

# Carlos Felipe **Alcala Perez**

Milwaukee, WI. | ☎ (+1) 414-426-6814 | ✉ [alcala21@gmail.com](mailto:alcala21@gmail.com) | 📱 [alcala21](#) | 🌐 [alcala21](#) | 🎓 Carlos F. Alcala

## Data Scientist

### Summary

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Accomplished Data Scientist with extensive experience in the gathering, cleaning, modeling, analysis and visualization of large amounts of data to solve problems in the Building Efficiency industry. Highly skilled in using advanced tools to develop and implement data science methods and achieve business goals. Award winning scholar who holds multiple patents.

### Areas of Expertise

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- Multivariate Statistical Analysis
- Mathematical Analysis
- Data Analytics and Visualization
- Fault Detection and Diagnosis
- Building Efficiency
- Research and Development

### Experience

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#### Johnson Controls

Oct. 2011 - Jan. 2020

##### PRINCIPAL RESEARCH ENGINEER

Milwaukee, WI

Dec. 2017 - Jan. 2018

- 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

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#### 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.

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

## Education

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### 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 TECNOLÓGICO DE CIUDAD MADERO

## Skills

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**Programming** R, Python, Matlab, VBA, RMarkdown,  $\text{\LaTeX}$   
**Applications** Sublime Text, Git, Github, Visual Studio Code  
**Languages** English, Spanish (native)

## Certifications

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### 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

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### Patents

Control system with response time estimation and automatic operating parameter adjustment

Carlos F. Alcalá Pérez, Timothy I. Salsbury

US Patent 10324424, 2019

Control system with asynchronous wireless data transmission

Carlos F. Alcalá Pérez, Kirk H. Drees

US Patent 10333810, 2019

Building climate control system with decoupler for independent control of interacting feedback loops

Timothy I. Salsbury, Carlos F. Alcalá Pérez, John M. House, Christopher R. Amundson

US Patent 10253997, 2019

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

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

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

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

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

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

Building control system with decoupler for independent control of interacting feedback loops  
 Timothy I Salisbury, Carlos F. Alcala Perez, John M House, Christopher R Amundson  
*US Patent App. 16/253,965, 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. Salisbury  
*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. Salisbury  
*Control Engineering Practice 60.3 (2017) pp. 1–6. 2017*

An extremum-seeking control method driven by input–output correlation  
 Timothy I Salisbury, 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. Alcalá, S. Joe Qin  
Industrial & Engineering Chemistry Research 49.17 (2010) pp. 7849–7857. 2010

## Reconstruction-based contribution for process monitoring

Carlos F. Alcalá, 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 Alcalá, John M House  
2019 American Control Conference (ACC), 2019

### Identification of a Self-Optimizing Control Structure from Normal Operating Data

Carlos F Alcalá, 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 Alcalá  
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 Alcalá, 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. Alcalá  
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. Alcalá, 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 Alcalá  
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. Alcalá  
Proceedings of the American Control Conference (ACC), 2015

### Monitoring of dynamic processes with subspace identification and principal component analysis

Ricardo Dunia Carlos F. Alcalá, 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. Alcalá, 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. Alcalá, S. Joe Qin  
Proceedings of the 2008 AIChE Annual Meeting, 2008, Philadelphia, USA

### Reconstruction-based contribution for process monitoring

Carlos Alcalá, S. Joe Qin  
Proceedings of the 17th IFAC World Congress, 2008, Seoul, Korea