

# Seyed Amir Alavi | Embedded Control Systems Researcher

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## Personal Profile

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As an embedded control systems researcher, I have designed different types of embedded systems in several areas such as the Internet of Things, smart grid, industrial control systems, and communication networks. I try to employ the latest technologies for software and hardware development, from embedded Linux to different real-time operating systems, and agile software development processes. Model-based control system design and implementation is my main expertise, which I have done during the last several years. During my doctoral research at Queen Mary University of London, I have worked on the development of multi-agent embedded systems for distributed control of microgrids, which operate over IoT wireless communications protocols with different objectives. I have published several papers in high impact engineering journals and presented my research in top rank conferences around the world.

## Skills

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|--------------------------------|----------------------------|---|
| ➤ C, C++, OOP Programming      | ➤ Embedded Linux           | ➤ Arduino & Mbed SDKs                     |
| ➤ SOLID and Design Patterns    | ➤ Qt/QML HMI Design        | ➤ ARM Cortex M3/M4/M7                     |
| ➤ Python Scripting             | ➤ RTOS (FreeRTOS, RIOT OS) | ➤ Altium PCB Designer                     |
| ➤ MATLAB/Simulink              | ➤ Real-Time HIL Simulation | ➤ Linux Device Driver (Character Devices) |
| ➤ IoT Communication Protocols  | ➤ CI/CD (Gitlab)           | ➤ Git VCS                                 |
| ➤ Event-Driven Control Systems | ➤ Teaching and Research    |   |

## Career summary

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**August 2020 – Present, Research Assistant, Fixed-Term**  
**Queen Mary University of London, London, United Kingdom**

In this research project, I am responsible for the design of an offshore microgrid system that is able to store wave energy. This project is a joint collaboration between an industrial technology partner who has patented a unique wave energy generation technology. This research project is a group work with three researchers in the area of microgrids and renewable energy systems, under supervision.

**May 2018– Present, Firmware Engineer, Fixed-Term**  
**Voltaware, London, United Kingdom**

Power disaggregation and residential energy monitoring are the main services of Voltaware. Voltaware's mission is to use electricity data to make homes more efficient, greener, reliable, and secure. Credit-card sized, the patented Voltaware smart meter can be installed in any fuse box. Voltaware meters collect high-resolution data and monitor energy usage in real-time. AI algorithms are used to track energy consumption down to the appliance level. My role at Voltaware is the development of the firmware for different variations of smart meters such as single-phase, three-phase, cellular, and WiFi/BT models.

### *Key responsibilities*

- Introduction of agile development ecosystem into the firmware to support CI/CD.
- Product owner in the firmware development team.
- Development of communication stacks and controllers such as MQTT, TLS, HTTP, etc.
- Development of embedded DSP algorithms for smart energy metering tasks.
- Design of test benches for performance validation of DSP algorithms.

**January 2020 – June 2020, Teaching Fellow, Fixed-Term**  
**Queen Mary University of London, London, United Kingdom**

As a teaching fellow, I was the lecturer for the module Advanced Control Systems in semester B, 2019-20 for both undergraduate and graduate students in the school of electronic engineering and computer science. In this module, up-to-date scientific content in the area of linear control systems and state-space modeling of dynamic systems was delivered. I was responsible for designing the syllabus, delivering the material, coursework design, and exam script marking.

**November 2017 – April 2018, Research Assistant and Demonstrator, Fixed-Term**  
**Queen Mary University of London, London, United Kingdom**

The title of this research project was aged lithium-ion batteries as a low-cost solution for rural microgrids, therefore the main objectives were the application and monitoring of aged Li-ion batteries for off-grid power systems such as smart villages and rural areas. The cost reduction was analyzed and it was concluded that aged Li-ion batteries of EVs which can not provide enough power for the car operation, can be used for microgrid stabilization and temporary reserve in the event of supply disconnection. I was also the demonstrator (teaching assistant) for the following modules, delivered in the school of electronic engineering and computer science: Power Electronics, Electrical Machines, Digital Systems. I was responsible for designing the coursework, designing the experiment in the electronics laboratory, teaching the operation of laboratory equipment, and exam script marking.

