Carlos Felipe **Alcala Perez**

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Data Scientist

Summary

Accomplished Data Scientist with extensive experience developing and implementing data-driven and machine learning solutions in the Building Efficiency and Chemical industries. Highly skilled in data gathering, transformation and visualization, and algorithm analysis, development and deployment. Award winning scholar with multiple patents and research articles.

Expertise

- Multivariate Statistical Analysis
- Machine Learning
- Mathematical Analysis
- Data Analytics and Visualization
- Application Development
- Research and Development

Experience

Johnson Controls — **Oct. 2011 - Jan. 2020**

Principal Research Engineer — *Milwaukee, WI* — **Dec. 2017 - Jan. 2020**

- Utilized advanced optimization and data analytics methods to improve the efficiency of heating, ventilation and air conditioning (HVAC) systems.
- Key role in the transfer of newly developed technology into products and applications.
- Multiple patents granted.

Senior Research Engineer — *Milwaukee, WI* — **May 2015 - Dec. 2017**

- Developed methods for monitoring the performance of PID controllers, to detect steady state operation of HVAC equipment, and reduce energy consumption in wireless thermostats while keeping acceptable comfort standards. Applied advanced mathematical tools to develop these methods, as well as artificial intelligence, machine learning and traditional statistical methods.

Senior Research Engineer — *Mexico City, Mexico* — **Jan. 2013 - May 2015**

- Developed data-driven methods for fault detection and diagnosis in connected chillers.

Senior Research Engineer — *Milwaukee, WI* — **Oct. 2011 - Jan. 2013**

- Developed a method for adaptive sampling of PID controllers.

Internship Experience

The Dow Chemical Company — *Freeport, TX* — **May 2010 - Aug. 2010**

Summer Research Intern

- Developed an Excel application for multivariate statistical monitoring of continuous and batch processes.

Capstone Technology — *Seattle, WA* — **2006 - 2009**

Summer Engineering Intern — **May. 2009 - Aug. 2009**

- Developed a multivariate image analysis application to monitor combustion efficiency in furnaces.

Summer Engineering Intern — **May. 2007 - Aug. 2007**

- Developed a multivariate statistical application for statistical modeling and prediction in chemical processes.

Summer Engineering Intern — **May. 2006 - Aug. 2006**

- Developed a multivariate statistical application for detection and diagnosis of sensor and process faults.

NMC North Microelectronics *Beijing, China* **Jun. 2008 - Jul. 2008**

Summer Engineering Intern

- Developed a multivariate statistical application for monitoring the operation of a semiconductor manufacturing process.

Education

Doctor of Philosophy in Chemical Engineering *Los Angeles, CA* **Aug. 2007 - Aug. 2011**

University of Southern California

- Awarded a Roberto Rocca Fellowship.

Master of Science in Chemical Engineering *Austin, TX* **Aug. 2005 - May 2007**

The University of Texas at Austin

- Fulbright Scholarship Recipient.

Bachelor of Science in Chemical Engineering, summa cum laude *Ciudad Madero, Mexico* **Aug. 1999 - Dec. 2003**

Instituto Tecnologico de Ciudad Madero

Skills

Programming	R, Python, SQL, Matlab, VBA, C#
Markup	LaTeX, Markdown, RMarkdown
Frameworks/Libraries	PyTorch, Tensorflow, numpy, pandas, dplyr, ggplot2
Applications	Bash, Git, Docker
Languages	English, Spanish (native)

Certifications

Computational Thinking using Python *MIT* **June, 2020**

edX

Credential ID: d3560c0c0c2541b1a5a38ca2fd6ebd08

Statistics with R *Duke University* **Oct. 29, 2018**

Coursera

Credential ID: UWG3PS5EXMBJ

Machine Learning *University of Washington* **Feb. 1, 2017**

Coursera

Credential ID: 2VHFDHW5GUK6

Data Science *Johns Hopkins University* **Apr. 20, 2016**

Coursera

Credential ID: W9DB45S3CGDZ

Publications

Patents

Newton-based extremum-seeking control system
Timothy I Salsbury, Kirk H Drees, John M House, Carlos F. Alcala Perez
US Patent 10,824,127, 2020

System and method for output compensation in flow sensors using pulse width modulation
Carlos F. Alcala Perez, Kirk H Drees, Timothy I Salsbury

US Patent 10,558,227, 2020

Control system with dimension reduction for multivariable optimization
Timothy I Salsbury, Carlos F. Alcala Perez, John M House
US Patent 10,558,177, 2020

Building management system with voting-based fault detection and diagnostics
Carlos F. Alcala Perez
US Patent 10,747,187, 2020

Thermostat with efficient wireless data transmission
Timothy I Salsbury, Carlos F. Alcala Perez, Homero L Noboa
US Patent 10,739,028, 2020

Building management system with predictive diagnostics
Samuel F Hamilton, Carlos F. Alcala Perez
US Patent 10,700,942, 2020

Control system with asynchronous wireless data transmission
Carlos F. Alcala Perez, Kirk H. Drees
US Patent 10,333,810, 2019

Control system with response time estimation and automatic operating parameter adjustment
Carlos F. Alcala Perez, Timothy I. Salsbury
US Patent 10324424, 2019

