 **2016 AIChE Annual Meeting, Hilton San Francisco and Parc 55 Wyndham San Francisco – Union Square, San Francisco, CA.**  
Talk: Web-Based Simulation Games for the Integration of Engineering and Business Best Practices.
- 2016 **2016 Materials Science & Technology, Salt Palace Convention Center, Salt Lake City, UT.**  
Invited Talk: Optimal Design of Atomic Crystalline Solids using Kernel Regression Property Prediction Models.
- 2015 **2015 AIChE Annual Meeting, Salt Palace Convention Center, Salt Lake Marriott Downtown at City Creek, and Hilton Salt Lake City Center, Salt Lake City, UT.**  
Talk: Optimal Procurement Contract Selection with Price Optimization under Uncertainty for Process Networks.
- 2015 **2015 ISMP Meeting, Wyndham Grand, Pittsburgh, PA.**  
Invited Talk: Data-Driven Chance-Constrained Optimization via Kernel Smoothing: Effective NLP Initialization Strategy.
- 2014 **2014 AIChE Annual Meeting, Atlanta Marriott Marquis and Hilton Atlanta, Atlanta, GA.**  
Talk: Data-Driven Individual and Joint Chance-Constrained Optimization via Kernel Density Estimation.
- 2014 **2014 INFORMS Annual Meeting, Hilton San Francisco and Parc 55 Wyndham San Francisco – Union Square, San Francisco, CA.**  
Invited Talk: Data-Driven Individual and Joint Chance-Constrained Optimization via Kernel Density Estimation.

- 2013 **2013 AIChE Annual Meeting**, *Hilton San Francisco and Parc 55 Wyndham San Francisco – Union Square*, San Francisco, CA.  
Talk: Multi-stage Scenario Tree Generation via Statistical Property Matching.
- 2013 **2013 INFORMS Annual Meeting**, *Minneapolis Convention Center*, Minneapolis, MN.  
Invited Talk: Multi-stage Scenario Tree Generation via Statistical Property Matching.
- 2012 **2012 AIChE Annual Meeting**, *David L. Lawrence Convention Center*, Pittsburgh, PA.  
Talk: Hybrid Bilevel-Lagrangean Decomposition Scheme for the Integration of Planning and Scheduling of a Network of Batch Plants.
- 2005 **5<sup>th</sup> Scientific Initiation National Congress (V CONIC)**, *UNIMONTE*, Santos, SP, Brazil.  
Talk: Biosorption/Bioflotation Combined System for the Removal of Cd Applied to Liquid Effluents Treatment.

## Publications

- [14] Calfa, B. A., W. F. Banholzer, M. M. Alger, and M. F. Doherty. “Web-Based Simulation Games for the Integration of Engineering and Business Fundamentals”. In: *Journal of Chemical Engineering Education*. 51.2 (2017), pp. 88–93.
- [13] I. E. Grossmann, R. M. Apap, Calfa, B. A., P. Garcia-Herreros, and Q. Zhang. “Recent Advances in Mathematical Programming Techniques for the Optimization of Process Systems under Uncertainty”. In: *Computers & Chemical Engineering*. 91 (2016), pp. 3–14.
- [12] Calfa, B. A. and J. R. Kitchin. “Optimal Design of Atomic Crystalline Solids using Kernel Regression Property Prediction Models”. In: (2016). In preparation.
- [11] Calfa, B. A. and J. R. Kitchin. “Property Prediction of Crystalline Solids from Composition and Crystal Structure”. In: *AIChE Journal*. 62.8 (2016), pp. 2605–2613.
- [10] Calfa, B. A. and C. T. Maravelias. “Conceptual Analysis of Process Configurations for Solar Fuels Production: The Role of Chemical Storage”. In: (2016). In preparation.
- [9] Calfa, B. A., A. Agarwal, S. J. Bury, J. M. Wassick, and I. E. Grossmann. “Data-Driven Simulation and Optimization Approaches to Incorporate Production Variability in Sales and Operations Planning”. In: *Industrial & Engineering Chemistry Research*. 54.29 (2015), pp. 7261–7272.
- [8] Calfa, B. A. and I. E. Grossmann. “Optimal Procurement Contract Selection with Price Optimization under Uncertainty for Process Networks”. In: *Computers & Chemical Engineering*. 82.1 (2015), pp. 330–343.
- [7] Calfa, B. A., I. E. Grossmann, A. Agarwal, S. J. Bury, and J. M. Wassick. “Data-Driven Individual and Joint Chance-Constrained Optimization via Kernel Smoothing”. In: *Computers & Chemical Engineering*. 78.1 (2015), pp. 51–69.
- [6] I. E. Grossmann, Calfa, B. A., and P. Garcia-Herreros. “Evolution of Concepts and Models for Quantifying Resiliency and Flexibility of Chemical Processes”. In: *Computers & Chemical Engineering*. 70 (2014), pp. 22–34.
- [5] Calfa, B. A.. *A Memory-Efficient Implementation of Multi-Period Two- and Multi-Stage Stochastic Programming Models*. Carnegie Mellon University. Technical Report, 2014. URL: <http://repository.cmu.edu/cheme/246/>.

- [4] Calfa, B. A., A. Agarwal, I. E. Grossmann, and J. M. Wassick. “Data-Driven Multi-Stage Scenario Tree Generation via Statistical Property and Distribution Matching”. In: *Computers & Chemical Engineering*. 68.1 (2014), pp. 7–23.
- [3] Calfa, B. A., A. Agarwal, I. E. Grossmann, and J. M. Wassick. “Hybrid Bilevel-Lagrangian Decomposition Scheme for the Integration of Planning and Scheduling of a Network of Batch Plants”. In: *Industrial & Engineering Chemistry Research*. 52.5 (2013), pp. 2152–2167.
- [2] Calfa, B. A. and M. L. Torem. “Bioreagents: their use in the removal of heavy metals from liquid streams by biosorption/bioflotation. (in Portuguese)”. In: *Revista Escola de Minas*. 60.3 (2007), pp. 537–542.
- [1] Calfa, B. A. and M. L. Torem. “On the Fundamentals of Cr(III) Removal from Liquid Streams by a Bacterial Strain”. In: *Minerals Engineering*. 21.1 (2007), pp. 48–54.