Ilyas Dawoodjee

(204) 881-9527 | ilyas.esack.dawoodjee@gmail.com | LinkedIn | GitHub | Personal Website

WORK EXPERIENCE

Research Engineer

Singapore

National University of Singapore (Building Robotics Laboratory)

April 2022 – December 2023

- Developed and implemented the **detection of heart rate** in a **non-intrusive way (remote Photoplethysmography – rPPG)**:
  - Worked on a project focusing on heart rate detection through **Machine Vision** and **Digital Signal Processing**, by employing a **simple RGB camera**
  - Conducted **extensive research** on papers and algorithms related to **various rPPG techniques**, resulting in the **development of an open-source framework** encompassing the original implementations of said techniques. Additionally **engineered a flexible framework** allowing users to **increase their rPPG accuracy** via an **exhaustive search algorithm** [link]
  - Designed and executed multiple extensive **databases**, both **public** and **in-house**, to rigorously **compare** rPPG-derived heart rate measurements with verified ground truth values within the framework.
- Implemented the **detection** of **real-world people and objects**, and **updated live** in a **Game Engine platform** (Unity):
  - **Detected** real world coordinates of a **person** using **YoloV3** relative to a designated local origin and **updated** it in a **software model of that room** (Digital Twin) in Unity via **AWS** to **simulate** real-time **movement** of a person
- **Automated** the **processing** of a huge (Terabytes) **dataset** on building science data:
  - Implemented a **single-objective optimization algorithm** that scans through **80k simulation results** and **identifies lowest energy consumption** and associated optimal setpoint and setback across a variety of climates and building sizes
  - Assisted with **data visualization**, and **mathematical modeling** for **analysis**, to understand the effect of different occupancy profiles on the selection of setpoints of the HVAC system
  - **Designed** and **built** a **web tool** for visualizing the findings of this project with an **interactive graph** using **d3.js** as **frontend** and **AWS S3 bucket** and **AWS Lambda** as **backend** [link]
- **Developed** a **website** for Building Robotics Laboratory:
  - Using **ReactJs and CSS** as **frontend** and **AWS** as **backend** to develop a website, to showcase research projects and increase online visibility
  - **Hosted** the **website** via **GitHub** [link]
  - **Developed** a **web tool** to **predict temperature setpoints** while minimizing reliance on occupant interactions, named ComfortGPT, with an **interactive graph** using **d3.js** as **frontend** and **AWS S3 bucket** and **AWS Lambda** as **backend** [link]
- Assisted the **development** of a **low-cost multi-sensing device**:
  - **Designed** and **developed hardware** and **software** for a low-cost multi-sensing device, integrating **10 IEQ sensors** with a **Raspberry Pi**.
  - Strategically **placed 20 devices** around the lab, **monitored** and **maintained** their operational integrity during a **month-long continuous data collection period**.
  - **Analyzed** collected **data** for **optimal** occupant-centric spatial **positioning of** low-cost IEQ multi-sensing **devices**.
  - **Assisted** in additional **experimental setup** of the devices for several **undergraduate thesis students**
- **Oversaw** all the **laboratory purchases/procurement**, **equipment management**, and **reclaiming process**

Research Assistant

Kuala Lumpur, Malaysia

Asia Pacific University of Technology & Innovation

February 2020 – May 2020

- **Customized** a carbon fiber **hexacopter drone** (> 8 kg, 50x50x40 cm) for **trimming tree branches**
- **Participated** in the MyDroneX University **Drone Competition** and received **1st Runner Up** organized by Futurise and MDEC: **(06/2019)**
  - Designed a self-charging drone for inventory update, using DJI Tello with a pre-programmed flight path based on the warehouse layout, where it **scans bar codes** on the shelves and **automatically updates the inventory in real-time**, reducing both injury risks and labor costs
  - Exhibited the MyDroneX project at Putrajaya International Convention Centre (PICC) for Industrial Revolution 4.0 Education Colloquium

Intern

Kuala Lumpur, Malaysia

EHM Global Sendirian Berhad

November 2020 – January 2021

- Built a **quadcopter drone** with **integrated machine vision** for the inspection of pipeline construction
- Developed a **MATLAB program** to automatically **recognize** the **music** that is playing by using **signal analysis**

EDUCATION

University of Manitoba (Intelligent Digital Manufacturing Laboratory)

Winnipeg, Manitoba, Canada

Master of Science in Mechanical Engineering

January 2024 – January 2026

- **Supervisor:** Dr. Matt Khoshdarregi
- **Recipient** of the **International Graduate Student Entrance Scholarship (IGSES)** valued about **CAD 7,000**
- **Recipient** of the **University of Manitoba Graduate Fellowship (UMGF)** valued at **CAD 20,000**

