

# Adil Khurram

## Curriculum Vitae

8875 Cost Verde Blvd., Apt 101  
San Diego, CA, 92122  
USA

+1 (802) 355 3174

✉ akhurram@ucsd.edu, adilkhurm@gmail.com

### Education

- 2017–2021 **Ph.D. in Electrical Engineering**, *University of Vermont, USA*, *CGPA: 3.76*.  
Advisor: Prof. Mads Almassalkhi, Co-Advisor: Dr. Luis A. Duffaut Espinosa  
Research: Modeling and Control for Packetized Energy Management
- 2014–2016 **MS in Electrical Engineering**, *American University of Sharjah, UAE*, *CGPA: 3.91*.  
Advisor: Prof. Habib-ur-Rehman, Co-Advisor: Prof. Shayok Mukhopadhyay  
Thesis: Performance Enhancement of Field Oriented Induction Motor Drive System
- 2009–2013 **BS in Electrical Engineering**, *National University of Sciences and Technology (NUST), Islamabad, Pakistan*, *CGPA: 3.68*.  
Advisor: Prof. Osman Hasan  
Thesis: Formal Reliability Analysis of Protective Relays in Power Distribution Systems

### Research interests

- Control of distributed energy resources (DERs)
- Statistical modeling of DERs
- Hardware-in-loop testing and validation
- Optimization and control
- Nonlinear systems theory

### Work Experience

- July, 2022 – present **Assistant Project Scientist**, *University of California San Diego*.
- DERConnect project  
Expanded role on the NSF funded DERConnect project which includes detailed design of the microgrid testbed, DER management system, outreach with industry professionals academic researchers as well as coordinating postdoctoral researchers and graduate students.
- 2021–June, 2022 **Post-doctoral researcher**, *University of California San Diego*.
- DERConnect project  
Working on the NSF funded DERConnect project that aims to develop a micro-grid testbed consisting of a heterogeneous fleet of DERs. Responsibilities include requirement specification, schematic design of micro-grid components and DER management system.
- 2017–2021 **Graduate Research Assistant**, *University of Vermont*.

- Packetized Energy Management (PEM), ARPA-E NODES  
Developed aggregate models of PEM enabled DERs along with the optimization framework for demand dispatch. Project highlights:
  - Hardware in loop validation platform using OPAL-RT's OP5600 and ePhasorSim with a cloud-based DER coordinator. Twisted.
  - Field testing of the PEM based controllers on real-world electric water heaters.
  - Model based quantification of the aggregate flexibility.
  - Identification of the parameters of the stochastic hot-water end-use process for electric water heaters modeled as a Markov renewal process from energy measurements.
- 2017 **Graduate Research Assistant**, *American University of Sharjah*, (5 months).
  - Field oriented control of induction motors for traction system of EVs/HEVs.
  - Estimation of state of charge of Lithium-ion based battery bank in the EV drive train.
- 2014–2016 **Graduate Teaching Assistant**, *American University of Sharjah*,  
Courses: Power Electronics, Electric Drives, Power Engineering Lab, Circuits Analysis, Electrical Energy Conversion.
- 2013–2014 **Associate Engineer**, *u-blox, Ltd.*
  - Worked on 4G LTE protocol stack development.

## Publications

### Journal Papers

- G. McClone, A. Ghosh, **A. Khurram**, B. Washom and J. Kleissl, "**Hybrid Machine Learning Forecasting for Online MPC of Work Place Electric Vehicle Charging**", IEEE Transactions on Smart Grid, doi: 10.1109/TSG.2023.3296014.
- **A. Khurram**, M. Amini, L. A. Duffaut-Espinosa, P. D. H. Hines, M. Almassalkhi, "**Real-time grid and DER co-simulation platform for testing large-scale DER coordination Schemes**", IEEE Transactions on Smart Grid, 2022, doi: 10.1109/TSG.2022.3184491.
- S. Brahma, **A. Khurram**, H. Ossareh, M. Almassalkhi, "**Optimal frequency regulation using packetized energy management,**", IEEE Transactions on Smart Grid, 2022, doi: 10.1109/TSG.2022.3197703.
- M. Lugo-Alvarez, J. Kleissl, **A. Khurram**, M. Lave, and C. Jones, "**Graph Theory and Nighttime Imagery based Microgrid Design,**", under review in Journal of Renewable and Sustainable Energy, 2022.
- A. Ghosh, M. Zamora Zapata, S. Silwal, **A. Khurram**, and J. Kleissl, "**Effects of number of electric vehicles charging/discharging on total electricity costs in commercial buildings,**", Journal of Renewable and Sustainable Energy, 2022.
- L. A. Duffaut Espinosa, **A. Khurram**, and M. Almassalkhi, "**Reference tracking control policies for packetized coordination of heterogeneous DER populations,**", IEEE Transactions on Control Systems Technology, vol. 29, no. 6, pp. 2427-2443, Nov. 2020, doi: 10.1109/TCST.2020.3039492.
- **A. Khurram**, R. Malhamé, L. A. Duffaut-Espinosa, and M. Almassalkhi, "**Identification of hot water end-use process of electric water heaters from energy measurements,**" Electric Power Systems Research, vol. 189, p. 106625, 2020.

