

Ghaith Al-refai

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[German Jordanian University](#) • [ResearchGate](#) • [Google Scholar](#)

Amman, Jordan

OBJECTIVE

To contribute to the advancement of robotics and autonomous systems through innovative research in AI, computer vision and AI-driven control. I strive to inspire students by providing high-quality education, practical learning experiences, and fostering interdisciplinary collaboration that addresses real-world challenges in mechatronics, robotics, and AI.

EDUCATION

- **Oakland University** Sep. 2014 - Dec. 2018
PhD in Electrical and Computer Engineering
◦ GPA: 3.91/4.00
Michigan, USA
- **Oakland University** Sep. 2012 - Jul. 2014
Master's Degree in electrical and Computer Engineering
◦ GPA: 3.82/4.00
Michigan, USA
- **Jordan University of Science and Technology** Sep. 2005 - Feb. 2010
B.Sc. Degree in Electrical Engineering
◦ GPA: 86.5/100
Irbid, Jordan

EXPERIENCE

- **German Jordanian University** Feb. 2022 - Now
Assistant Professor, Mechatronics Department
Amman, Jordan
 - Teaching: Instructing courses in the Mechatronics Engineering Department.
 - Course Development: Developing and updating course curricula, lab syllabus, and experiments.
 - Committee Work: Serving on various school committees focused on research, funding, and teaching-related duties.
 - Research: Conducting research in autonomous systems, computer vision, artificial intelligence, and robotics.
- **Robert Bosch LLC** Jul. 2018 - Feb. 2022
Senior Systems Engineer
Michigan, USA
 - Stereo vision camera for ADAS, systems engineer and system architect
 - Product requirement development
 - Product requirement management in DOORS
 - Hardware in Loop (HIL) and Software in Loop for vehicle and bench testing
 - CAN and Ethernet interface development
 - Supporting tools: Canoe, Canalyzer, Lauterbach, MATLAB
- **Clarion Corporation of America** Mar. 2016 - Jul. 2018
Senior Systems Engineer
Michigan, USA
 - Audio head unit system architect and requirement development
 - Requirements test and validation in bench and vehicle, update the result reports
 - Technical project management: customer interface for software releases timing, bug fixes and issues
- **TRW** Sep. 2013 - Mar. 2016
Product Systems Engineer
Michigan, USA
 - Audio head unit system architect and requirement development
 - Requirements test and validation in bench and vehicle, update the result reports
 - Technical project management: customer interface for software releases timing, bug fixes and issues
 - Front Camera testing and validation
 - Requirement review and test specification development per requirements
 - Performing test on vehicle and bench, create test report
 - Diagnostics, simulation and data logging using CANalyzer, Canoe, Neo, RTK
 - Data analysis using MATLAB, and Microsoft excel
 - DFMEA implementation using FMEA IQ

- **Oakland university**

Sep. 2012 - Sep. 2012

Teaching Assistant and Research Assistant

Michigan, USA

- Lab Instructor for Design and Analysis of Electromechanical Systems Course (EGR280)
- Researcher at Chrysler Hardware in loop (HIL) laboratory
- Use the HIL setup in fuel economy study project

- **Korea Southern Power Company**

Jun. 2010 - Jul. 2012

Operation and Control Engineer

Amman, Jordan

- Operation and control room engineer of a combined cycle power plant of two gas-turbines and one steam turbine at Korea Southern Power Company, the capacity of the plant is 390 Mega Watts

LATEST PUBLICATIONS

1. Al-refai, Ghaith, Hisham Elmoaqet, Abdullah Al-Refai, Ahmad Alzu'bi, Tawfik Al-Hadhrami, and Abedalrhman Alkhateeb. "Two-stage object detection in low-light environments using deep learning image enhancement." *PeerJ Computer Science* 11 (2025): e2799.
2. Al-refai, Ghaith, Dina Karasneh, Hisham Elmoaqet, Mutaz Ryalat, and Natheer Almtireen. "Surface Classification from Robot Internal Measurement Unit Time-Series Data Using Cascaded and Parallel Deep Learning Fusion Models." *Machines* 13, no. 3 (2025): 251.
3. Al-refai, Ghaith, Mohammed Al-refai, and Ahmad Alzu'bi. "Driving Style and Traffic Prediction with Artificial Neural Networks Using On-Board Diagnostics and Smartphone Sensors." *Applied Sciences* 14, no. 12 (2024): 5008.
4. Al-refai, Ghaith, Sahar Qadan, Mohammed Al-refai, and Hisham Elmoaqet. "Introducing Edges Density and Texture Contrast Scores as Quality Metrics for Enhanced Low Light Images." In *2024 22nd International Conference on Research and Education in Mechatronics (REM)*, pp. 1-5. IEEE, 2024.
5. ElMoaqet, Hisham, Dina Karasneh, Sameer Al-Dahidi, and Ghaith Al-Refai. "Predicting Solar Photovoltaic Power Production Using Artificial Intelligence-Based Algorithms." In *2024 IEEE 12th International Conference on Intelligent Systems (IS)*, pp. 1-5. IEEE, 2024.
6. Banitaan, Shadi, Ghaith Al-refai, Sattam Almatarneh, and Hebah Alquran. "A review on artificial intelligence in the context of industry 4.0." *International Journal of Advanced Computer Science and Applications* 14, no. 2 (2023).
7. Al-refai, Ghaith, Hisham Elmoaqet, and Mutaz Ryalat. "In-vehicle data for predicting road conditions and driving style using machine learning." *Applied Sciences* 12, no. 18 (2022): 8928.
8. Ryalat, Mutaz, Enrico Franco, Hisham Elmoaqet, Natheer Almtireen, and Ghaith Al-Refai. "The Integration of Advanced Mechatronic Systems into Industry 4.0 for Smart Manufacturing." *Sustainability* 16, no. 19 (2024): 8504.
9. Al-refai, G. and Al-refai, M., 2020. Road object detection using Yolov3 and Kitti dataset. *International Journal of Advanced Computer Science and Applications*, 11(8).
10. El Moaqet, Hisham, Mohammad Eid, Mutaz Ryalat, Natheer Almtireen, Ghaith Al-Refai, and Thomas Penzel. "Automatic Sleep Staging for EEG Signals Using GoogLeNet Deep Architecture and Continuous Wavelet Transform." In *2023 Seventh International Conference on Advances in Biomedical Engineering (ICABME)*, pp. 115-120. IEEE, 2023.

