SAKIB CHOWDHURY

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Summary

Experienced researcher and machine learning engineer skilled in developing advanced motion planning and robotic systems. Successfully implemented innovative convolutional motion planners, achieving significant speedups and optimized neural models for high-speed robotic manipulation tasks. Ready to leverage expertise in AI and robotics to enhance technological solutions and drive innovation in robotics and automation domains.

EDUCATION

Stevens Institute of Technology **Dec 2025**
M.Sc., Robotics
- **GPA:** 3.97/4.00 (Expected Dec 2025)
- **Coursework:** Modeling and Optimization, Introduction to Mobile Robotics, Cooperative Autonomous Mobile Robotics, Probability and Statistics, Deep Learning, Introduction to Mobile Manipulators, Digital Signal Processing, Data Acquisition and Modeling for Machine Learning

Bangladesh University of Engineering and Technology (BUET) **May 2022**
B.Sc., Electrical & Electronic Engineering
- **GPA:** 3.65/4.00
- **Coursework:** Linear Control Systems, Digital Logic Design, Microprocessors, VLSI, C Programming

TECHNICAL SKILLS

- **Computer Vision**: Object Detection, Vision Transformers
- **ML Frameworks**: PyTorch, TensorFlow, Scikit-Learn, Numpy, ONNX, CUDA
- **Robotics Softwares and Simulators**: ROS, Bullet, IsaacSim, Gazebo
- **Programming Languages**: Python, C/C++, Bash, MATLAB, DART
- **Microcontrollers**: ATmega328, STM32, ESP32, MSP430
- **Others**: Docker, Git, Google Cloud Platform, Flask, FastAPI, Flutter

PROFESSIONAL EXPERIENCE

Stevens Institute of Technology **Sep 2024 - Present**
Graduate Research Assistant (Robotics & Automation Lab) *NJ*
- Developed and trained novel convolutional motion planners using PyTorch for ultra high-speed motion planning in mobile manipulators.
- Designed a simulation training environment in PyBullet (Python wrapper of the Bullet physics engine) for a mobile manipulator system: a Franka Emika Panda arm mounted on a Husky robot.
- Trained the motion planners in simulation and successfully transferred them to the real Franka Emika Panda robotic arm for deployment.
- Applied ONNX quantization to optimize the neural motion planning model for faster inference on NVIDIA A6000 GPUs, achieving 10x speedups over classical planners (e.g., RRT, PRM) in the ROS MoveIt framework.

Stevens Institute of Technology **Sep 2023 - Aug 2024**
Graduate Research Fellow *NJ*
- Researched the application of residual learning to improve trajectory estimation of moving projectiles, such as a table tennis playing robot, enhancing prediction accuracy in dynamic environments
- Developed a custom simulation environment in Pybullet for a table tennis playing robot, facilitating advanced testing and refinement of robotic movements
- Applied supervised imitation learning to teach the robotic arm striking skills from expert data, resulting in improved accuracy and efficiency in robotic performance
- Utilized Kalman Filtering with multiple Intel Realsense RGB-D depth sensing cameras to accurately detect and track moving ball trajectories in 3D space, enhancing real-time tracking capabilities

Celloscope **Dec 2021 - Sep 2023**
Machine Learning Research Engineer *Dhaka, Bangladesh*
- Trained and compared state-of-the-art ASR models ESPNet, Wav2Vec, and Whisper on the Bengali Common Voice dataset for Bangla speech recognition.
- Trained ESPNet text-to-speech (TTS) model to generate synthetic Bangla audio.
- Built a data collection and annotation pipeline using Label Studio for image-to-text extraction tasks.
- Trained a Vision Transformer (ViT) model for text extraction from Bangla national ID cards and Bangladeshi vehicle license plates.
- Developed a data pipeline for collecting and labeling speech data in local Bengali dialects.

BUET **Mar 2021 - Nov 2021**
Research Assistant *Dhaka, Bangladesh*

- Designed a sensing circuit interfacing an ATmega328P microcontroller with multiple piezoelectric crystals to detect rail track vibrations, enhancing the accuracy of vibration detection. Developed drivers in C programming language to ensure efficient data processing
- Trained and deployed a novel TensorFlow Lite model on the microcontroller to autonomously detect potential rail track derailments from vibrations sensed up to 1 km away.

