

## Dr. Salman Hafeez

Welwyn AL6 9FD Hertfordshire England

+44-7400-641242

[salman.hafeez89@gmail.com](mailto:salman.hafeez89@gmail.com)

### Education

#### Ph.D. Electrical Engineering

University of Newcastle, NSW, Australia

2014- 2018

**Thesis:** *A Control-Theoretic Approach to Incorporate Uncertainty into the Dynamic Integrated Climate-Economy (DICE) Model*

#### Master's in Business Administration (MBA Executive with Distinction)

University of Essex, Colchester, United Kingdom

2018-2020

#### BSc. Electrical Engineering (CGPA: 3.731/4.0)

University of Engineering and Technology, Lahore, Pakistan

2008-2012

### Research Publications

Google scholar profile available at: <https://scholar.google.com.au/citations?user=0fFANfEAAAAJ&hl=en>

1. **Hafeez S.**, Weller S. R., Kellett C. M. Impact of climate model parametric uncertainty in an MPC implementation of the DICE integrated assessment model. IFAC-PapersOnLine. 2017 Jul 1;50(1):959-65. *Received the IFAC inaugural award for this paper*
2. **Hafeez, S.**, Weller, S. R., and Kellett, C. M. (2015). Steady-state and transient dynamic behavior of simple climate models for application in integrated assessment models. In *5th Australian Control Conference (AUCC)* (pp. 269-273). Gold Coast, Australia: Engineers Australia.
3. **Hafeez, S.**, Weller, S.R., and Kellett, C.M. (2016). Transient climate response in the DICE integrated assessment model of climate economy. Accepted for *Australian Control Conference (AUCC 2016)*.
4. Weller, S. R., **Hafeez, S.**, and Kellett, C. M. (2015). A receding horizon control approach to estimating the social cost of carbon in the presence of emissions and temperature uncertainty. In *54th IEEE Conference on Decision and Control (CDC 2015)* (pp. 5384-5390). Osaka, Japan: IEEE.
5. Weller, S. R., **Hafeez, S.**, and Kellett, C. M. (2015). Feasibility of 2 °C as a post-2020 warming threshold via input-constrained optimal control. In I. Petersen, & S. Moheimani (Eds.), *2015 IEEE Multi-Conference on Systems and Control* (pp. 1117-1123). Sydney, Australia: IEEE.
6. Weller, S. R., **Hafeez, S.**, and Kellett, C. M. (2015). Estimates of the social cost of carbon using climate models derived from the CMIP3 ensemble. In P. Jeyapal (Ed.), *Proc. 3rd ASEAN Australian Engineering Congress (AAEC 2015)* (pp. 84-89). Barton, ACT: Engineers Australia.

## Professional Experiences

### Embedded Software Engineer

**Ocado Technology, Welwyn Garden City, United Kingdom**  
*Swiftfields, AL7 1LY United Kingdom*

2020-Current

In this role, I was responsible for developing and maintaining motion control embedded software for the grocery picking robots. The day-to-day job required design and implementation of control algorithms, their implementation in C language, testing of code in C++ and Java, and data analysis and visualization in Python and SQL

#### Robotics Embedded Software

- I improved the existing implementation of the event driven, QPC framework-based C code for the motion control of grocery picking robots.
- I implemented unit and behavioral tests in C++ and Java to validate the code

#### Data Analysis and Visualisation

- I designed a dashboard for querying and visualizing the data produced by the robots
- I implemented complex SQL queries to fetch 1millisecond frequency data from Bigquery, clean it, and process it for easier consumption in python scripts
- I created visualization of data using python and libraries such as Bokeh and Plotly

### Robotics Research Associate (R&D Engineer)

**University of Essex, United Kingdom**  
(Project funded by the UK government)  
*Wivenhoe Park, Colchester CO4 3SQ, Essex, United Kingdom*

2017-2020

In this role, I developed an industrial automation solution for polymer processing industry. The solution utilized four technologies from industry 4.0. package, i.e., autonomous robotics, industrial IoT, simulations, and cloud infrastructure. Details are as follows:

#### Robotics Application

- I designed and implemented a XYZ robotics pick and place unit using FESTO's and SMC's linear and rotary actuators.
- I developed a C# based customized human machine interface to control and monitor the overall system.
- I implemented industrial communication network to communicate sensors data to supervisory control. This communication was based on RS232 and RS485 standards.
- I developed embedded firmware to support communication operations. Firmware was developed in C language for ARM Cortex M4 microcontroller and electronics were designed in Altium designer 19 software.

### Engineering Project Assistant

**Highway group, Australia**

*44-Maitland Road, Mayfield East 2304, NSW, Australia*

2014-2017

In this role, I developed an electronic gaming solution. A C++ based user interface was developed and ARCADE gaming software was integrated with it. Details are as follows:

#### **Software development**

- A software in C++ was developed that integrated conventional gaming software such as Arcade and Pinball. The software also integrated gaming joystick hardware.
- A bash automation script was developed to automate software installation and configuration procedure.

