Siratul Islam

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Shahjalal University of Science and Technology, Sylhet - 3114, Sylhet, Bangladesh

RESEARCH FOCUS

I work at the intersection of embedded systems, real-time operating systems, and IoT, with focus on automation, and education applications. My research addresses practical problems like energy efficiency in buildings, accessible technology for rural education in Bangladesh, and safety-critical autonomous systems. As a Linux Foundation Zephyr RTOS contributor, I develop board support and device drivers for ARM, RISC-V, and Xtensa platforms. Technical interests include RTOS kernel development (Zephyr, FreeRTOS), embedded Linux, driver optimization, and ROS2 robotics. Seeking graduate studies in embedded systems architecture and real-time computing for medical devices, industrial automation, and assistive technologies.

EDUCATION

Shahjalal University of Science and Technology   Sylhet, Bangladesh
Bachelor of Science (Hons) in Physics   *Aug. 2023 – Aug 2027*
- Relevant Coursework: Basic & Digital Electronics, C Language, Electricity & Magnetism, Mathematical Methods in Physics, Computational Physics
- Academic Achievement: Bronze Medal, (International) University Physics Competition 2024
- Research Focus: Applied physics with emphasis on embedded systems and IoT applications

RESEARCH EXPERIENCE

Shahjalal University of Science and Technology   Sylhet, Bangladesh
Research Assistant - Department of Electrical and Electronic Engineering   *Jun 2025 – Present*
- Developed production smart display system with custom Zephyr RTOS driver (HUB12) for building automation displays
- Developing smart relay control systems for government cost optimization in collaboration with EE faculty
- Research focuses on IoT-enabled power management systems using STM32 and ESP32 microcontrollers
- Implementing MQTT-based data acquisition systems for real-time monitoring and control
- Conducting radar-based occupancy detection research for automated energy optimization in government buildings
- Developing RFID-based attendance management systems for rural educational institutions in Bangladesh

PROFESSIONAL EXPERIENCE

Hackules Inc.   Remote
Software Engineer   *Jun. 2024 – Jun. 2025*
- Led full-stack development for educational platforms including Teachers Today (Next.js + Express.js)
- Developed Opedemy learning platform with 200+ API integrations and optimized SSR for 50% faster load times
- Conducted technical interviews for engineering positions
- Technologies: SvelteKit, Next.js, Django, TypeScript, MongoDB, SMS/Email APIs

Software Engineer, Intern   *Feb. 2024 – Jun. 2024*
- Built AI-powered marketing analytics tool with Facebook Graph API integration
- Developed Flutter CRM mobile application serving 1000+ active users
- Technologies: SvelteKit, Flutter, Facebook Graph API, LinkedIn API, Firebase

Copernicus Astronomical Memorial of SUST   Sylhet, Bangladesh
IT Secretary   *Nov. 2024 – Present*
- Built the new official website from ground up using modern technologies like NextJS + Typescript
- IT coordinator and Scientific Organizing Committee member of CAM-SUST Summer School on Astronomy 2025
- Organized in-person recruitment events and coordinated technical workshops

Assistant IT Secretary   *Apr. 2024 – Oct. 2024*
- Managed and maintained the old Wordpress website, configuring packages for various functionalities
- Developed educational content and Python programming tutorials for 200+ students
- Handled content publishing on the website including blogs, and magazine

Open Source Contributions

Linux Foundation Zephyr RTOS Project Github

Official Contributor - 13 Merged Pull Requests *2025 – Present*

- **Project Impact**: 13 merged PRs expanding Zephyr's hardware ecosystem across ARM Cortex-M, RISC-V, and Xtensa architectures, serving 5000+ embedded developers globally
- **Contribution Breakdown**: 8 board support packages, 2 board improvements, 2 display drivers (display & auxdisplay subsystem), 1 toolchain integration
- **Architecture Coverage**: ARM Cortex-M0+/M4/M33, RISC-V RV32IMC, Xtensa LX6/LX7

Display Driver Contributions (2 PRs) *Display & Auxdisplay Subsystems*

- **drivers: auxdisplay: Add TM1637 7-segment display driver (PR #96510)**: Full driver implementation with brightness control, segment manipulation API, sample code, and test suite
- **drivers: display: add HUB12 LED matrix driver (PR #97921)**: LED matrix driver for large displays with device tree bindings and complete API