SELECTED TAUGHT COURSES

1. **Machine Intelligence**

The course introduces the fundamentals of image processing, feature extraction, and descriptors, along with advanced computer vision techniques for object detection and classification using deep learning models like CNN, YOLO, and SSD. It also covers time-series data analysis, incorporating recurrent neural networks such as LSTM and transformer models, and explores the application of reinforcement learning in autonomous systems.

2. **Mechatronics Systems Design**

The course explores system design through the V-model framework, using case studies in mechatronics system design to illustrate key principles. It provides a comprehensive overview of essential components in mechatronics systems, including sensors, actuators, microcontrollers, interfacing techniques, and control methodologies. To enhance students' understanding, the course incorporates industry-standard tools such as LabVIEW and MATLAB for designing and simulating real-world mechatronics systems.

3. **Control Systems**

The course covers the fundamentals of the Laplace transform and the modeling of electrical, mechanical, and electromechanical systems. Topics include system block diagram representation and simplification, closed-loop system analysis, system response, and stability assessment. Additionally, control system design is addressed, focusing on PID controllers and root locus techniques.

4. **Microcontrollers design and IoT**

This course introduces the core concepts of microcontrollers architecture and programming. Students will learn how to interface with a variety of sensors and actuators to build responsive embedded systems. The course also covers key communication protocols such as UART, SPI, and I2C, which are essential for device integration. Through hands-on projects using Arduino and ESP32 platforms, students apply Internet of Things (IoT) concepts in practical applications—typically focusing on robotics and smart home automation.

SOME PHD CLASS WORK

1. **Linear system theory**

The course is focused on studying linear systems stability, controllability and observability of the systems, state feedback and state estimator, and pole placement and model matching.

2. **Optimal control theory**

The course is focused on designing controllers and filters for nonlinear systems, Lyapunov Stability, feedback stepping and feedback linearization, nonlinear observers.

3. **Intelligent control systems:** The course is focused on intelligent systems, artificial neural networks, fuzzy logic, Genetic algorithms

4. **Robotics**

The standard robotics course introduces students to the core principles of robot kinematics, dynamics, and control. It covers the Denavit-Hartenberg (DH) convention for systematic frame assignment and transformation, essential for describing the spatial configuration of robot joints and links. Through this approach, students learn to model and analyze robotic arms, focusing on forward and inverse kinematics, workspace analysis, and motion control.

FUNDS

- **Cooperative Aerial and Ground Robots for Crop Inspection, Monitoring and Diagnosis:** *Jun. 2025 - Jun. 2028*
 - Secured \$408,000 in funding from the Dean of Scientific Research to acquire multiple drones equipped with advanced sensors for smart farming applications, including hyper-spectral cameras, depth cameras, LiDAR, and thermal imaging systems.
 - Acquired outdoor-capable ground robots equipped with advanced sensors for mapping, localization, and path planning. The mobile platform also includes a 6-DOF robotic arm with a gripper designed for plant interaction.
 - Ongoing research focuses on computer vision for smart agriculture, including plant monitoring and diagnostics, visual SLAM, path planning, swarm robotics, and IoT integration.
- **Drones and Ground Robots for mapping, path planning and Computer Vision Applications:** *Dec. 2024 - Dec. 2026*
 - Secured seed funding from the Dean of Scientific Research for the acquisition of two drones and two ground robots, totaling \$93,000.
 - Robots are equipped with high-resolution cameras, depth sensors, and IMUs.
 - Research areas include computer vision for infrastructure monitoring and inspection, visual SLAM, path planning, and control systems.

SKILLS

- **Programming Languages:** Python, MATLAB, C, C++
- **Computer Vision & AI Packages:** Open CV, Tensorflow, Keras, Pytorch, Numpy
- **Tools:** MATLAB Simulink, Labview, Spyder, CodeWarrior, Jupyter Notebook, Google Colab
- **Microcontrollers:** Arduino, ESP 32, Raspberry Pi, Jetson Nano, MyRio
- **Applications:** Latex, Overleaf, Office, DOORS, Redmine

COMMUNITY SERVICES

1. **Serving in the organizing committee in 22nd International Conference on Research and Education in Mechatronics (REM 2024).**
2. **Organizing committee in a workshop on dark environment applications in cyber security in Bulgaria-Varna as part of Cyber-AI 2025 conference.**
3. **Serving as a reviewer in many international journals and conferences.**
4. **Serving a committee member in the German Jordanian University Council for the academic year of 2023-2024.**
5. **Serving a committee member in the school of applied technical sciences in the German Jordanian University for the academic year 2024-2025.**

6. **Serving a member in many committees in the German Jordanian University for study plans and laboratories development.**
7. **Actively participating in workshops and sessions focused on research and educational development.**
8. **Organizing robotics workshops and interactive activities for school students on campus, aimed at demonstrating robotics concepts and sparking interest through hands-on, engaging experiences.**

ADDITIONAL INFORMATION

Languages: English (Proficiency level:Excellent), Arabic (Native language)