- **A. Khurram**, H. Rehman, S. Mukhopadhyay, “**Comparative Analysis of Integer Order and Fractional Order PI controller for Induction Motor Drive Systems**”, in Journal of Power Electronics, vol. 18, no. 3, pp. 67-77, May, 2018
- **A. Khurram**, H. Rehman, S. Mukhopadhyay, “**Comparative Analysis of Integer Order and Fractional Order PI controller for Induction Motor Drive Systems**”, in Journal of Power Electronics, vol. 18, no. 3, pp. 67-77, May, 2018
- D. Ali, S. Mukhopadhyay, H. Rehman, **A. Khurram**, “**UAS based Li-ion battery model parameters estimation**”, Control Engineering Practice, 2017.

#### Conference Papers

- A. Ghosh, C. Cortes-Aguirre, Y. -A. Chen, **A. Khurram** and J. Kleissl, L. A. D. Espinosa, M. Almassalkhi, “**Adaptive Chance Constrained MPC under Load and PV Forecast Uncertainties**”, 2023 IEEE PES Grid Edge Technologies Conference & Exposition (Grid Edge), San Diego, CA, USA, 2023, pp. 1-5, doi: 10.1109/GridEdge54130.2023.10102711.
- **A. Khurram**, L. A. D. Espinosa, M. Almassalkhi, “**A Quantization based Approach for Heterogeneity under Packetized Energy Management**”, CCTA 2022.
- **A. Khurram**, L. A. D. Espinosa, M. Almassalkhi, “**A Methodology for Quantifying Flexibility in a fleet of Diverse DERs**” 2021 IEEE Madrid PowerTech, June 28 - July 2, 2021, pp. 1-6, doi: 10.1109/PowerTech46648.2021.9494864.
- L. A. D. Espinosa, **A. Khurram**, M. Almassalkhi, “**A Virtual Battery Model for Packetized Energy Management**”, in Control and Decision Conference, December 14-18, 2020, Jeju, Korea (South), pp. 42-48, doi: 10.1109/CDC42340.2020.9304065.
- **A. Khurram**, L. A. D. Espinosa, M. Almassalkhi, Roland Malhamé, “**Identification of hot water end-use process of electric water heaters from energy measurement**”, Power System Computation Conference 2020.
- M. Amini, **A. Khurram**, A. Klem, M. Almassalkhi, P. D. H. Hines, “**A Model-Predictive Control Method for Coordinating Virtual Power Plants and Packetized Resources, with Hardware-in-the-Loop Validation**”, IEEE Power and Energy Society General Meeting 2019, Atlanta, GA, USA, pp. 1-5, doi: 10.1109/PESGM40551.2019.8973835.
- K. Desrochers, V. Hines, F. Wallace, J. Slinkman, A. Giroux, **A. Khurram**, M. Amini, M. Almassalkhi, P. D. H. Hines, “**Real-world, Full-scale Validation of Power Balancing Services from Packetized Virtual Batteries**”, 2019 IEEE Power and Energy Society International Conference on Smart Grid Technologies, February 18-21, 2019, Washington, DC, USA, pp. 1-5, doi: 10.1109/ISGT.2019.8791628.
- L.Y. Ghamri, H. Awadh, N. Alshamsi, S. Alkhateri, **A. Khurram**, H. Rehman, “**A Novel Automatic Voltage Regulator Design for Synchronous Generators**”, 2018 International Conference on Power Electronics, Machines and Drives (PEMD), Liverpool, UK.
- H. Rehman, **A. Khurram**, “**Fuzzy Logic Enhanced Sensorless Alternative Energy Vehicular Drive System**”, 2017 IEEE Vehicle Power and Propulsion Conference (VPPC), Belfort, France, pp. 1-5, doi: 10.1109/VPPC.2017.8330885.

- **A. Khurram**, H. Rehman, S. Mukhopadhyay, “**A novel hybrid synchronous PWM inverter based IFO drive system**”, 7th International Conference on Modeling, Simulation, and Applied Optimization (ICMSAO), Sharjah, 2017, pp. 1-5, doi: 10.1109/ICMSAO.2017.7934908.
- **A. Khurram**, H. Rehman, S. Mukhopadhyay, “**A High Performance Speed Regulator Design for AC Machines**”, Applied Power Electronics Conference and Exposition (APEC), March 20-24, 2016, Long Beach, CA, USA, pp. 2782-2787, doi: 10.1109/APEC.2016.7468258.
- **A. Khurram**, H. Ali, A. Tariq, O. Hasan, “**Formal Reliability Analysis of Protective Relays in Power Distribution Systems**”, 18th International Workshop on Formal Methods for Industrial Critical Systems (FMICS-2013), Springer LNCS 8187, Madrid, Spain, pp. 169-183.

## Technical and Programming skills

Programming	C/C++, MATLAB/Simulink, Python, VHDL
Optimization	CVX, Julia, JuliaOpt, JuMP, Gurobi, MPT
RT/Hardware	OPAL-RT, dSPACE, Arduino, Vertex FPGA (Xilinx)
CAD tools	OrCAD-PCB Design, Proteus, Altium Designer
Version Control	Subversion (SVN), GitHub/GitLab

## Relevant Course work

- Convex Optimization
- Nonlinear Systems Theory
- Advanced Control Systems
- Stochastic Processes
- Power System Operation and Control, Power System Dynamics
- Dynamics and Control of Electrical Drives
- Advanced Power Electronics