Board Support: STM32 Platform (3 PRs) *ARM Cortex-M Series*

- **boards: arm: add WeAct STM32F446 Core board (PR #91886)**: Complete board support with device tree configuration, GPIO mappings, and peripheral initialization
- **boards: arm: add support for WeAct STM32WB55 Core Board (PR #97435)**: Dual-core ARM Cortex-M4 & M0+ board with integrated BLE 5.0 radio for wireless applications
- **boards: arm: add support for WeAct STM32G030 Core Board (PR #97553)**: ARM Cortex-M0+ board support for low-power and entry-level projects

Board Support: ESP32 Platform (5 PRs) *RISC-V & Xtensa Architectures*

- **boards: add WeAct Studio ESP32-S3-B board support (PR #96687)**: Xtensa LX7 board with WiFi/BLE, flash configuration, and esptool integration
- **boards: add WeAct ESP32-C6 Mini board support (PR #97578)**: RISC-V board with WiFi 6, Zigbee/Thread support, and hardware security features
- **boards: riscv: Add support for WeAct Studio ESP32-C3-Mini (PR #97670)**: RISC-V board with WiFi/BLE and low-power mode support
- **boards: xtensa: Add support for WeAct Studio ESP32-S3-MINI (PR #97720)**: Compact ESP32-S3 board with optimized pinout for small form factor designs
- **boards: xtensa: add support for DOIT ESP32 DevKit V1 (PR #97882)**: Popular ESP32 development board with WiFi/BLE and complete peripheral access

Toolchain Integration (1 PR) *Development Tools*

- **boards: weact: add runner support for stm32f446_core and stm32f405_core (PR #92985)**: Added PyOCD and STM32CubeProgrammer support for improved debugging workflow

Espressif ESP-IDF Ecosystem Espressif Component Registry

Component Publisher - Sensor & Display Drivers *2025 – Present*

- Published production-ready components on official ESP Component Registry with documentation and integration examples

RD-03D mmWave Radar Sensor Component *v1.0.0*

- ESP-IDF component for AI-Thinker RD-03D radar with filtering algorithms and real-time coordinate tracking

TM1637 4-Digit 7-Segment Display Component *v1.0.1*

- Display driver component with API for display control, brightness adjustment, and segment manipulation

STM32 HAL Ecosystem Github

Hardware Abstraction Layer Development *2025 – Present*

- Developed HAL drivers for Bosch BME280 environmental sensor with I2C communication
- Created portable sensor libraries for rapid prototyping of environmental monitoring systems

Web Development Libraries Github

svelte-cloudinary - Official Contributor *2024 – Present*

- Fixed critical video player aspect ratio bug (PR #108/#109) affecting 800+ developers

Publications & Presentations

Air Evacuation Time for Holes of Variable Diameters in a Space Station
Nov 2024

ResearchGate Publication – University Physics Competition 2024 *Published*

- **Authors**: Siratul Islam, Ibrahim Hossain, Rimon Acharjee Sumon
- **Recognition**: Bronze Medal among international undergraduate physics teams
- **Access**: ResearchGate

Awards & Recognition

Bronze Medal - International University Physics Competition
Nov 2024

Team 750, Problem A - Mathematical Modeling Excellence *Global Competition*

- Recognized among top international undergraduate physics teams for innovative mathematical solution to space station air evacuation problem
- Developed novel application of Poiseuille's law and Ideal Gas Law for fluid dynamics modeling under extreme conditions
- Competition involved 1000+ teams from universities worldwide, Bronze Medal represents top 15% performance

Linux Foundation Zephyr RTOS Contributor
2025

Multi-Contribution Developer Status - Board Support & Toolchain *Open Source Community*

- Achieved official contributor badge with multiple merged pull requests to upstream Zephyr project
- Contributions impact 5000+ embedded systems developers globally through improved hardware support

Harvard CS50x Certification
2023

Computer Science Fundamentals - Certificate of Completion *Harvard University*

- Successfully completed Harvard's rigorous introduction to computer science course
- Demonstrated proficiency in multiple programming languages and computer science concepts

