Bipin Saha

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Education

University of Dhaka May 2023 - Present
MSc. in Robotics and Mechatronics Engineering
Relevant Courses: Computer Vision, Bio Robotics, Computational Human-Robot Interaction, Internet of Things, Multi-Robot Systems, Deep Learning

University of Rajshahi Graduated: Sept. 2022
BSc. in Electrical and Electronic Engineering | Statement of Courses ***GPA: 3.38/4.00***
Relevant Courses: Control System, Digital Signal Processing, Microprocessor and Embedded System, Power Electronics, Biomedical Engineering, Computational Methods, and MATLAB Programming.

Experience

Machine Learning Engineer Dec. 2023 - Present
Business Automation Ltd. *Generative Transformers, LLM, VLM, Computer Vision*

- Digitized handwritten prescriptions with OCR model, leveraging Generative LLM models for output formation and Layout-based document digitalization using LayoutLM and Donut model.
- Implemented Bangla Law Consultancy chatbot with interaction-based instruction dataset using Llamma-3, featuring RAG system and effective tokenization method.
- Extracted Land Records information using OCR, Bangla Document OSD functioning, and Name Entity Recognition employing the Mistral Model with 4-bit quantization for effective memory allocation.
- Executed BIDA and EBS Employee Behavioral Log Text Summarization enhancing efficacy in task-based accomplishment utilizing Mistral, Pegasus, and ML Models.
- Contributed to EBS Inshight-db database QnA using ChatGPT API and TAPAS model.

Assistant IoT Engineer Jan. 2023 - Nov. 2023
Get-Aid Ltd. *Computer Vision - Detection, Segmentation, Mobile Robots, Manipulator, PID Control*

- Developed an Object Detection pipeline using YOLOv5 and v8 for grocery product recognition (@mAP.50-0.995, @mAP.50:0.95 – 0.872)
- Implemented 5DOF inverse kinematic manipulator to navigate 3D shelf space using visual perception.
- Implemented PID control algorithm, resulting in precise and accurate slot navigation for the robotic system.

Computer Vision Research Intern Mar. 2023 - Jun. 2023
Brainekt AI Lab

- Annotated image data and prepared Emotion Recognition Dataset.
- Trained deep learning algorithm for 9 facial expression recognition.

Skills

Languages: Python, MATLAB, C, C++
AI Stack: Multimodal LLM, VLM, Generative Transformers, Computer Vision, DL, ML
Frameworks: PyTorch, Tensorflow, HuggingFace Transformers, Scikit-Learn
Modules: NLTK, Spacy, Pandas, OpenCV, Pillow, Numpy, Matplotlib, Seaborn, Flask
DevOps: Docker, GitHub Actions CI/CD
Tools: Coppeliasim, Simulink, Proteus, Easy-EDA, Git
Platforms: Arduino, STM32(BluePill), ESP32/8266/TTGo(MQTT,REST-API), Raspberry Pi (Debian), Linux
Documentation: Origin Pro, LaTeX, Adobe Photoshop, Premier Pro

Notable Projects || Complete Project List

ChatPDF with RAG System - Gemini Pro (Specialized for Research Paper QnA)

ChatPDF with RAG is a system designed to answer your questions about research papers in a chat-like interface. It uses Retrieval-Augmented Generation (RAG) to understand the paper and provide summaries or specific information. Uniquely, it can also translate the research paper's concepts into code, potentially helping you implement the paper's ideas. [GitHub] [Deployment]

Text2Text Generation and Summarization using Mistal-7B and Pegasus Model

This project uses a powerful AI model to automatically summarize employee work logs. By feeding verbose logs into the system, managers get concise summaries highlighting key points, progress, and challenges. This approach is demonstrably effective and helps streamline processes for better decision-making and performance evaluation. [GitHub]

Bengali Sentiment Analysis using BERT LSTM, BiLSTM, GRU Models

This research builds a highly accurate (90.31% test accuracy) sentiment analysis model for Bangla text. It uses a special kind of neural network with data augmentation techniques to understand the sentiment (positive, negative, neutral) of Bangla writing, even when the way people express themselves is complex. This is useful for any application that needs to understand how people feel in Bangla text. [GitHub]

Slab Bend Detection and Tracking (Collaboration : Tata Steel India)

This project is a real-time system for industrial video monitoring, built with Python to detect defects like metal slab bends. It uses multiple cameras and a YOLO model to find anomalies in the video feed. Anomalies are shown on a user-friendly interface with details like camera number and a confidence score. The system can also log data, manage users, and connect to IP cameras. [YouTube]

End to End Behavioral Cloning of Self Driving Car

This project builds a self-driving car system using cameras and a specially designed neural network. The network analyzes camera images to steer the car, and a separate controller manages the car's speed. This system combines deep learning with control engineering to achieve real-time self-driving navigation. [GitHub] [YouTube]

Appearance Based Eye Gaze Estimation and MultiLangual Keyboard

This project creates a system that tracks eye gaze in real-time using regular webcams or phone cameras. It works even if you move your head around naturally. The system is very accurate (around 98%) and can be used for many different things, like improving computers with you interact with your eyes, controlling robots, or even in medical studies. [Paper]

Customer Queue Management with Waiting Time Prediction

This project involves the design and implementation of a Customer Queueing System. The customers register for taking services, and a central server is responsible for assigning them to available service counters. A live tracking feature estimates waiting time using LSTM method.

Teleoperated Quadcopter for Aerial Mapping (Gravity Destroyer)

The Gravity Destroyer is a quadcopter drone designed for stable photography and videography with features like brushless motors and autopilot sensors. It can be controlled via radio or telemetry and offers a flight time of 20-25 minutes within a 2km radius. It can also lift up to 10kg and works with a landmine detector bot. [YouTube]

Research || Google Scholar

- **Saha B**, Islam MJ, Mostaque SK, Bhowmik A, Karmakar T, Chowdhury NH, Reaz, MIB. **Bangladeshi Native Vehicle Detection in Wild**. arXiv pre-print, Submitted in IEEE Transaction on Intelligent Transportation Systems
- **Saha B**, Islam MJ, Dipto AS, Mostaque SK. **An Efficient Approach for Appearance-Based Eye Gaze Estimation with 13 Directional Points**. In 2021 International Conference on Computer, Communication, Chemical, Materials and Electronic Engineering (IC4ME2) 2021 Dec 26 (pp. 1-5). IEEE.
- **Saha B**, Mondal BK, Mostaque SK, Hossain M, Hossain J. **Numerical Modeling of CuSbSe2- based Dual-Heterojunction Thin Film Solar Cell with CGS Back Surface Layer**. AIP Advances. 2023 Feb 1;13(2):025255.

Leadership and Volunteering

- Chairperson, IEEE RAS, University of Rajshahi SBC. (December 2020 - October 2022)
- Secretary, IEEE University of Rajshahi Student Branch. (December 2019 - December 2020)
- Volunteer, Bangladesh Innovative Education Society (April 2018 - March 2019)
- Instructor, Design You PID Controller Webinar (August, 2021). YouTube)
- Instructor, Arduino Workshop Series, Electronics Club [EEE,RU] (October 2019 - January 2020)

References

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