Adorsho Pranisheba **Jul 2020 - Dec 2020**
Intern Engineer (Hardware Design) *Dhaka, Bangladesh*

- Designed a custom PCB to interface an STM32 microcontroller with an ADXL345 accelerometer for monitoring cattle movement in large-scale dairy farms; programmed the STM32 in C++.
- Interfaced an MSP430 microcontroller with MQ2 gas sensors to monitor air quality in indoor cowsheds.
- Implemented UART, SPI, and I²C driver software in C for the MSP430 microcontroller.

PUBLICATIONS

- S. Chowdhury, Y. Guo. Learning to Strike for Robotic Table Tennis. (Submitted).
- S. M. Monsur, Shariar Kabir, S. Chowdhury. SynthNID: Synthetic Data for Bangla Key Information Extraction. EMNLP Bangla Workshop 2023.
- S. M. Monsur, S. Chowdhury, M. S. Fatemi, et al.. SHONGLAP: Bengali Open-Domain Dialogue Corpus. LREC 2022.
- T. Mahmud, M. J. Alam, S. Chowdhury, et al.. CovTANet: Hybrid Tri-Level Attention Network for COVID-19 Lesion Segmentation and Severity Prediction. IEEE Transactions on Industrial Informatics, 2021.
- S. Chowdhury, M. Morshed, S. A. Fattah. SpectroCardioNet: Attention-Based Triple-Spectrogram PCG Network for Cardiac Disease Detection. IEEE Sensors Journal, 2022.
- S. Chowdhury, D. K. Sikder, A. Roy. A Simulated Intelligent Pixelated Electrode Array for Surface Electromyography Sensors. IEEE Sensors Journal, 2023.
- S. Chowdhury, M. L. Rahman, S. N. Ali, M. J. Alam. RNN-Based Framework for Twitter Sentiment Analysis. ICECE 2020.

SELECTED PROJECTS

Convolutional Motion Planners
- Designed a fast neural motion planner that learns from classical planners (RRT, PRM) and achieves a 10× speedup in planning.
- Collected synthetic trajectories using Bullet Physics Engine and applied novel trajectory compression techniques to reduce dimensions of the data.
- The model was designed in PyTorch and quantized with ONNX after training.

Residual Learning in Robotic Table Tennis
- Applied residual learning to enhance ball trajectory estimation in robotic table tennis gameplay.
- Designed and implemented the model using PyTorch.

Goal-Directed Reinforcement Learning with DDPG
- Implemented the Deep Deterministic Policy Gradient (DDPG) algorithm on a Franka Emika Panda robotic arm to reach target states within a limited number of steps.
- Designed the model in PyTorch and trained on an NVIDIA A6000 GPU.

Bangla Voice Banking System
- Developed a Bangla speech-to-speech system by integrating automatic speech recognition (ASR), text-to-speech (TTS), and neural chatbot models.
- Trained all the separate models in docker containers to avoid dependency conflicts.
- Designed specifically for banking applications and currently deployed by a major financial institution in Bangladesh.

Automated Vehicle Tracking at Toll Plazas
Kalna Toll Plaza, Bangladesh
- Developed a vision-based vehicle tracking system using the YOLO object detection model to locate license plates and Vision Transformers to extract plate numbers from camera images.
- Deployed at Kalna Toll Plaza in Bangladesh for real-time vehicle identification and monitoring.

Bolus: Ingestible Health Monitoring Device for Dairy Cattle
- Designed a compact, swallowable device ("Bolus") to monitor movement and temperature from inside a cow's stomach.
- Developed custom PCBs using Eagle and integrated an ultra-low-power MSP430 microcontroller for onboard processing and data transmission.
- Drivers were designed in C language.
- Aimed at improving health monitoring in large-scale dairy farms.

Brushless DC Motor Controller
- Designed a circuit to control the speed of BLDC motors using three MOSFET half-bridge drivers.
- Implemented Field Oriented Control (FOC) with integrated Hall sensors to reduce slippage and improve motor performance.
- Used ATmega328p microcontroller with C programming language to synchronize the timings.