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

Multivariate Statistical Fault Detection and Diagnosis, Data Analysis, Machine Learning, Tuning and Monitoring of PID Controllers, 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 self-optimizing control methods to improve the efficiency of heating, ventilation and air conditioning (HVAC) systems. A patent has been filed.
- I am working in the implementation of artificial intelligence methods to optimize the operation of HVAC systems. A patent has been filed.
- I am involved in the development and transfer of research projects into products and applications.
- I worked in the development of methods to reject pressure disturbances in control valves. A patent was filed.

2015 – 2017 **Johnson Controls International** Milwaukee, Wisconsin.
Senior Research Engineer
- Developed methods for monitoring the performance of PID controllers. Three patents were granted.
- Developed a method to detect steady state operation in HVAC equipment. A patent was filed.
- Developed method to reduce energy consumption in wireless thermostats while keeping acceptable comfort standards. A patent was filed, and another one was granted.

2013 – 2015	**Johnson Controls de México**	Mexico City, Mexico.

Senior Research Engineer
- Developed data-driven methods for fault detection and diagnosis in connected chillers. A patent was filed.

2011 – 2013	**Johnson Controls, Inc**	Milwaukee, Wisconsin.

Senior Research Engineer
- Developed a method for adaptive sampling of PID controllers. A patent was granted.

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		
2006		

Summer Engineering Intern
- 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 at the 2015 BE TechChallenge**	Building Efficiency, Johnson Controls Inc.

I won the annual company-wide innovation competition at JCI.

2007	**Roberto Rocca Education Program Fellowship**	University of Southern California

I was awarded a fellowship to do my PhD at USC.

2005	**Fulbright Scholarship**	University of Texas at Austin

I was awarded a Fulbright scholarship to do my Masters at UT Austin.

publications

Patents

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. 15/625,605, 2017

Control system with dimension reduction for multivariable optimization
Timothy I. Salsbury, Carlos F. Alcala Perez, John M. House
US Patent App. 15/476,465, 2017

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

Control system with asynchronous wireless data transmission
Carlos F. Alcala Perez, Kirk H. Drees
US Patent App. 15/619,203, 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

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

Control system with response time estimation
Carlos F. Alcala Perez, Timothy I. Salsbury
US Patent App. 15/173,284, 2016

Control system with response time estimation and automatic operating parameter adjustment
Carlos F. Alcala Perez, Timothy I. Salsbury
US Patent App. 15/173,295, 2016

Building management system with voting-based fault detection and diagnostics
Carlos F. Alcala Perez
US Patent App. 14/744,761, 2015

Feedback control system with normalized performance indices for setpoint alarming
Timothy I. Salsbury, Carlos F. Alcala Perez, Michael J. Ajax
US Patent App. 14/961,747, 2015

Systems and methods for adaptive sampling rate adjustment
Carlos F. Alcala Perez, Timothy I. Salsbury
US Patent App. 13/794,683, 2013

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*

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

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

C. F. Alcala, T. 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

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