

Atonu Ghosh

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Career Highlights

Patents (Granted)	3	Patents (Filed)	10
Patents Commercialized	1	Journal Articles	5
Journal Preprints	3	Conference Articles	3

Education

2021– **Ph.D., Computer Science & Engineering.**

Present: *Indian Institute of Technology, Kharagpur, India*

Supervisor: Prof. Sudip Misra

IoT, IIoT, Edge Computing, Low Power Networks, Condition Monitoring, Digital Transformation

2020–2018: **Master of Technology, Computer Science & Engineering.**

Maulana Abul Kalam Azad University of Technology (formerly WBUT), Nadia, West Bengal, India

CGPA: 8.93/10

Project on design and implementation of logging system using Ethereum blockchain and IPFS

2014–2017: **Bachelor of Technology, Computer Science & Engineering.**

Institute of Engineering and Management (IEM), Salt Lake, Kolkata, India

CGPA: 7.71/10

Project on implementation of a simple operating system accepting commands

Patents

Granted

- PG3 **Atonu Ghosh**, Biswajit Ghosh, Ruelia Saha, Sudip Misra, and Arijit Roy, System for Real Time Intrusion Detection, Actuation and Alert and Method Thereof, *Indian Patent*, Number – 566326, May 16, 2025.
- PG2 Subhas Chandra Misra, Debanjan Das, Sudip Misra, Venkanna Udutalapally, **Atonu Ghosh**, and Tanushree Pan, Wireless Network Device for Wireless Communication with User Devices in a Wireless Communication Network, *Indian Patent*, Number – 539308, May 27, 2024.
- PG1 Subhas Chandra Misra, Debanjan Das, Venkanna Udutalapally, Sudip Misra, and **Atonu Ghosh**, Blockchain-Enabled IoT System and Method for Securing Real Time Data In a Microcontroller-Based Blockchain Network, *Indian Patent*, Number – 529261, Mar 20, 2024.

Filed

- P10 Sudip Misra, **Atonu Ghosh**, Biswajit Ghosh, Swaraj Lahiri, Bharat Bhushan, Subrata Ray, and Sonali Pan, Embedded System and Method for Condition Monitoring of Electric Overhead Travelling (EOT) Cranes, *Indian Patent*, File No. – 202531033456, Apr 4, 2025.
- P9 Aparesh Mahapatra, Biswajit Ghosh, **Atonu Ghosh** Suryansh Sharma, Debayan Biswas, Sudip Misra, Partha Sarathi Ghoshal, and Manoj Kumar Tiwari, IoT-Enabled Smart Hardware System with Edge Intelligence for Rapid Leak Detection in Water Distribution Networks, *Indian Patent*, File No. – 202531028121, Mar 25, 2025.

- P8 **Atonu Ghosh** and Sudip Misra, LoRaNext: Embedded System and Method for Decentralized HTTP Communication Over LoRa, *Indian Patent*, File No. – 202531024600, Mar 19, 2025.
- P7 **Atonu Ghosh**, Sudip Misra, and Sharath Chandan, Long Range Multiple Input Multiple Output System for High Throughput Communication, *Indian Patent*, File No. – 202431094880, Dec 2, 2024.
- P6 Kumarjit Ray, **Atonu Ghosh**, Biswajit Ghosh, and Sudip Misra, Universal Software-Defined LoRa Gateway Based Network System for Remote Programming and Management of Network Functions, *Indian Patent*, File No. – 202431046371, Jun 15, 2024.
- P5 Ruelia Saha, **Atonu Ghosh**, and Sudip Misra, Confidant: An Internet of Things-Based System and Method for Mental Health Monitoring and Support, *Indian Patent*, File No. – 202431034007, Apr 29, 2024.
- P4 Biswajit Ghosh, **Atonu Ghosh**, and Sudip Misra, An Edge Intelligence Based Programmable Logic Controller, *Indian Patent*, File No. – 202431032957, Apr 25, 2024.
- P3 **Atonu Ghosh**, Sudip Misra, Arijit Roy, and Anandarup Mukherjee, A System for Remote Monitoring, Actuation and Data Prediction, *Indian Patent*, File No. – 202231040824, Jul 17, 2022.
- P2 Sudip Misra, Saswati Pal, and **Atonu Ghosh**, Modularized IoT-Based On-Demand Ambulatory Hospital Recommender System, *Indian Patent*, File No. – 202231008007, Feb 15, 2022.
- P1 Sudip Misra, Debanjan Das, Venkanna Udutalapally, **Atonu Ghosh**, and Pallav Kumar Deb, A Secured Edge-Based Automated Power Control and Communication System for Legacy IoT Infrastructures, *Indian Patent*, File No. – 202131038016, Aug 23, 2021.