Control system with response time estimation
Carlos F. Alcala Perez, Timothy I. Salsbury
US Patent 10317856, 2019

Building climate control system with decoupler for independent control of interacting feedback loops
Timothy I. Salsbury, Carlos F. Alcala Perez, John M. House, Christopher R. Amundson
US Patent 10253997, 2019

Building control system with decoupler for independent control of interacting feedback loops
Timothy I Salsbury, Carlos F Alcala Perez, John M House, Christopher R Amundson
US Patent 10,253,997, 2019

Feedback control system with normalized performance indices for setpoint alarming
Timothy I. Salsbury, Carlos F. Alcala Perez, Michael J. Ajax
US Patent 10,197,977, 2019

Systems and methods for steady state detection
Carlos F. Alcala Perez
US Patent 10,495,334, 2019

Normalized indices for feedback control loops
Timothy I. Salsbury, Carlos F. Alcala Perez
US Patent 9920943, 2018

Systems and methods for adaptive sampling rate adjustment
Carlos F. Alcala Perez, Timothy I. Salsbury
US Patent 9395708, 2016

Journal Papers

Self-perturbing extremum-seeking controller with adaptive gain
Timothy I. Salsbury, John M. House, Carlos F. Alcala
Control Engineering Practice *101 (2020) p. 104456. 2020*

A method for setpoint alarming using a normalized index
Carlos F. Alcala, Timothy I. Salsbury
Control Engineering Practice *60.3 (2017) pp. 1–6. 2017*

An extremum-seeking control method driven by input–output correlation
Timothy I Salsbury, John M House, Carlos F Alcala, Yaoyu Li
Journal of Process Control *58 (2017) pp. 106–116. Elsevier, 2017*

Analysis and generalization of fault diagnosis methods for process monitoring

Carlos F. Alcala, S. Joe Qin
Journal of Process Control *21.3 (2011) pp. 322–330. 2011*

Generalized reconstruction-based contributions for output-relevant fault diagnosis with application to the tennessee eastman process
Gang Li, Carlos F. Alcala, S. Joe Qin, Donghua Zhou
Control Systems Technology, IEEE Transactions on *19.5 (Sept. 2011) pp. 1114–1127. 2011*

Reconstruction-based contribution for process monitoring with kernel principal component analysis
Carlos F. Alcala, S. Joe Qin
Industrial & Engineering Chemistry Research *49.17 (2010) pp. 7849–7857. 2010*

Reconstruction-based contribution for process monitoring
Carlos F. Alcala, S. Joe Qin
Automatica *45.7 (2009) pp. 1593–1600. 2009*

Conference Papers

Self-optimizing Control of an Air Source Heat Pump
Zhongfan Zhao, Yaoyu Li, Timothy I Salsbury, Carlos F Alcala, John M House
2019 American Control Conference (ACC), 2019

Identification of a Self-Optimizing Control Structure from Normal Operating Data
Carlos F Alcala, Timothy I Salsbury, John M House
2019 American Control Conference (ACC), 2019

Decoupling Method for PI Controllers via Setpoint Modification Applied to HVAC Systems
Timothy I Salsbury, John M House, Carlos F Alcala
ASME 2018 Dynamic Systems and Control Conference, 2018

Reduction of Transmissions in Wireless Thermostats with Send-on-Delta Sampling and a Deadband Filter
Carlos F Alcala, Timothy I Salsbury
2018 Annual American Control Conference (ACC), 2018

Decoupling Method for PI Controllers via Setpoint Modification Applied to HVAC Systems
Timothy I. Salsbury, John M. House, Carlos F. Alcala
Proceedings of the Dynamic Systems and Control Conference, 2018

Reduction of Transmissions in Wireless Thermostats with Send-on-Delta Sampling and a Deadband Filter
Carlos F. Alcala, Timothy I. Salsbury
Proceedings of the 2018 Annual American Control Conference (ACC), 2018

Model Selection for Predicting the Return Time from Night Setback
John E Seem, John M House, Carlos F Alcala
Proceedings of the International High Performance Buildings Conference, 2016

Two new normalized EWMA-based indices for control loop performance assessment
Timothy I. Salsbury, Carlos F. Alcala
Proceedings of the American Control Conference (ACC), 2015

Monitoring of dynamic processes with subspace identification and principal component analysis
Carlos F. Alcala, Ricardo Dunia, S. Joe Qin
Proceedings of the 8th IFAC International Symposium on Fault Detection, Supervision and Safety of Technical Processes, 2012, Mexico City, Mexico

Unified analysis of diagnosis methods for process monitoring
Carlos F. Alcala, S. Joe Qin
Proceedings of the 7th IFAC International Symposium on Fault Detection, Supervision and Safety of Technical Processes, 2009, Barcelona, Spain

Unification of contribution analysis for process monitoring
Carlos F. Alcala, S. Joe Qin
Proceedings of the 2008 AIChE Annual Meeting, 2008, Philadelphia, USA

Reconstruction-based contribution for process monitoring
Carlos Alcala, S. Joe Qin
Proceedings of the 17th IFAC World Congress, 2008, Seoul, Korea