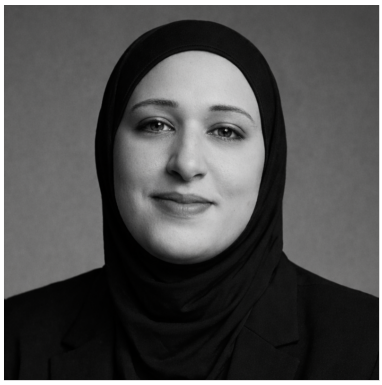
Postdoctoral Application File

Research Portfolio & Curriculum Vitae

Ferdaous MASMOUDI

PhD in Electrical Engineering
Energy Systems Modeling, Control & Optimization



Sfax, Tunisia · French residence permit

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Online Research Portfolio

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Research Profile

PhD in Electrical Engineering and Renewable Energy Systems with experience in the end-to-end development of intelligent energy platforms, covering nonlinear mathematical modeling, parameter identification, optimization strategies, embedded implementation, and experimental validation.
Research activities include multi-level mathematical modeling of photovoltaic and electrochemical energy systems, data-driven parameter identification (least squares, ARX-based approaches), and optimization-based tuning under real environmental conditions. State estimation techniques, including Extended Kalman Filtering (EKF), were implemented for real-time monitoring and control-oriented system supervision.
Strong experience in the integration of sensors, real-time data acquisition chains, signal processing, and control algorithms within embedded architectures, complemented by MATLAB/Simulink-based simulation, power electronics implementation, and cloud-enabled supervision platforms for real-world system deployment.

Education

2016 **PhD in Electrical Engineering**, *National Engineering School of Sfax (ENIS), University of Sfax*, Tunisia, Thesis: *Optimization of Standalone Photovoltaic Systems*.

2012 **MSc in Electrical Conversion and Renewable Energy (CEER)**, *ENIS, University of Sfax*, Tunisia, Research: *Modeling and MPPT Control of a PV Conversion System*.

2011 **Engineering Degree in Electrical Engineering (Electro-Technics)**, *ENIS*, Sfax, Tunisia

2008 **Preparatory Cycle for Engineering Studies (Mathematics–Physics)**, *IPEIM El Manar*, Tunis, Tunisia

2006 **Baccalaureate in Mathematics, with Honors**, *Lycée Pilote Ariana (LPA)*, Ariana, Tunisia

Doctoral Research Contributions

Nonlinear Modeling and Identification
Development of nonlinear mathematical models of photovoltaic generators (single-, double-, and multi-diode configurations, panel-level modeling) and electrochemical storage systems, including analytical formulation, state-space representation, and data-driven parameter identification and estimation under real operating conditions.

Optimization and Control
Formulation and implementation of optimization-based control strategies for photovoltaic energy systems, including MPPT algorithms, dual-axis solar tracking mechanisms, and boost-converter power regulation, with performance validation under dynamic irradiance and temperature variations.

Embedded Implementation and Experimental Validation
MATLAB/Simulink-based simulation and model validation, followed by implementation of embedded control architectures (C++/Python) on SoC and microcontroller platforms for real-time operation. Design and realization of a boost converter power stage and dual-axis solar tracking mechanism with motor drivers integration. Development of real-time multi-sensor acquisition systems (voltage, current, irradiance, temperature, GPS, RTC, IMU) including signal conditioning, filtering, and experimental dataset validation. Deployment of cloud-enabled supervision and server-side data logging for remote monitoring and system performance analysis.

Applied Research & Engineering Experience

2016–Present **Co-founder and R&D Lead**, *NOVEL-TI*, Sfax, Tunisia

- Directed applied research and system development in intelligent energy systems, embedded architectures, and AI-enabled IoT platforms.
- Designed and supervised end-to-end development of hardware–software systems, including mobile robotic platforms, photovoltaic-powered systems, multi-sensor acquisition architectures, and cloud-connected supervision dashboards.
- Led development of AgriTech solutions integrating LoRa/WiFi connectivity, RFID/NFC logging, and blockchain-based traceability infrastructures (Hyperledger Fabric) for compliance-driven industrial environments.
- Managed multidisciplinary technical teams and coordinated international collaborations with European industrial partners.

Academic Internships & Early Industrial Training

2013–2014 **Research Internship – Battery Observation and Management System (BOMS)**, *LSIS Laboratory, Polytech Marseille*, Marseille, France

- Modeling and embedded implementation of battery monitoring and energy management algorithms, with laboratory validation using MATLAB and microcontroller-based architectures.

2012 **Research Internship – Residential PV Integration**, *TU Chemnitz*, Chemnitz, Germany

- Simulation and component-level optimization of photovoltaic system integration in residential environments.

