Carlos Felipe **Alcala Perez**

Principal Research Engineer

contact

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languages

spanish (native)
english (fluent)

programming

R, Python, Matlab,
Modelica, LaTeX,
RMarkdown, Bash

applications

Simulink, Dymola,
RStudio, Git, Github,
Visual Studio Code

certifications

Statistics with R
Machine Learning
Data Science

education

2007–2011 **Doctor of Philosophy** in Chemical Engineering
University of Southern California. Los Angeles, California.

2005–2007 **Master of Science** in Chemical Engineering
The University of Texas at Austin. Austin, Texas.

1999–2004 **Bachelor of Science** in Chemical Engineering
Technological Institute of Ciudad Madero. Ciudad Madero, Mexico
Summa Cum Laude.

research interests

Data Analytics, Statistical Analysis, Machine Learning, Tuning and Monitoring of PID Controllers, Fault Detection and Diagnosis, Optimization, Self-Optimizing Control, Extremum-Seeking Control

experience

full time

2017 – Now **Johnson Controls International** Milwaukee, Wisconsin.
Principal Research Engineer.

- I am currently working in the development and implementation of methods to improve the efficiency of heating, ventilation and air conditioning (HVAC) systems. I make use of traditional and modern optimization methods, as well as artificial intelligence and machine learning methods. I'm also involved in the transfer of newly developed technology into products and applications.

2015 – 2017 **Johnson Controls International** Milwaukee, Wisconsin.
Senior Research Engineer

- I 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. I used advanced mathematical tools to develop these methods, as well as artificial intelligence, machine learning and traditional statistical methods.

2013 – 2015 **Johnson Controls BE Servicios** Mexico City, Mexico.
Senior Research Engineer

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

2011 – 2013 **Johnson Controls, Inc** Milwaukee, Wisconsin.
Senior Research Engineer

- Developed a method for adaptive sampling of PID controllers.

internships

2010 **The Dow Chemical Company** Freeport, Texas
Summer Research Intern
Developed an Excel application for multivariate statistical monitoring of continuous and batch processes.

2009 **Capstone Technology** Seattle, Washington
2007 *Summer Engineering Intern*
2006
- Developed a multivariate image analysis application to monitor combustion efficiency in furnaces.
- Developed a PLS application for statistical modeling of chemical processes.
- Developed a PCA application for detection and diagnosis of sensor and process faults.

2008 **NMC North Microelectronics** Beijing, China
Summer Engineering Intern
- Developed a PCA application for monitoring the operation of a semiconductor manufacturing process.

awards

2015 **1st Place - 2015 BE TechChallenge** Building Efficiency, Johnson Controls Inc.
I won the annual company-wide innovation competition at JCI.

2007 **Roberto Rocca Fellowship** University of Southern California
I was awarded a fellowship from the Roberto Rocca Education Program to do my PhD at USC.

2005 **Fulbright Scholarship** University of Texas at Austin
I was awarded a Fulbright scholarship to do my Masters degree at UT Austin.

publications

Patents

Building management system with voting-based fault detection and diagnostics
Carlos F. Alcala Perez
US Patent 10401262, 2019

Control system with asynchronous wireless data transmission
Carlos F. Alcala Perez, Kirk H. Drees
US Patent 10333810, 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

Feedback control system with normalized performance indices for setpoint alarming
Timothy I. Salsbury, Carlos F. Alcala Perez, Michael J. Ajax
US Patent 10197977, 2019

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

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 App. 15/908,041, 2018

System and method for output compensation in flow sensors
Carlos F. Alcala Perez, Kirk H Drees
US Patent App. 15/897,987, 2018

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 App. 16/253,965, 2017

Thermostat with efficient wireless data transmission
Timothy I Salsbury, Carlos F. Alcala Perez, Homero L Noboa
US Patent App. 15/618,492, 2017

Systems and methods for steady state detection
Carlos F. Alcala Perez
US Patent App. 15/449,732, 2017

Systems and methods for automatically creating and using adaptive pca models to control building equipment
Carlos F. Alcala Perez
US Patent App. 15/279,336, 2016

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

Building management system with predictive diagnostics
Carlos F. Alcala Perez, Samuel F. Hamilton
US Patent App. 15/188,824, 2016

Journal Papers

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

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

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

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

Reduction of Transmissions in Wireless Thermostats with Send-on-Delta Sampling and a Deadband Filter
C. F. Alcala, T. I. Salsbury
Proceedings of the 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
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

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
Ricardo Dunia Carlos F. Alcala, 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