Current Research Projects

Autonomous Vehicle Navigation System
2025

EEE Department-Funded Project - 5-Member Research Team *Ongoing*

- Developing ROS2-based autonomous navigation stack with LiDAR sensor fusion and OpenCV computer vision
- Building STM32F4-based vehicle control system for real-time actuator management and motor control
- Implementing sensor fusion algorithms for obstacle detection and path planning
- Technologies: Jetson Orin, ROS2, OpenCV, LiDAR, STM32F4, embedded C++, autonomous navigation

RFID-based Attendance Management System
2025

Educational Technology for Rural Bangladesh *Ongoing*

- Developing low-cost RFID attendance system for remote schools, villages, and universities in Bangladesh
- Creating offline-capable solution with synchronization features for areas with limited internet connectivity
- Research addresses educational infrastructure challenges in rural Bangladesh through accessible technology
- Technologies: RFID modules, ESP32, offline data storage, web-based dashboard, database synchronization

Technical Skills

Embedded Systems Engineering:
  Languages & Frameworks: Embedded C/C++, Rust, STM32 HAL, ESP-IDF, Embassy-rs, Embedded Linux
  Microcontrollers & Processors: STM32 (H7, H5, F4 Series), ESP32 (C3, C6, S3 series), Jetson Orin, RISC-V
  Real-Time Operating Systems: Zephyr RTOS (official contributor), FreeRTOS, CMSIS-RTOS
  Hardware Protocols: GPIO, I2C, SPI, UART, ADC, PWM, interrupt handling, DMA
  Communication & IoT: MQTT, Wi-Fi, BLE, LoRa, IoT protocols, power electronics, smart relays
  Development Tools: STM32CubeIDE, CMake, PlatformIO, ESP-IDF, KiCAD, OpenOCD, GDB, ROS2, OpenCV
Full-Stack Web Development:
  Languages & Frameworks: TypeScript, JavaScript, Python, C#, Dart, Kotlin
  Frontend Technologies: SvelteKit, Next.js, Flutter, Tailwind CSS, shadcn/ui
  Backend Technologies: .NET, Django, Express.js, SQL
  Cloud & Databases: Google Cloud Platform, MongoDB, Firebase
  Development Tools: Docker, Git, Linux, Vim, Bash

Selected Projects

Embedded Systems & IoT Projects

Smart Display System with Zephyr RTOS | *C, Zephyr RTOS, ESP32-S3, MQTT* demo video forthcoming
- Architected complete firmware stack on Zephyr RTOS for IoT-enabled multi-function display (date/time, stopwatch, scheduler, notifications)
- Developed and upstreamed HUB12 LED matrix driver with horizontal chaining support (PR #97921) - merged into Zephyr mainline
- Built secure OTA update system with RSA-signed binaries and TLS 1.3 MQTT communication
- Implemented RTC sync via SNTP, WiFi provisioning via captive portal AP, and custom font rendering engine
- Hardware: ESP32, HUB12 LED matrix, WiFi, mbedTLS stack

STM32 BME280 HAL Driver | *C, STM32, HAL* source code
- Custom HAL driver implementation for Bosch BME280 environmental sensor
- Provides temperature, humidity, and pressure readings with I2C communication
- Hardware: STM32, BME280 sensor, I2C interface

ESP32-S3 Weather Station | *C++, ESP32-S3, MQTT, Raspberry Pi 5* source code
- Comprehensive weather monitoring system with multi-sensor environmental data collection
- Features OLED display, MQTT connectivity for real-time data streaming
- Measures temperature, humidity, pressure, light intensity, and magnetic field with compass heading
- Hardware: BME280, BH1750, QMC5883L, SSD1306 OLED, WiFi connectivity

ESP32-S3 Biometric Attendance System | *C++, ESP32-S3, BLE* source code
- Portable biometric attendance tracking solution using fingerprint recognition
- Features offline storage with SPIFFS, Google Sheets integration for data sync
- BLE control interface and RGB LED feedback for secure attendance management
- Hardware: AS608 Fingerprint sensor, NeoPixel LEDs, WiFi/BLE connectivity

