Exponent®
Engineering & Scientific Consulting

Sergio Mendoza, Ph.D.

Senior Manager | Data Sciences
Natick
+1-508-652-8523 tel | smendoza@exponent.com

Professional Profile

Dr. Mendoza earned his Ph.D. in mechanical engineering at Pennsylvania State University. His areas of expertise include model-based control, estimation, information theory, and optimal experimental design.

Dr. Mendoza's research focused on quantifying how the thermodynamic properties of lithium-ion batteries contribute to errors in state and parameter estimation. Additionally, his extensive knowledge of energy storage materials enabled him to study battery pack performance and safety.

Dr. Mendoza's publications include methods for estimating the entropy coefficients of lithium-ion batteries from dynamic experiments, optimal trajectory shaping for combined thermal and electrochemical model parameter identification, and experimentally validated analytic expressions to quantify the error in battery state of charge (SOC) estimation. The fundamental contributions of his work with lithium-ion batteries are broadly applicable to other energy storage technologies.

Prior to joining Exponent, Dr. Mendoza was a Battery Controls Software Lead Engineer at General Motors (GM). His efforts focused on developing control software for propulsion batteries and battery management systems (BMS). He validated the controls software using hardware in the loop (HIL) setup and he executed tests for functional and performance validation. He also worked on the development and implementation of model-based control and diagnostic strategies to enable gas engines to meet EPA emission requirements, to optimize fuel consumption, and to maintain vehicle drivability.

Dr. Mendoza also has a background in Economics and is a certified Six Sigma Green Belt by GM. He has applied his knowledge of Economics and project management for over 8 years in project budgeting, scope analysis, cost tracking and life cycle studies.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Penn State University, 2017

M.S., Mechanical Engineering, Penn State University, 2014

B.A., Economics, University of Memphis, 2011

B.S., Mechanical Engineering, University of Memphis, 2010

Engineering Dean's Award, 2011

Student marshal, Herff College of engineering, class of 2010

Prior Experience

General Motors - Model-based Powertrain Controls Engineer 2/2017 - 5/2018

- Developed control-oriented models of the aftertreatment system in gas engines to improve emissions and fuel consumption
- Designed model-based diagnostic strategies to verify the compliance of different components in the aftertreatment system in gas engines
- Analyzed the implications and potential benefits of different projects on the overall business model

General Motors - Battery Controls Software Lead 5/2018 - 10/2018

- Led development of control software for propulsion batteries used in non-automotive applications
- Developed and execute functional and performance software validation
- Defined diagnostic strategy and implementation
- Led controls system safety analyses including Preliminary Hazard Analyses (PHA) and Design Failure Mode and Effects Analyses (DFMEA)

Professional Affiliations

American Society of Mechanical Engineers (2014 - present)

Languages

Spanish

Publications

S. Mendoza, M. Rothenberger, A. Hake, H. Fathy, "Optimization and Experimental Validation of a Thermal Cycle that Maximizes Entropy Coefficient Fisher Identifiability for Lithium Iron Phosphate Cells", Journal of Power Sources, vol 308, pp. 18 - 28, 2016.

S. Mendoza, J. Liu, Mishra, Partha, H. Fathy, "On the Relative Contributions of Bias and Noise to Lithium-ion Battery State of Charge Estimation Errors", Journal of Energy Storage, vol 11, pp. 86-92, 2017.

P. Mishra, G. Mayank, S. Mendoza, J. Liu, C. Rahn, H. Fathy, "How Does Model Reduction Affect Lithium-ion Battery State of Charge Estimation Errors? Theory and Experiments, Journal of the Electrochemical Society, 164 (2), pp.A237-A251, 2017.

Conference Proceedings

S. Mendoza and H. K. Fathy, "Entropy Coefficient and Thermal Time Constant Estimation from Dynamic Thermal Cycling of a Cylindrical LiFeP04 Battery Cell," in Proceedings of the ASME 2014 Dynamic

Systems and Control Conference, pp. 1-9, San Antonio, 2014.

J. Liu, S. Mendoza, G. Li, H. Fathy, " Efficient Total Least Squares State Estimation for Differentially Flat Systems", in Proceedings of the ACC 2016 American Controls Conference, Boston, 2016.

S. Mendoza, J. Liu, Mishra, Partha, H. Fathy, " Statistical Quantification of Least-Squares Battery State of Charge Estimation Errors" in Proceedings of the ASME 2016 Dynamic Systems and Control Conference, Minneapolis, 2016.

J. Liu, M. Rothenberger, S. Mendoza, P. Mishra, Y. Sik, H. Fathy, "Can an Identifiability-Optimizing Test Protocol Improve the Robustness of Subsequent Health-Conscious Battery Control? An Illustrative Case Study, in Proceedings of the ACC 2016 American Controls Conference, Boston, 2016

S. Mendoza, M. Rothebenger, H.Fathy, "Maximizing Parameter Identifiability of a Combined Thermal and Electrochemical Battery Model Via Periodic Input Optimization", in the proceedings of the IFAC 2017 Conference, Toulouse France, 2017.

Presentations

S. Mendoza, et al Model-based Control and Diagnostics for TWC Aftertreatment System (GM Kettering Forum, 2018)

S. Mendoza, M. Rothenberger, A. Hake, and H. Fathy, Experimental Parameter Identification of a LiFePO4 Thermal Battery Model through Identifiability Maximization Using Input Trajectory Optimization (ECS Fall Meeting, 2014)

S. Mendoza, J. Marchetta, "Rotary Fuel Cell" (50th AIAA Aerospace Sciences Meeting)