

Contact

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(LinkedIn)

Top Skills

C (Programming Language)
RTL Design
Embedded Linux

Languages

English (Full Professional)
Bahasa Indonesia (Native or Bilingual)
Swedish (Limited Working)

Certifications

IoT Foundations: Operating Systems Fundamentals
C Programming for Embedded Applications
C++ Supplementary
C++ Essential Training
How to Research and Write Using Generative AI Tools

Honors-Awards

CIMB Unggulan scholarship grantee from Kemendikbud and CIMB Niaga Bank
First Winner in category Technology Development, Robot Terbang Indonesia (KRTI) 2016
First Winner in category Mapping Fixedwing, Robot Terbang Indonesia (KRTI) 2015
Top 10 Teams at HACK-A-FARM Innovation Camp Indonesia
The 2nd Winner of Paper Competition

Publications

M Ihsan Al Hafiz

PhD in Hardware Accelerator for Neuromorphic Computing at KTH, Sweden
Stockholm, Stockholm County, Sweden

Summary

With eight years of experience in embedded systems engineering, I am a doctoral researcher at KTH Royal Institute of Technology, where I work on hardware accelerator design for neuromorphic computing in the IoT-Edge-Cloud continuum. My research aims to enable faster and more efficient computation for artificial intelligence applications, such as image recognition and natural language processing, by mimicking the structure and function of the human brain.

My technical skills include FPGA development with VHDL and HLS, microcontroller programming with STM32, analog electronics, and MATLAB. I have applied these skills in various projects, such as implementing matrix multiplication algorithms in RTL, designing a custom RISC processor, and integrating visual-inertial data fusion with a deep learning model for bolt detection and localization. I have also gained industry experience at Atlas Copco, where I developed and tested embedded software for tightening tools. I am passionate about learning new technologies and techniques, solving complex problems, and delivering high-quality work. I am excited to collaborate with a dynamic team and contribute to the advancement of neuromorphic computing.

Experience

Kungliga Tekniska högskolan
Doctoral Researcher
April 2024 - Present (1 year 5 months)
Stockholm County, Sweden

I'm currently pursuing a PhD focused on developing hardware accelerators for neuromorphic computing, implemented on FPGAs. My research aims to enable energy-efficient, low-latency AI processing across the IoT-Edge-Cloud continuum. This involves designing brain-inspired architectures that can

Implementation of Bolt Detection and Visual-Inertial Localization Algorithm for Tightening Tool on SoC FPGA

A Reconfigurable Stream-Based FPGA Accelerator for Bayesian Confidence Propagation Neural Networks

handle real-time data streams and support adaptive intelligence in embedded systems, smart devices, and cloud-edge platforms.

My work bridges the gap between AI algorithms and hardware by exploring spiking neural networks (SNNs), brain-like learning models, and reconfigurable computing to address the growing need for sustainable and scalable AI at the edge.

Atlas Copco

Software Engineer

August 2023 - March 2024 (8 months)

I worked on the Hardware and Software team, Segments Department, Research and Development Atlas Copco. I was involved with the MicroTorque tool. Here is my contribution

1. SD Card Testing and Quality Assurance

- Spearheaded the upgrade of SD card testing protocols, developing comprehensive strategies to ensure high-quality and reliable SD cards for handling machine licenses and database logs.
- Conducted detailed statistical analysis and histograms for SD card read/write speeds to verify performance standards and reliability.

2. Automatic Testing Board Development

- Designed and implemented an Automatic Testing Board for MicroTorque, enabling seamless switching connections between multiple controllers and tools.
- Enhanced testing efficiency and accuracy, significantly reducing manual intervention and testing time.

3. DC Motor Temperature Estimation

- Led exploration, experimentation, and implementation of winding DC motor temperature estimation techniques for the MicroTorque tool.
- Developed solutions to prevent early motor failure, ensuring long-term reliability and performance during tool operation.

KTH Royal Institute of Technology

Research Assistant

June 2023 - August 2023 (3 months)

Stockholm, Stockholm County, Sweden

Research Assistant at EECS, KTH Royal Institute of Technology under Prof. Ahmed Hemani's Research Group.

Matrix Multiplication Algorithms:

- Led the RTL implementation of multiple matrix multiplication algorithms using the High-Level Synthesis (HLS) process from Simulink Matlab.
- Managed the synthesis and execution of VHDL code to derive accurate utilization and power estimations for each design.

Silago Project:

- Contributed significantly to the implementation of the Global Interconnect and Control (GLIC) in SystemVerilog.
- Engaged in comprehensive RTL design and verification to ensure GLIC functionality.
- Designed and incorporated a custom RISC processor tailored specifically for the advanced requirements of the GLIC system.