Autonomous Vehicle Navigation System | *ROS2, C++, Python, Jetson Orin* in development
- EEE department-funded autonomous car project with 5-member research team
- Implementing ROS2-based navigation stack with LiDAR sensor fusion and OpenCV computer vision
- Developing STM32F4-based vehicle control system for real-time actuator management
- Hardware: Jetson Orin, LiDAR sensors, STM32F4, camera modules, motor controllers

Educational Technology & Web Platforms

CAM-SUST Official Website | *NextJS, TypeScript, API Integration* live url
- Built the full-stack website for CAM-SUST from ground up replacing the old Wordpress website
- Migrated to modern technologies and implemented SSR/static rendering, reducing load times by 80%
- Redesigned from scratch for a more appropriate space-themed look, attracting more users

Opedemy Learning Platform | *SvelteKit, TypeScript, API Integration* live url
- Led frontend development for educational platform with 200+ API integrations (auth, payments)
- Optimized SSR/static rendering, reducing load times by 50% and improving SEO performance
- Designed responsive UI with Tailwind CSS, ensuring seamless cross-device usability

Teachers Today Recruitment Platform | *Next.js, Express.js, MongoDB* live url
- Full-stack teacher recruitment platform with advanced filtering and matching algorithms
- Integrated MongoDB for CRUD operations, SMS and Email API for notifications and updates
- Role-based dashboards for tutors, students, and administrators

HIAR Research Collaboration Platform | *SvelteKit, TypeScript, API Integration* live url
- Led SvelteKit-based frontend for academic research platform
- Integrated 100+ API endpoints with real-time collaboration
- Reduced design debt by 30% using shadcn/ui components

Technical Documentation

Official Zephyr RTOS Documentation 2025
Linux Foundation Zephyr Project - Board Support Documentation *Published*

- **Documentation Scope**: Authored comprehensive technical documentation for 8 board support packages serving global Zephyr developer community
- **Content Coverage**: Hardware specifications, pin mappings, peripheral configuration, programming guides, debugging instructions, and sample applications

STM32 Platform Documentation (3 Boards) *ARM Cortex-M Series*

- **WeAct STM32F446 Core**: docs.zephyrproject.org/latest/boards/weact/stm32f446_core/doc/index.html
- **WeAct STM32WB55 Core**: docs.zephyrproject.org/latest/boards/weact/stm32wb55_core/doc/index.html
- **WeAct STM32G030 Core**: docs.zephyrproject.org/latest/boards/weact/stm32g030_core/doc/index.html

ESP32 Platform Documentation (5 Boards) *RISC-V & Xtensa Architectures*

- **WeAct ESP32-S3-B**: docs.zephyrproject.org/latest/boards/weact/weact_esp32s3_b/doc/index.html
- **WeAct ESP32-S3-MINI**: docs.zephyrproject.org/latest/boards/weact/weact_esp32s3_mini/doc/index.html
- **WeAct ESP32-C3-Mini**: docs.zephyrproject.org/latest/boards/weact/weact_esp32c3_mini/doc/index.html
- **WeAct ESP32-C6-Mini**: docs.zephyrproject.org/latest/boards/weact/weact_esp32c6_mini/doc/index.html
- **DOIT ESP32 DevKit V1**: docs.zephyrproject.org/latest/boards/doit/esp32_devkit_v1/doc/index.html

ESP-IDF Component Documentation 2025
Espressif Component Registry - Official Component Documentation *Published*

- **Documentation Impact**: Created comprehensive API documentation and integration guides for IoT sensor and display components

TM1637 4-Digit 7-Segment Display Component *v1.0.1*

- Complete API documentation with code examples, brightness control, segment manipulation, and integration tutorials
- **Component URL**: components.espressif.com/components/heronet/tm1637

RD-03D mmWave Radar Sensor Component *v1.0.0*

- Comprehensive documentation including API reference, parameter explanations, and integration examples for radar applications
- **Component URL**: components.espressif.com/components/heronet/esp_rd-03d

Teaching & Mentorship Experience

Student Organization Leadership & Education 2024-2025
IT Secretary & Educational Content Developer *Copernicus Astronomical Memorial - SUST*

- Lead technical initiatives for 200+ member astronomy organization as elected IT Secretary
- Developed Python programming tutorials and computational astronomy educational content
- IT coordinator and Scientific Organizing Committee member of CAM-SUST Summer School on Astronomy 2025
- Organized technical workshops on programming applications in astronomical research and data analysis

