Siratul Islam

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

Research Focus

Official Maintainer of the Zephyr RTOS Biometrics Subsystem, architecting security frameworks and device drivers for a global developer ecosystem. My research bridges Applied Physics and Systems Engineering, focusing on RTOS kernel development, autonomous navigation, and industrial IoT. I leverage cross-platform expertise in ARM, RISC-V, and Xtensa architectures to develop scalable, safety-critical solutions for medical and industrial applications.

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

Linux Foundation - Zephyr RTOS Project Remote
Biometrics Subsystem Maintainer, Zephyr Maintainers Team *Feb. 2026 – Present*

- Promoted to subsystem maintainer after authoring Zephyr's biometrics subsystem (PR #100139), the first biometric authentication framework in the RTOS, enabling fingerprint-based security for embedded applications
- Designed complete subsystem architecture including public API interfaces, device abstractions, driver framework, and Kconfig integration for biometric sensors
- Implemented reference drivers for ZFM-x0 & GT-5x optical fingerprint sensors with enrollment, verification, and template management
- Establish technical standards and review all community contributions to the biometrics subsystem
- Technologies: Zephyr RTOS, Embedded C, Subsystem Architecture, Device Drivers, Device Tree, Git

Contributor (Triage), Zephyr Contributors Team *Jun. 2025 – Present*

- Accepted into official Zephyr Contributors Team following 15+ merged PRs expanding hardware ecosystem across ARM, RISC-V, and Xtensa platforms
- Develop device drivers and board support packages serving 5000+ embedded developers globally
- Review community contributions and provide technical guidance on driver architecture and device tree bindings
- Maintain official documentation for display subsystems and 9+ board support packages in Zephyr upstream

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

Assistant General Secretary *Jan. 2026 – Present*

- Host Executive meetings
- Oversee all other sectors

IT Secretary *Nov. 2024 – Jan. 2026*

- 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 - Technical Contributions Github

17+ Merged Pull Requests - Driver Development & Board Support *Jun. 2025 – Present*

- **Contribution Breakdown**: 1 subsystem (biometrics), 9 board support packages, 3 board improvements, 3 display drivers (display & auxdisplay subsystem), 1 toolchain integration
- **Platform Coverage**: ARM Cortex-M (STM32F446, STM32WB55, STM32G030), RISC-V (ESP32-C3, ESP32-C6), Xtensa (ESP32-S3, ESP32)

Biometrics Subsystem *New Subsystem - Security & Authentication*

- **RFC: drivers: biometrics: Add driver subsystem, GT5x, and ZFM-X0 fingerprint sensor drivers (PR #100139)**: Authored complete biometrics subsystem from ground up - first biometric authentication framework in Zephyr RTOS

Display Driver Contributions *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
- **drivers: display: hub12: add horizontal chaining support (PR #98445)**: Enhanced HUB12 driver with horizontal chaining capability enabling scalable multi-panel LED matrix displays

Board Support: STM32 Platform *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 *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
- **boards: xtensa: add support for WEMOS LOLIN32 Lite (PR #100080)**: Compact ESP32 board with integrated battery charging (TP4054), 4MB flash, and CH340C USB-serial converter

Toolchain Integration *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

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 (PR #97921, #98445) with horizontal chaining support for scalable multi-panel displays - 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 2023

Technical Proficiency Certifications *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 2021

1st Place - Social Media & E-commerce Platform Development *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 2021

1st Place - Social Media & E-commerce Platform *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 2021

Senior Projects Competition - Social Media Website Development *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 Sylhet, Bangladesh
Associate Professor - Department of Electrical & Electronic Engineering *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 Sylhet, Bangladesh
Associate Professor - Department of Physics *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