# Siratul Islam

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## Research Focus

My work focuses on embedded systems and IoT technologies, leveraging Real-Time Operating Systems, embedded Linux development, RISC-V architecture, smart grid communication protocols, and power electronics. Transitioning from a physics foundation, I integrate full-stack web development skills for end-to-end IoT solutions, contribute to open-source ecosystems (e.g., Zephyr RTOS, ESP-IDF), and pursue undergraduate research in industry automation, power management while preparing for graduate studies in embedded systems engineering.

## 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*

- 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
- Contributing to autonomous vehicle development team for EEE department-funded project using Jetson Orin
- Working on ROS2-based navigation stack with LiDAR sensor fusion and OpenCV image processing
- Developing STM32F4-based vehicle control system for actuator management and real-time motor control
- Technologies: Jetson Orin, ROS2, OpenCV, LiDAR, STM32F4, embedded C++, sensor fusion, autonomous navigation

## 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

## Publications & Presentations

**Radar-based Occupancy Detection and Automated Relay System for Energy Saving** 2025

*Ongoing Research - Government Office Buildings Energy Management* *In Progress*

- Developing intelligent occupancy detection system using RD-03D mmWave radar sensor for automated lighting and HVAC control
- Implementing ESP32-based relay control with Google Sheets data logging for energy consumption analysis
- Research focuses on reducing energy waste in government buildings through presence-based automation
- Technologies: ESP32, RD-03D radar sensor, relay modules, Google Sheets API, ESP-IDF

**RFID-based Attendance Management System for Rural Educational Institutions** 2025

*Ongoing Research - Educational Technology for Remote Communities in Bangladesh* *In Progress*

- Developing low-cost RFID attendance system specifically designed 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

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

*ResearchGate Publication – University Physics Competition 2024 (Team 750, Problem A)* *Published*

- **Authors**: Siratul Islam, Ibrahim Hossain, Rimon Acharjee Sumon
- **Abstract**: A micrometeorite impact caused an air leak in a space station. Using Poiseuille's law and the Ideal Gas Law, we derived an equation to model air mass flow rate under the pressure difference and calculated evacuation time. For a 1 cm-diameter hole, pressure drop from 1 atm to 0.3 atm requires approximately 27,168 s ($\approx 7.597$ h).
- **Methodology**: Developed a mathematical model incorporating fluid flow and thermodynamic principles (Poiseuille's law and Ideal Gas Law), and visualized relationships between hole diameter and evacuation time through graphical analysis.
- **Recognition**: Awarded Bronze Medal for mathematical solution and presentation quality among international undergraduate physics teams.
- **Access**: Full-text available open access on ResearchGate.

## Open Source Contributions & Technical Leadership

**Linux Foundation Zephyr RTOS Project** Github

*Official Contributor - Multiple Merged Contributions* *2025 – Present*

- **Impact**: 4 merged pull requests serving 1000+ embedded developers globally with improved hardware support and expanded driver ecosystem
- **Technical Scope**: ARM Cortex-M4/Xtensa bring-up, KConfig systems, device tree programming, driver architecture, build system integration

*Board Support Contribution - WeAct STM32F446RET6* *PR #91886*

- Added complete board support with device tree, GPIO mappings, and peripheral initialization for STM32F446
- Enables Zephyr RTOS compatibility for popular ARM Cortex-M4 development board

*Board Support Contribution - WeAct ESP32-S3-B* *PR #96687*

- Added WeAct Studio ESP32-S3 board support with complete device tree and peripheral configuration
- Contribution includes GPIO mappings, WiFi/BLE support, and flash configuration for ESP32-S3 platform

*Driver Development - TM1637 Auxdisplay Subsystem* *PR #96510*

- Contributed TM1637 4-digit 7-segment display driver to official Zephyr auxdisplay subsystem
- Implemented complete driver with API for segment control, brightness adjustment, and display management

*Development Tools Enhancement - PyOCD & STM32CubeProgrammer* *PR #92985*

- Added PyOCD and STM32CubeProgrammer support for WeAct STM32F405/F446 boards
- Improved toolchain flexibility and debugging options for STM32 development workflow

**Espressif ESP-IDF Ecosystem** Espressif Component Registry

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

- Published production-ready components on official ESP Component Registry serving IoT developers globally
- Comprehensive documentation with integration examples and hardware abstraction layers

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

- ESP-IDF component for AI-Thinker RD-03D radar with intelligent filtering algorithms and real-time coordinate tracking
- Published on official registry with comprehensive API for target detection and positioning

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

- Display driver component with comprehensive API for display control, brightness management, and segment manipulation
- Enables integration of TM1637 displays in ESP32-based IoT projects

**STM32 HAL Ecosystem** Github

*Hardware Abstraction Layer Development* *2025 – Present*

- Developed custom HAL drivers for Bosch BME280 environmental sensor with optimized I2C communication
- Created portable sensor libraries enabling rapid prototyping for 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

## Technical Documentation

**Official Zephyr RTOS Documentation - WeAct STM32F446 Board Support** 2025

*Linux Foundation Zephyr Project - Official Project Documentation* *Published*

- **Board Documentation**: docs.zephyrproject.org/latest/boards/weact/stm32f446_core/doc/index.html
- Authored comprehensive documentation for WeAct STM32F446 including hardware specs, programming instructions, and sample applications
- Documentation serves 1000+ embedded systems developers globally using Zephyr RTOS with STM32 hardware and modern debugging tools

**Official Zephyr RTOS Documentation - WeAct ESP32-S3 Board Support** 2025

*Linux Foundation Zephyr Project - Official Project Documentation* *Published*

- **Board Documentation**: docs.zephyrproject.org/latest/boards/weact/weact_esp32s3_b/doc/index.html
- Authored comprehensive documentation for WeAct ESP32-S3 including hardware specs, WiFi/BLE configuration, and programming instructions
- Documentation serves embedded systems developers using Zephyr RTOS with ESP32-S3 hardware platform

**ESP-IDF Component Documentation - TM1637 Display Driver** 2025

*Espressif Component Registry - Official Component Documentation* *Published*

- **Component URL**: components.espressif.com/components/heronet/tm1637
- Created comprehensive API documentation and usage examples for TM1637 4-digit 7-segment display integration
- Documentation includes code examples, brightness control, segment manipulation, and integration tutorials

**ESP-IDF Component Documentation - RD-03D Radar Sensor** 2025

*Espressif Component Registry - Official Component Documentation* *Published*

- **Component URL**: components.espressif.com/components/heronet/esp_rd-03d
- Created comprehensive API documentation and usage examples for RD-03D mmWave radar sensor integration
- Documentation includes code examples, parameter explanations, and integration tutorials for IoT developers

## Selected Projects

### Embedded Systems & IoT Projects

**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 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

## 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 Official Contributor** 2025

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

- Achieved official contributor status with multiple merged pull requests (#91886, #92985) to upstream Zephyr project
- Contributions impact 1000+ embedded systems developers globally through improved hardware support
- Recognition from Linux Foundation for technical excellence in embedded systems development

**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

**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

## 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

## 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