Technical Recruitment 2024-2025
Software Engineering Interview *Hackules Inc.*

- Conducted technical interviews for software engineering positions, evaluating candidates on programming skills
- Mentored junior developers and interns in full-stack development technologies and best practices
- Designed technical assessment criteria for evaluating programming competency and problem-solving abilities

IT Coordinator & Programming Instructor 2021-2022
C Programming Language *Nirjhor Cantonment Public School & College*

- Appointed as IT Coordinator for for NCPSC IT Club responsible for technical education initiatives
- Designed and delivered C programming language curriculum to 50+ college students
- Mentored students in programming logic, debugging techniques, and software development best practices

Pre-University Technical Achievements

Multiple HackerRank Certifications
Technical Proficiency Certifications

2023
Industry Standard

- Earned certifications in React, Angular, C#, JavaScript, Java, and Python
- Validated technical skills through industry-standard assessment platform
- Demonstrates continuous learning and technical skill development

Champion - Inter Cantonment IT Festival
1st Place - Social Media & E-commerce Platform Development

2021
National Level

- Won first place for innovative social media and e-commerce platform among cantonment colleges nationwide
- Demonstrated early expertise in full-stack development and system architecture
- Recognized for technical innovation and presentation skills in competitive programming environment

Champion - Nirjhor Cantonment Public School & College Science Fest
1st Place - Social Media & E-commerce Platform

2021
Regional Competition

- Secured first position for comprehensive social media and e-commerce solution
- Showcased advanced web development skills and database integration capabilities
- Early recognition of full-stack development expertise that built foundation for current technical work

Third Place - Notre Dame Science Festival
Senior Projects Competition - Social Media Website Development

2021
Inter-College Competition

- Achieved 3rd place for social media website project among 200+ competing projects
- Demonstrated strong technical implementation and project presentation abilities
- Competitive recognition among Bangladesh's leading educational institutions

Future Academic & Research Plans

Graduate Studies: Pursuing Master's/PhD in Embedded Systems Engineering, Computer Engineering, or Electrical Engineering with focus on Real-Time Operating Systems, RISC-V processor design, and embedded Linux for IoT applications

Research Interests: RISC-V architecture optimization, RTOS kernel development, communication protocols, power electronics integration in IoT devices, and open-source hardware/software ecosystem advancement

Career Objectives: Seeking research opportunities in embedded systems design, processor development, and industrial IoT while contributing to open-source embedded systems communities

Industry Focus: Targeting automotive embedded systems, medical device development, aerospace applications, smart grid infrastructure, industrial IoT systems, and renewable energy solutions

Language Proficiencies

Native Language: Bengali (Native speaker)
Academic & Professional: English (Fluent - Advanced academic and technical communication)
Basic Communication: Hindi/Urdu (Conversational level)

References

Dr. Md. Rasedujjaman
Associate Professor - Department of Electrical & Electronic Engineering

Sylhet, Bangladesh
SUST

- Current Research Supervisor and Co-author on smart relay control systems and RFID research projects
- Email: mrased-eee@sust.edu
- Phone: +8801714557885
- Office: Department of EEE, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh
- Research Areas: Nonlinear optics, Photonic materials, Quantum optics
- Relationship: Direct research supervisor, co-author, and faculty mentor (March 2025 - Present)

Dr. Md. Enamul Hoque
Associate Professor - Department of Physics

Sylhet, Bangladesh
SUST

- Academic supervisor familiar with physics coursework performance and academic development
- Email: mjonyh-phy@sust.edu, mjonyh@gmail.com
- Phone: +8801719277759

- Office: Department of Physics, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh
- Research Areas: Nonlinear Optics, Ph.D. in Nonlinear Optics from SUST
- Relationship: Physics faculty member, project mentor, and academic advisor

Additional References   Available Upon Request
Professional and Academic References   *Contact Information Available*

- Professional references from software engineering leadership positions at Hackules Inc.
- Faculty advisors from CAM-SUST student organization leadership and educational program coordination
- Additional physics faculty members familiar with academic performance and research interests
- Complete reference information including contact details and recommendation letters available during application processes