- **CAD model classification** using **Point Clouds** and **Deep Learning**
- **2D Hand-to-Eye Calibration:**
  - Using **Triton 2D camera** to **implement hand-to-eye calibration** to align the coordinate systems of 3 DoF robotic arm and camera
- **3D Hand-to-Eye Calibration:**
  - Using **Helios 3D camera** and **Triton 2D camera** to **implement hand-to-eye calibration** to align the coordinate systems of 3 DoF robotic arm and cameras in **three-dimensional space**
  - Obtained **colored point cloud** by using **2D camera RGB data** and **overlapping** it with the **3D point cloud data**
- **Improving Warehouse Parts Picking Process (Lean Six Sigma Green Belt Project for Operational Excellence Course):**
  - **Diagnosed Key Bottlenecks:** Pinpointed "**missing parts**" as the top issue contributing to **77%** of assembly time loss, leveraging **time-motion studies, Pareto analysis, and decision trees.**
  - **Resolved BOM Start Date Errors:** Corrected **350+** defective BOM line items by defining **process ownership** and automating **daily checks** for invalid start dates—leading to an **18.3%** (**10.85 mins/hour** to **8.86 mins/hour**) reduction in reported assembly time loss.
  - **Implemented 8 Quick Kaizens (Early Wins):** Deployed **standardized labeling**, **streamlined PIR processes**, optimized **cart storage**, and reorganized hardware—boosting **cross-functional morale** and **stabilizing** workflow steps.
  - **Established Sustainability Measures:** Developed **SOP revisions**, **daily dashboards**, and **automated notifications** to maintain BOM integrity and foster **continuous improvement** in the warehouse picking workflow

Asia Pacific University of Technology & Innovation (APU)

Kuala Lumpur, Malaysia

Bachelor of Engineering (Hons.) in Mechatronics Engineering

November 2017 – February 2022

- CGPA: **3.87/4.0**
- Valedictorian for Class of 2022 and **Outstanding Achievement Award**
- Member of the **Center for Research and Development in IoT Club (CREDIT Club)** - **Worked** on **multiple** different **projects (see RA position above)** and **joined competitions** with some of those **projects** (06/2019 - 02/2022)
- **Final Year Project**: Machine Vision Analysis for Anomaly Detection in a Controlled Environment (02/2021 - 10/2021)
  - Designed an **Exam Proctoring System** to observe students and maintain exam integrity during COVID-19
  - Utilized **Machine Vision & Machine Learning** techniques to **identify & verify students** before they take their exams by **facial recognition, detect & track objects** such as the usage of phones during the exams, and process images to check if they are talking or looking around
  - As a part of the **Artificial Intelligence for SMES (AI4S) Program Inception**, my university, **Asia Pacific University, received a prize** valued at approximately **75,000 USD** for the development of the automated exam proctoring system [link]
  - **Created** a comprehensive **GitHub repository** outlining the **system setup** and explanation, including necessary third-party software's & libraries [link]
- Smart Environment Detection System for Vehicles (02/2021 - 06/2021)
  - Designed and developed a **smart environment detection system** for cars
  - The overall project was developed with 5 teammates with the personal individual component being a **real-time weather classification system** using machine vision and machine learning
  - The **maximum allowable speed** for that particular road is then **dynamically changed depending on the weather**, which in return can potentially reduce road accidents
  - Utilized **TensorFlow Lite Model Maker to train** a model with 4400 images, containing four different weather types, with an average **accuracy of 89%**

PUBLICATIONS

- **Dawoodjee, I.** and Ghahramani, A. (2024) "A Flexible Framework for Optimal Design and Validation of rPPG Methods", *IEEE Access* [Under Review]
- Talami, R., Hu, X., **Dawoodjee, I.** and Ghahramani, A. (2024) "Examining Different Placement Strategies for Indoor Environmental Quality Sensors in Office Environments", *Science and Technology for the Built Environment* [Under Review]
- Talami, R., **Dawoodjee, I.** and Ghahramani, A. (2024) "Demystifying energy savings from dynamic temperature setpoints under weather and occupancy variability", *Energy and Built Environment* [link]
- Talami, R., **Dawoodjee, I**. and Ghahramani, A. (2023) "Quantifying energy savings from optimal selection of HVAC temperature setpoints and setbacks across diverse occupancy rates and patterns", *Buildings* [link]

SKILLS

SOFTWARE **Python** (Machine Vision, Machine Learning, Signal Processing), **MATLAB** (Simulink, Digital/Analogue Signal Processing), **SolidWorks** (2D Sketch, 3D Modelling, FEA), **Arduino IDE**

SolidCAM (Milling, Turning), **RAPID Programming Language** (ABB Arm Robot), **LTSPICE, CNC Simulator** (Milling, Turning), **LabVIEW, Automation Studio** (PLC, Electro-pneumatics), **Multisim** (Digital Electronics), **Dart** (Flutter, Mobile App Development), **JavaScript, HTML, CSS, ReactJs** (Front End Web Development, d3.js), **Git/GitHub, AWS** (S3 Bucket, Lambda)

HARDWARE **Soldering, Electrical Circuit Wiring** (BJTs, Logic Gates, Arduino, Raspberry Pi)

PERSONAL PROJECTS

- **Designed** and **developed custom websites** using **ReactJs and CSS** for diverse **clients**:
  - **Built a personal website** where I will regularly post concise, yet insightful project highlights—drawing from my research pursuits and personal projects related to machine vision, machine learning, and robotics projects, offering a behind-the-scenes look at my ongoing experiments [link].
  - Created a website for a Middle Eastern restaurant, enhancing online presence and customer engagement (2024) [link]
  - Developed a sleek, minimalistic resume website for a postdoctoral researcher friend to showcase his professional achievements and skills [link]
- Head Position Recognition (2021)
  - Trained and implemented a **machine learning model** to **recognize different head orientation** based on deep **neural network** using **LSTM** (Long Short-Term Memory) layers with **Tensorflow** and **Keras**, utilizing sequence of keypoints obtained from user's face using **MediaPipe.**
- Developed a MATLAB program that records, analyzes, stores, and detects the voice of specific users from their pitch based on signal analysis.