#### **Leadership and development**

- I lead a team of 4 developers, a graphic designer, and an animator to achieve software development.
- I managed communication between team members and with key stakeholders.
- I prepared requirements specifications and story board of the software

#### **Design Engineer**

2012-2013

##### **Open-Silicon, Inc**

Lahore Pakistan

In this role, I developed automated testing software for the testing and verification of ASIC soft cores written in Verilog. Specific details are as follows:

#### **Automation software development**

- I developed a testing software to automate the testing of ASIC cores. I used UVM 1.1. testing methodologies and ModelSim software for this purpose.
- I developed C language code for 8051 microcontrollers to perform testing of ASIC cores

### **Conferences/Presentations**

- Exhibited poster at the Australian Control Conference, Gold Coast, Australia 2015.
- Oral presentation of the research work at the Australian Control Conference, 4-November, 2016, Newcastle Australia 2016.
- Presented current research work publically at the University of Newcastle for Ph.D. confirmation.
- Attended the IEEE Multi-Conference on Systems and Control, Sydney, Australia, 2015

### **Skills**

- Robotics systems development using linear and rotary electric actuators
- C language programming, MISRA standard, STM32 and ARM M4 microcontroller
- C++ unit and functional testing
- Object Oriented Programming
- Bokeh, Plotly, Numpy, Pandas, Bigquery, SQL, GCP
- Clion, IntelliJ, PyCharm, VSCode, Visual Studio
- CodeSys, PLC
- C# programming in Visual Studio for HMI development
- WPF/UWP programming for user interface development, MVVM, MVC Pattern,

- Industrial communication: RS485, RS232, SPI, I2C, Modbus TCP,
- Scientific computing, Data Analysis, Data Visualisation in Python
- Embedded firmware development in C and ARM Cortex M4 microcontrollers
- Project management and execution using JIRA/Gitlab and Smartsheets
- Won the IFAC2017 inaugural award for work presented in publication “**Hafeez, S.**, Weller, S. R., & Kellett, C. M. (2017). Impact of climate model parametric uncertainty in an MPC implementation of the DICE integrated assessment model. In *Proc. 20th World Congress of the International Federation of Automatic Control (IFAC) 2017*, Toulouse, France, 9-14 Jul. 2017”. This inaugural award recognises a contribution which shows how automatic control science and technology can contribute to significant advances in the broad area of sustainable development.
- Secured International Postgraduate Research Scholarship for Ph.D.
- Passed BSc. with first class honours | Among top 5% students
- 8.0 band in IELTS.

## References

Will be provided upon request

## Industrial Project Experiences

### RAG AI Chatbot

- A web-based AI chatbot with RAG capability for answering questions abouts proprietary documents using retrievers and similarity searches
- The project deployed a Python based Flask server and used Lang Chain and OpenAI LLMs.

### Virtual Odometer

- An Embedded C software solution for performing odometry based on motor feedback data.
- This project was implemented on STM32 and used the exponential moving average smoothing for processing signals.

### Data Analysis and Visualization Dashboard

- A Python based data analysis dashboard for processing high frequency data, retrieved from BigQuery using SQL, and processed using Pandas and Numpy
- Data visualization using Bokeh and Plotly

### 3D – Robotic pick and place system

- A closed-loop feedback control system is being designed to implement a xyz linear robotic pick and place system using stepper motors, optical encoders, linear guide rails, and force/pressure sensors
- This project integrated ARM SAM4S microcontroller, programmed in C language using Atmel Software Framework

### Wi-Fi enabled handheld controlling device

- Developed the complete system to enable the control of appliances with portable devices such as smart phones.
- This project integrated PIC18F4620 micro-controller, ENC28j60 Ethernet module and C language. The complete TCP/IP stack was implemented within limited memory of micro-controller with build-in support for DHCP.

### **Ethernet packet capturing and decoding**

- Developed a C language-based application to capture and decode the real time Ethernet packets. This project utilized the "Winpcap" API and visual studio development tools.

### **Light following robot**

- Designed a robot which was capable of sensing light and move towards the brighter light source.
- The project was implemented by using Operation Amplifiers, 8051 micro-controller, assembly language and DC geared motors.

### **Home automation: Infrared**

- Developed the complete system for controlling the home appliances with a Philips TV remote control
- The RC5 protocol decoder was implemented with 8051 micro-controller and assembly language along with the IR sensors.

### **Solid State Device (SSD) controller verification**

- Developed the verification environment, test plans and test sequences for SSD controller verification. The environment followed the universal verification methodology (UVM) utilizing the system Verilog language and included APB and AXI protocol specific drivers, monitors and scoreboards.
- Developed the firmware for 8051 micro-controller using C language to perform formal verification of SSD controller.

### **Hybrid Memory Cube (HMC) model modifications**

- Improved the specification of system Verilog based HMC model by adding the support for 4-flits data handling.
- Modified the corresponding drivers and monitors in the UVM based verification environment.
- Documented the work according to the standards.

### **SRAM controller design**

- Developed the RTL of an SRAM controller to handle the data flow through the memory.
- Developed the test bench in Verilog to test the design.

Github Profile Link: <https://github.com/sh17156>