SHAOWNAK SHAHRIAR

Machine Vision Engineer

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Summary

I am a Computer Science graduate from BRAC University with nearly five years of experience in Robotics and AI, specializing in Computer Vision, Autonomous Systems, and Control Systems. I have worked on Mars Rovers (URC 2023, IRC 2023), Autonomous Underwater Vehicles (ROBOSUB 2023 - 2nd place globally), and Unmanned Areal Systems (IMEchE UAS Challenge). My expertise includes AI, Machine Learning, Deep Learning, NLP, Robotics Control System, and Software Development. With a strong foundation in competitive programming, I am passionate about developing intelligent autonomous systems and AI-driven robotics solutions.

Education

BRAC University, School of Data Science   **Graduated in 2024**

Bachelor of Science in Computer Science   *Dhaka, Bangladesh*

- **Notable Courses:** Quantum Computing, Artificial Intelligence, Neural Networks, Introduction to Robotics, Pattern Recognition, Software Engineering, System Analysis and Design

Experience

Dubotech   **May 2024 – October 2024**

Autonomous Systems Engineer   *Dhaka, Bangladesh*

- Developed control software for AUVs, collaborating with the software team to control the AUV from base station.
- Designed and implemented a GAN-based real-time underwater video enhancement algorithm, incorporating color correction techniques.
- Integrated and optimized autonomous control systems utilizing Pixhawk, Raspberry Pi, and Nvidia Jetson Orin Nano, interfacing with various onboard sensors.

BRACU Duburi   **June 2021 – April 2024**

Sub-Team Lead, AI and Machine Vision   *Dhaka, Bangladesh*

- Led the vision and control system development for BRACU Duburi's autonomous underwater vehicle.
- Developed a core navigation algorithm leveraging machine vision for underwater object detection.
- Implemented and optimized deep learning models (SSD MobileNet V2, YOLO v3/v4/v5, Mask R-CNN) on Nvidia Jetson Nano for real-time underwater object recognition.
- Integrated and tuned Pixhawk-based control systems, incorporating ROS (Robot Operating System) and vector-based navigation.
- Designed and implemented sensor fusion algorithms using Kalman Filter and Madgwick Algorithm to enhance IMU, compass, and depth sensor accuracy.
- Developed and fine-tuned PID controllers to optimize AUV maneuverability.
- Worked extensively with embedded systems, including Nvidia Jetson Nano, Raspberry Pi, Pixhawk, ESP32, and Arduino.

BRACU Mongol-Tori   **January 2022 – August 2023**

Senior Member, Autonomous Systems and AI   *Dhaka, Bangladesh*

- Developed autonomous navigation algorithms integrating VectorNav for precise localization.
- Designed and deployed deep learning models (YOLO v5, Faster R-CNN, SSD MobileNet V2) for object detection, including rock identification, tool recognition, and equipment inspection in Martian-like environments.
- Implemented SLAM (Simultaneous Localization and Mapping) using LiDAR and Intel RealSense cameras, fusing IMU and GPS data for aerial and terrain mapping.
- Developed motor control strategies using L298N, IBT2, Monster, and Cytron motor drivers for optimal robotic mobility.
- Integrated ROS for real-time robotic communication and autonomous operations.
- Worked extensively with Nvidia Jetson Nano, Raspberry Pi, Pixhawk, ESP32, and Arduino, interfacing with IMU, LiDAR, RealSense, and various sensor modules.

Technical Skills

Languages: Python, C, C++, C#, Arduino.
Data Science Tools and Framework: TensorFlow, Pytorch, Jetson Inference, OpenCV, ScikitLearn, Keras, MiDAS, PyNltk, Numpy, Pandas, MatplotLib.
Models: SSD MobileNet, YOLO, FasterRCNN, EfficientDet, Mask-RCNN, Complex-YOLOv4, SE-SSD, GLENetVR, Inception v3, Xception, VGG16, Reinforcement Learning, GAN, BERT, LSTM, GRU, Conv1D, Decision Tree Regressor, Random Forest, KNN, XGBoost, Ada Boost.
Robotics: Rover Autonomy, Robot Vision, Robotics Control System.
Tools and Technologies: Linux, ROS, Nvidia Jetson Nano, Rspberry Pi, Arduino, ESP32, Stero Vision, SLAM.
Sensors: IMU, GPS, Vectornav, SBG, RTK.
Software Development: ASP.NET, Django, MySQL, Microsoft SQL, HTML, CSS, Bootstrap.
Miscellaneous: Git, LaTex.

