Victor Alves

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SUMMARY AND SKILLS

I am a Ph.D. candidate in chemical engineering at West Virginia University and a member of CODES research group. My expertise encompasses Process Systems Engineering (PSE), where I have developed advanced algorithms for process modeling, control, and nonlinear constrained optimization. Additionally, I possess expertise in supervised machine learning techniques applied to industrial applications. My background is further enriched by hands-on industry experience in the oil and gas, petrochemical, and energy sectors.

Expertise: Advanced process control, process simulation, plantwide control, process operability analysis, supervised machine learning, nonlinear constrained optimization (NLP)
Programming: Python, MATLAB, markdown, restructuredText, LaTeX and exposure to R
Technologies: Git, GitHub, Simulink
Process simulation: Aspen Plus, Aspen Plus Dynamics, Aspen Custom Modeler, HYSYS, AVEVA Process Simulation, PRO/II, Dynsim
Languages: English and Portuguese

Clifton Strengths: Achiever — Context — Learner — Intellection — Focus

EDUCATION

West Virginia University — Morgantown, WV, USA
Ph.D. Candidate (ABD Status), Chemical Engineering; — *Aug. 2020 − May 2024 (Expected)*
GPA: 3.80/4.00

Federal University of Campina Grande — Campina Grande, Paraiba, Brazil
M.Sc., Chemical Engineering; — *Sept. 2017 − March 2020*
Academic Coefficient: 10.00/10.00

University of Birmingham — Birmingham, United Kingdom
B.Sc., Chemical Engineering (Exchange Student); — *Sept. 2014 − Aug. 2015*
British Degree Classification: Upper Second

Federal University of Campina Grande — Campina Grande, Paraiba, Brazil
B.Sc., Chemical Engineering; — *March 2012 − March 2017*
Academic Coefficient: 8.69/10.00

WORK EXPERIENCE

West Virginia University — Morgantown, WV, USA
Graduate Research Assistant (Ph.D.) — *Aug. 2020 − Currently*
- Tutored undergraduate students at the senior level, allowing them to be introduced to scientific research in process systems engineering, process modeling (steady-state/dynamics), process operability concepts and control.
- Collaborated with Dr. Fernando V. Lima as his Teaching Assistant for the Chemical Process Control course, undergraduate senior-level. Prepared lectures, tutorials in MATLAB/Simulink and problem sets for students, in a problem-based learning fashion.

Federal University of Campina Grande — Campina Grande, Paraiba, Brazil
Graduate Research Assistant (M.Sc.) and Developer — *Sept. 2017 − March 2020*
- Research and development of BRPWC for PETROBRAS: An automated software capable of easily selecting the most promising self-optimizing control structures in industrial processes.
- Worked on developing the calculation engine in Python for BRPWC, based on the research results from my Master's thesis.
- Conceptualized the user interface for BRPWC, generating mock-ups that were sent to the computer science team to develop the front-end interface.

SigmaCT as a contractor to Braskem — Marechal Deodoro, Alagoas, Brazil
Process Engineering Intern — *March 2017 − Sept. 2017*
- Worked as a process engineering intern in Vinyl Chloride Monomer (VCM) and Polyvinyl Chloride (PVC) production plants.
- Developed simulations in Aspen Plus and Aspen Plus Dynamics to investigate operating regions of the VCM/PVC plants.

Research Experience

West Virginia University Morgantown, WV, USA

Graduate Research Assistant (Ph.D.) *Aug. 2020 − Currently*

- Currently working with Dr. Fernando V. Lima on the development of emerging techniques for process operability calculations, involving mainly supervised machine-learning, constrained nonlinear programming (NLP) and automatic differentiation (AD) for efficient algorithm development.
- Development of an open-source Python package for process operability calculations, for ease-of-use and dissemination of operability algorithms in academia and industry.
- Control, Optimization and Design for Energy and Sustainability (CODES) research group leader, supervising the group's activities, as well as organizing the semester schedule, workshops, weekly meetings and relevant announcements.

Federal University of Campina Grande Campina Grande, Paraiba, Brazil

Graduate Research Assistant (M.Sc.) *Sept. 2017 − March 2020*

- M.Sc. thesis: "Metamodel-based Numerical Techniques for Self-Optimizing Control": Developed a methodology capable of using Gaussian Process Regression (GPR) to aid the optimal selection of controlled variables (CVs) in industrial processes, following the Self-Optimizing Control (SOC) methodology.

Projects

Opyrability: Process Operability Analysis in Python | *codes-group.github.io/opyrability*

- Opyrability - A Python-based package for process operability analysis - is an open-source project for advanced process operability analyses. The opyrability codebase includes the main operability algorithms, supplementary analysis and visualization methods to allow for the assessment of simultaneous design and control objectives early in the conceptual phase.

Metacontrol | *meta-control.net*

- Metacontrol is a Python-based software that assembles several methodologies into a single bundle so that a fast implementation of the Self-Optimizing Control (SOC) technique can be achieved. Metancontrol's calculation engine and main steps were conceptualized during my Master's thesis.

Selected Research Publications

Alves, Victor, Gazzaneo, Vitor, Lima, Fernando V. "A machine learning-based process operability framework using Gaussian processes". In: *Computers & Chemical Engineering* 163 (2022), p. 107835.

Alves, Victor, Kitchin, John R, Lima, Fernando V. "An inverse mapping approach for process systems engineering using automatic differentiation and the implicit function theorem". In: *AIChE Journal* (2023), e18119.

Alves, Victor, Lima, Felipe S, Silva, Sidinei K, Araujo, Antonio CB. "Metamodel-based numerical techniques for self-optimizing control". In: *Industrial & Engineering Chemistry Research* 57.49 (2018), pp. 16817–16840.

Lima, Felipe Souza, **Alves, Victor**, Araujo, Antonio Carlos Brandao. "Metacontrol: A Python based application for self-optimizing control using metamodels". In: *Computers & Chemical Engineering* 140 (2020), p. 106979.

Sweeney, Dean M. **Alves, Victor**, Sakhai, Savannah, Dinh, San, Lima, Fernando V. "Techno-economic analysis and optimization of intensified, large-scale hydrogen production with membrane reactors". In: *Industrial & Engineering Chemistry Research* 62.46 (2023), pp. 19740–19751.

Relevant Coursework

Major coursework: Transport Phenomena, Advanced Chemical Engineering Thermodynamics, Chemical Reaction Engineering, Mathematical Methods in Chemical Engineering, Statistical Methods, Oil and Gas Refining, Teaching Practicum, Dynamic Simulations, Linear Control Systems, Advanced Optimization

Teaching

Chemical Process Control West Virginia University

Teaching Assistant *Spring, 2023*