Hammad Hasan

📍 Abu Dhabi, United Arab Emirates | ✉ hammadkhasan@gmail.com | 📞 +971 56 432 3947 | in hammadhasan1

Summary

Research experience in advanced motor control techniques, as well as power electronics design, including inverters and DC-DC converters using SiC MOSFETS. Hands-on experience in hardware prototyping and PCB design with emphasis on reducing EMI.

Experience

Research Associate, Khalifa University   Aug 2024 - Present

- Worked on advanced control and fault diagnosis techniques for multiphase induction drives.
- Control of motor drives: both continuous and discrete-time control theory, state estimation using observers, field-oriented control, direct torque control, and model predictive control.
- Control simulation and verification via MATLAB/Simulink: auto-generate embedded C code and integration into control board, hardware-in-the-loop (HIL) testing.
- Literature review on fault diagnosis and control techniques for multiphase drives.
- Application of neural networks and other machine learning techniques in the detection and localization of faults.
- Contributed to various research projects in the Power Electronics and Sustainable Energy Research Lab.
  - Design of an interleaved converter for fuel cell application.
  - Three level dual active bridge converter for EV applications.
  - Computationally efficient direct torque control for open-end induction machine for electric vehicles.
  - PCB design of SiC-based hybrid DC-DC converter with isolated gate drivers and short-circuit protection.

Education

Khalifa University, Abu Dhabi, UAE   Aug 2022 - May 2024
Master of Science in Electrical and Computer Engineering

Thesis: "Fault Diagnosis of Multiphase Electrical Drives Using Machine Learning"

- GPA: 3.88/4.00
- Numerical simulation of a rotor field-oriented controlled five-phase induction machine on MATLAB/Simulink.
- Developed a hardware prototype for a 2 hp five-phase induction drive system.
- Applied machine learning algorithms to detect and localize open-switch and open-phase faults.
- Teaching assistant for the "Introduction to Python" and "Data Structures and Algorithms" courses.
- Assisted undergraduate students in the development and execution of their senior design projects.
- **Coursework:** Power Electronics, Engineering Numerical Methods, System Optimization

National University of Computer and Emerging Sciences, Islamabad, Pakistan   Aug 2017 - May 2021
Bachelor of Science in Electrical Engineering

- GPA: 3.57/4.00
- Ranked within the top 5% of 150 students in my batch.
- Hands-on experience with ATmega328P, 8051, and ESP32 microcontrollers.
- Proficiency in Object-Oriented Programming (C++) and Assembly Language.
- **Coursework:** Electromagnetic Theory, Multivariable Calculus, Feedback Control Systems

Selected Projects

Advance Control Techniques for Multiphase Induction Machines   Jan 2025 - Present
- Conducted a comprehensive review of the state-of-the-art techniques proposed in the literature.
- Evaluation of the selected and improved model predictive control techniques on MATLAB/Simulink.
- Experimental test bench for five-phase induction machine using TI F28379D.
- Improved Direct Torque Control for Five-Phase Induction Machine with Reduced CMV
  - Proposed new virtual voltage vector realization techniques for better control of higher order harmonics.

Fault Diagnosis of Multiphase Electrical Drives Using Machine Learning   Aug 2024 - Dec 2024
- Developed and trained machine learning models to diagnose switch faults in five-phase induction.
- Data collected from MATLAB simulations and hardware prototype.
- Offline fine-tuning and testing of the machine learning models on experimental data.

Skills

Programming Languages: Python, MATLAB, C++, LaTeX

Development Tools: MATLAB, Simulink, KiCad, Altium Designer, LTspice, PLECS

Hardware Platforms: C2000, ESP32, STM32

Key Achievements

- Recipient of a 10-year UAE Golden Visa for outstanding academic performance in 2024
- Awarded Khalifa University's Master Research Teaching Scholarship from 2022 to 2024
- Silver Medalist for academic performance in 2017 and 2018

Publications

H. Hasan, O. A. Zaabi, K. A. Hosani, and M. E. Moursi, "Data-Driven Fault Diagnosis and Localization in Multiphase Induction Drives," in *2024 6th International Conference on Smart Power & Internet Energy Systems (SPIES)*, Dec. 2024, pp. 118–123. doi:10.1109/SPIES63782.2024.10983462.

H. Hasan, O. A. Zaabi, K. A. Hosani, and M. E. Moursi, "Neural Network-Based Open-Circuit Fault Diagnosis Method for Multiphase Drive Systems" in IEEE Transactions on Energy Conversion. **(Under Review)**

H. Hasan, O. A. Zaabi, "Direct Torque Control of Five-Phase Induction Machine with Reduced Common Mode Voltage and Harmonic Suppression" in IEEE Transactions on Industrial Electronics. **(Under Review)**