Projects

Autonomous Systems & Robotics

- **BRACU RaptorX** (Dec 2023 - Dec 2024) – Co-founded BRACU RaptorX for UAS research, developing the country's first autonomous quad plane (VTOL). Led Autonomous & Navigation team, building hardware/software and conducting autonomous flights.
- **Shurokkha Rescue Bot** (Nov 2023) – Developed an autonomous rescue robot for disaster response, integrating object detection, localization, and aerial mapping.
- **Object Detection & Navigation with CV and Arduino** (Feb 2022) – Built an autonomous navigation system using computer vision and Arduino. GitHub

Machine Vision & AI

- **Object Detection** – Developed various object detection models:
    * **3D Object Detection**: Complex-YOLOv4, SE-SSD, GLENetVR
    * **Image Segmentation**: Mask-RCNN
    * **Underwater Object Detection**: YOLOv4-v8, SSD MobileNet v2
    * **Mars Surface Detection**: YOLOv5, SSD MobileNet, Faster-RCNN
- **Sentiment Analysis** (Aug 2022) – Analyzed Food, Toxic, and Twitter datasets using LSTM, GRU, BERT, and Conv1D. GitHub
- **Face Mask Detector** (Oct 2021) – Built a real-time face mask detection model. GitHub
- **Arrow Direction Detection and Distance Measurement** (Oct 2022) – Developed an arrow detection system for measuring direction and distance. GitHub
- **Multi-camera Threading using OpenCV** (May 2022) – Built a real-time multi-camera system for efficient video processing. GitHub

IoT & Control Systems

- **Gas Flow Controller System** (Sep 2023 - Oct 2023) – Designed an IoT-based gas leak detection system with automated shut-off, alarms, and remote monitoring.
- **MPU6050 Sensor Fusion using Kalman Filter** (Dec 2022) – Implemented sensor fusion with Kalman filtering for motion tracking. GitHub

Software

- **Bracu Lost-and-Found** (Oct 2022) – Developed a website for finding lost items in Brac University premises using Django and MySQL. GitHub
- **ERP Software for E-commerce** using ASP.NET MVC (December 2024). GitHub

Achievements

- Participated in **IMechE UAS Challenge 2024** – Bracu RaptorX, IMechE (Leicester, England)

- First Runner-up (Globally) at **ROBOSUB 2023** – Bracu Duburi, RoboNation (Los Angeles, California, USA)

- Participant in **University Rover Challenge (URC) 2023** – BRACU Mongol-Tori, The Mars Society (Utah, USA)

- 7th Position (Globally) in **International Rover Challenge (IRC) 2023** – BRACU Mongol-Tori, The Space Robotics Society (Bangalore, India)

- 3rd Position in **International Kibo Robot Programming Competition 2022 (Bangladesh Round)** – JAXA (Dhaka, Bangladesh)

- 3rd Position in **BRACU Intra University Programming Contest 2021** – BRAC University (Dhaka, Bangladesh)

Academic Thesis and Research

Point-Cloud-based 3D Object Detection for Autonomous Navigation in Unmanned Ground Vehicles

May 2023 – October 2024

- Our research focuses on improving 3D object detection for autonomous Unmanned Ground Vehicles (UGVs) by addressing the limitations of traditional 2D detection methods. We propose a two-stage pipeline that leverages point cloud data to generate 3D object proposals, followed by a fusion of GLENetVR and SE-SSD architectures for accurate detection. This hybrid approach enhances spatial understanding, improving object distinction and recognition in complex environments. Through extensive evaluations on benchmark datasets, our model demonstrates superior accuracy, surpassing both standalone SE-SSD and GLENetVR models, contributing to safer and more reliable UGV navigation.

Research Mentorship

- **Smart Driver Safety System based on driver Drowsiness Detection, Car Lane detection and Depth estimation** (July 2023 – October 2023)

- **Breast Cancer Detection by fusing SSD MobileNet v2, VGG16 and ResNet with KNN, Random Forest and XGBoost** (November 2022 – December 2022)

- **Underwater waster detection on muddy water by fine tuning Yolo v5, v7 and EfficientDet-D0** (October 2023 – January 2024)

Other Notable Experiences

Robotics Instructor, BRAC University   **May 2022 - August 2023**

BRAC University

- Worked as a robotics instructor for the course "Introduction to Robotics" offered at BRAC University for three consecutive semesters.
- Served as a robotics instructor at the BRAC Hope Fest hosted by BRAC University in June 2023.

Robotics Club of BRAC University (ROBU)   **January 2020 - December 2023**

Senior Executive of Strategic Planning

- Served as a robotics instructor for workshops such as "Basics of Robotics."
- Conducted several workshops on "Introduction to Computer Vision" and "Introduction to Autonomous Systems."
- Built and maintained strong connections within the robotics and academic community.

References

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Additional references available upon request.