2009–2011 **Industrial Training – Energy and Power Systems (Tunisia)**: STEG (National Dispatching), OACA – Carthage Airport, SNDP AGIL. Exposure to grid operation, medium-voltage system design, switchgear manufacturing, and grid-connected photovoltaic system sizing.

Teaching Experience

2016–Present Contract-based Lecturer and Research Collaborator. Delivered lectures and laboratory sessions in instrumentation, mechatronics, embedded systems, and open-source development across multiple higher education institutions.

Teaching Institutions: Faculty of Sciences of Sfax (FSS); Higher Institute of Industrial Management (ISGI); Private Institute of Applied Sciences (IPSAS).

Courses and Labs: Computer-Based Instrumentation; Open-Source Software Development; Maintenance of Mechatronic Systems; Mechatronics.

Participation in IEEE SSD'18 and technical workshops on IoT, STM32, Arduino, and smart systems.

Technical Skills

Programming & Build Systems	C++, Python, MATLAB, Bash scripting, GNU Make	Embedded Platforms	STM32, ESP32, Arduino, Jetson, Raspberry Pi, Odroid, Motor Driver
Simulation & Instrumentation	MATLAB/Simulink, LabVIEW, Proteus (ISIS/ARES)	PCB Design& Hardware	Altium, KiCad, EasyEDA, firmware development, bootloader configuration
Communication & IoT	MQTT, LoRa, Zigbee, Wi-Fi, BLE, GSM, Modbus, I2C, SPI, UART	Robotics Middleware	ROS/ROS2, Gazebo, RViz
Mobile & Web Development	Android (Kotlin), REST APIs, Firebase, QR/Camera integration	Cloud & Backend	Real-time data logging, server-side supervision, cloud synchronization
AI & Vision	OpenCV (C++/Python), YOLO, TensorFlow Lite, ONNX, RL(basic)	Platforms & Tools	Linux, Windows, Git

Languages

Arabic (Native) · French (Fluent) · English (Professional proficiency) · German (Basic knowledge)

Selected Publications

Peer-Reviewed Journals

- Masmoudi, F., "Identification of internal parameters of a mono-crystalline photovoltaic cell model with experimental validation," *International Journal of Renewable Energy Research (IJRER)*, 2014 (Indexed in Scopus).
- Jarraya, I., Masmoudi, F., et al., "An online state-of-charge estimation for lithium-ion and supercapacitor in hybrid electric drive vehicle," *Journal of Energy Storage*, 2019 (Elsevier, Scopus indexed).
- Loukil, J., Masmoudi, F., Derbel, N., "A real-time estimator for model parameters and state-of-charge of lead-acid batteries in photovoltaic applications," *Journal of Energy Storage*, 2021 (Elsevier, Scopus indexed).

International Conferences (IEEE Xplore Indexed)

- SSD 2019 – MPPT control strategies for photovoltaic applications: algorithms and comparative analysis.
- SSD 2018 – "Modeling and parameters estimation for lithium-ion cells in electric drive vehicle,"
- SSD 2018 – "Performance analysis of Luo-converter for photovoltaic application,"
- SSD 2017 – "Design and comparison of quadratic boost and double cascade boost converters with boost converter,"
- SSD 2017 – "Comparative study of fundamental variable input converters used for PV conversion systems,"
- SSD 2017 – "State-of-charge estimation of lead-acid battery using a Kalman filter,"
- SM2C 2017 – "Comparative study of the performances of the DC/DC Luo-converter in photovoltaic applications,"
- IREC 2016 – "Modeling and simulation of conventional DC–DC converters dedicated to photovoltaic applications,"
- SSD 2016 – "Single and double diode models for conventional mono-crystalline solar cell with extraction of internal parameters,"
- SSD 2016 – "Modeling of internal parameters of a lead-acid battery with experimental validation,"
- STA 2015 –"Design and realisation of a photovoltaic system controlled by an MPPT algorithm,"
- SAAEI 2014 –"Simple models design for one mono-crystalline photovoltaic cell by identification of internal parameters." Maroc (Tanger).
- EVER 2012 –"Oil service station PV-based power supply: a challenging Tunisian national program," (Monaco).

Book Chapters (Springer)

- Loukil, J., Masmoudi, F., Derbel, N., "Third order model and identification of lead-acid batteries using meta-heuristic algorithms and experimental measurements," Book Chapter, 2020.
- Boujelben, N., Masmoudi, F., Djemel, M., Derbel, N., "Modeling and comparison of boost converter with cascaded boost converters," *Green Energy and Technology*, Book Chapter, 2019.

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