Atlas Copco

1 year 1 month

Master Thesis Student

January 2023 - June 2023 (6 months)

Stockholm, Stockholm County, Sweden

I worked in the Total Workstation team. I am doing a thesis with the topic "Implementation of Visual-Inertial Localization Algorithm for Tightening Tool on SoC FPGA"

Mechatronics Engineer

August 2022 - December 2022 (5 months)

Stockholm County, Sweden

My work description:

1. I was involved in the Ultrasound tightening system project. I made an analysis of the analogue circuit from the current prototype to evaluate the performance. I used LTSpice, ADS, and Pspice for the analogue simulation. I did transient and AC analyses to simulate the filter, amplifier, and switching IC. I made the improvement of the filter design with the ADS software and verified it in LTSpice software. I used Pspice software to do simulations for specific ICs from Texas Instruments.

2. I designed the amplifier circuit for an additional amplifier of the ultrasound board. I made the selection by evaluating the suitable ICs according to the

requirement. I read the datasheet to verify the specification and I did simulation to know the performance characteristics with mostly LTspice software.

3. I was assigned to assist and monitor the PCB manufacture for the PIL board that I designed during the summer job

4. I was involved in the software development of Processor-In-Loop testing. I used C++ embedded programming to program the STM32 microcontroller. I worked in a group using the Git platform (Gerrit) to do collaboration programming.

Summer Worker (RnD Engineer)
June 2022 - August 2022 (3 months)
Stockholm County, Sweden

I worked in Tool Embedded and Tightening Software team. I got responsible for creating the electronics platform for making Processor-In-Loop Tests. I built the PCB with OrCAD PCB design software. I made the analysis of STM32 with the types F4, H7, L4, and G4, to get the similarities of pinout for creating the universal PIL testing board. I integrated the 10 ICs into one board that involved the peripheral UART, I2C, SPI, QSPI, ADC, DAC, and GPIO.

The Agency for the Assessment and Application of Technology
(BPPT) Indonesia
Electronics Engineer
January 2018 - August 2021 (3 years 8 months)
Indonesia

Duties

- Design of embedded system devices (integrated PCB with a microcontroller)
- Design of communication system (Wireless and Optical Communication)
- Programming embedded system devices (C, C++ programming, and VHDL)
- Test and validation of electronics systems

Research & Projects Experiences

o 2019-2021, Indonesia Tsunami Early Warning System (InaTEWS) Project. I contributed to the electronics and communication design in the system Buoys Tsunami and the Cable Based Tsunameter (CBT). I designed the low-power CPU system with STM32 Microcontroller for the central controller in data acquisition and data transmission on the Buoys tsunami. I created the design of a communication system for uploading data in the CBT project. I have currently involved in programming the data format for transmission data from

Cable-Based Tsunameter that provide data for tsunami prediction and sea environment monitoring.

o 2018-2019, Automatic Identification System (AIS) Project.

I was responsible for developing electronics and communications from developing marine navigation tools to assist fisher in safety. I contributed to a design radio system that follows the standard transmission of AIS transmitter.

o 2018-2019, Development of Visible Light Communication (VLC).

I was responsible for developing light communication architecture via LEDs for internet data transmission. I created the electronics module design that was used to modulate the data into an optical signal. I implemented the data protocol communication to transmit the internet data with visible light.

Universitas Gadjah Mada (UGM)

2 years 4 months

Teaching Assistant, Department of Nuclear Engineering and Engineering Physics, UGM

September 2016 - December 2016 (4 months)

Artificial Intelligence Course, Sep 2016 - Dec 2016

I helped the lecturer for handling the students by actively conducting additional lessons for discussion together with the subjects of Artificial Neural Networks (ANN) and fuzzy logic. I was also responsible for checking the student's assignments.

Laboratory Assistant, Department of Nuclear Engineering and Engineering Physics, UGM

September 2014 - December 2016 (2 years 4 months)

Yogyakarta Area, Yogyakarta, Indonesia

- Sensor Technology Sep 2016 – Dec 2016
- Digital Electronics Lab Work Sep 2015 – Dec 2016
- Analog Electronics Lab Work Jan 2015 – June 2016
- Measurement System Lab Work Feb 2016 – June 2016
- Technical Drawing Lab Work Sep 2014 – Nov 2014
- Statistic and Probability Lab Work Sep 2014 – Nov 2014

Education

Kungliga Tekniska högskolan

Doctor of Philosophy - PhD · (April 2024)

KTH Royal Institute of Technology

Master's degree, Embedded Systems · (September 2021 - June 2023)

Universitas Gadjah Mada

Sarjana Teknik (S.T.), Engineering Physics · (2013 - 2017)