**Jul 2015 – Sep 2017, Embedded System Designer, Permanent**  
**Gostaresh Hararat Matboe Nour (GHMN), Tehran, Iran**

At GHMN, I was responsible for the analysis of requirements, product design, and development. The main products were IoT-based remote controllers, smart home automation, and HVAC control systems. I employed the latest technologies to develop reliable embedded systems with minimum time-to-market using embedded Linux, Qt, and IoT communication protocols such as MQTT and CoAP. This basis enabled the company to further release new products in the area of IoT and Smart City.

*Key responsibilities*

- Product features analysis based on customer requirements
- Coordinating team of engineers for hardware design and firmware development
- Development of HMI software and UX based on Qt/QML
- Hardware architecture design based on 8-bit AVR and 32-bit ARM microcontrollers
- The representative of the company in conferences and seminars
- Academic coordinator of the company with several universities for joint industrial projects

**Sep 2014– May 2015, Embedded Software Developer, Fixed-Term**  
**Pouyesh Samtech Fartak, Tehran, Iran**

As an embedded software developer, I was responsible for the analysis and development of several communication monitoring tasks for layer three managed Ethernet switches.

*Key responsibilities*

- Analysis of managed Ethernet switch security features
- Development of software stack for packet sniffing and analysis
- Implementation of security functions such as DHCP Snooping, Dynamic ARP Inspection, MAC filtering, and UDLD (Unidirectional Link Detection)

## **Qualifications**

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- **Ph.D. Electronics Engineering (Full Scholarship)** – Queen Mary University of London, UK  
Supervisors: Dr Kamyar Mehran, Prof Yang Hao (Current Status: Submitting Thesis)
- **MSc. Control Systems Engineering, 17/20** – Shahid Beheshti University, Tehran, Iran – 2017
- **BSc. Electrical Engineering, 15/20** – Power & Water University of Technology, Tehran, Iran – 2013

## Publications

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My mostly cited recent publications are listed as follows. For a complete list of my publications please refer to my [Google Scholar profile](#).

- Alavi, Seyed Amir, Xiaomiao Li, and Kamyar Mehran. Chapter: "Delay resilient networked control with application to microgrids.", Book: Control Strategy for Time-Delay Systems: Part II: Engineering Applications 2020, Publisher: Academic Press.
- "Optimal Observer Synthesis for Microgrids With Adaptive Send-on-Delta Sampling Over IoT Communication Networks" IEEE Transactions on Industrial Electronics, 2020.
- "A distributed event-triggered control strategy for DC microgrids based on publish-subscribe model over industrial wireless sensor networks." IEEE Transactions on Smart Grid, 2019.
- "Microgrid Optimal State Estimation Over IoT Wireless Sensor Networks With Event-Based Measurements." IECON 2019-45th Annual Conference of the IEEE Industrial Electronics Society, IEEE, 2019.
- "A Distributed Control Strategy with Fractional Order PI Controller for DC Microgrid" 2019 Smart Grid Conference (SGC), IEEE, 2019.
- "Voltage control in LV networks using electric springs with coordination." 2018 IEEE Canadian Conference on Electrical & Computer Engineering (CCECE). IEEE, 2018.
- "An IoT-based data collection platform for situational awareness-centric microgrids." 2018 IEEE Canadian conference on electrical & computer engineering. IEEE, 2018.

## Other Projects

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### **Jun 2016 – Oct 2016, 3D Printer Product Development** **Ahvans Consultation, Tehran, Iran**

In this contract project, I was coordinating the team consisting of a mechanical engineer, an electronic engineer, and a software engineer to design a new 3D printer prototype with a customized user interface.

### **Mar 2013 – Sep 2013, Real-Time Substation Distributed Control System (DCS) Simulator Development** **Based on IEC 61850 Communication Standard** **Shahid Beheshti University, Tehran, Iran**

In this project, a DCS simulator for substation operator training was developed. The substation model was implemented in MATLAB/SIMULINK and the network system was implemented in the OMNeT++ network simulator. The HMI was developed in C#.NET to resemble the real HMI used in the field. This project won the best project prize in the control engineering department. My role in this teamwork was the development of the HMI and interfacing it with the mentioned real-time simulators.

### **Dec 2011 – Mar 2012, Development of a transmission line design computational software titled "TLineM"** **based on IEEE standards** **Shahid Beheshti University, Tehran, Iran**

This educational tool helped students and researchers to select the correct cable size and pattern for the transmission lines, based on the specified requirements. The software development was done in C#.NET using Windows Forms framework.

## Languages

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English (Professional proficiency): IELTS Academic, Overall: 7  
Persian (Native)