Publications

Journal Articles

- J4 **Atonu Ghosh**, Sudip Misra, Venkanna Udutalapally, and Debanjan Das. Loraute: Routing messages in backhaul lora networks for underserved regions. *IEEE Internet of Things Journal*, volume 10, pages 19964–19971, 2023, DOI: <https://doi.org/10.1109/JIOT.2023.3281941>.
- J3 **Atonu Ghosh**, Sudip Misra, and Venkanna Udutalapally. Multiobjective optimization and sensor correlation framework for iot data validation. *IEEE Sensors Journal*, volume 22, pages 23581–23589, 2022, DOI: <https://doi.org/10.1109/JSEN.2022.3215993>.
- J2 **Atonu Ghosh**, Ruelia Saha, and Sudip Misra. Persistent service provisioning framework for iomt based emergency mobile healthcare units. *IEEE Journal of Biomedical and Health Informatics*, volume 26, pages 5851–5858, 2022, DOI: <https://doi.org/10.1109/JBHI.2022.3172624>.
- J1 **Atonu Ghosh**, Anandarup Mukherjee, and Sudip Misra. Sega: Secured edge gateway microservices architecture for iiot-based machine monitoring. *IEEE Transactions on Industrial Informatics*, volume 18, pages 1949–1956, 2021, DOI: <https://doi.org/10.1109/TII.2021.3102158>.

Communicated Journal Articles and Preprints

- P1 **Atonu Ghosh**, Akhilesh Mohanasundaram, Srishivanth R F, and Sudip Misra, TLoRa: Implementing TLS Over LoRa for Secure HTTP Communication in IoT, To be submitted to *IEEE Transactions on Network Science and Engineering*, 2025.
arXiv Preprint: <https://arxiv.org/abs/2510.02519>
- JR3 **Atonu Ghosh**, David Breuss, Simon Howind, Sudip Misra, Thilo Sauter, and Surjya Kanta Pal, SenseAI: Staged Model Deployment for Resource Constrained AIoT-Enabled Industrial Environments, In *IEEE Transactions on Artificial Intelligence*, Under Review, 2025.

- JR2 **Atonu Ghosh** and Sudip Misra, LoRaConnect: Unlocking HTTP Potential on LoRa Backbones for Remote Areas and Ad-Hoc Networks, In *IEEE Transactions on Network Science and Engineering*, Reject and Resubmit, 2025.
arXiv Preprint: <https://arxiv.org/abs/2501.02469>
- JR1 **Atonu Ghosh**, Sharath Chandan, and Sudip Misra, Implementing LoRa MIMO System for Internet of Things , In *IEEE Internet of Things Journal*, Reject and Resubmit, 2025.
arXiv Preprint: <https://arxiv.org/abs/2501.07148v1>
- [In Conference Proceedings](#)
- C3 **Atonu Ghosh**, Debashis De, and Koushik Majumder. A systematic review of log-based cloud forensics. In *Inventive Computation and Information Technologies (ICIT)*, pages 333–347. Springer, 2021, DOI: https://doi.org/10.1007/978-981-33-4305-4_26.
- C2 **Atonu Ghosh**, Koushik Majumder, and Debashis De. Android forensics using sleuth kit autopsy. In *International Conference on Mathematics and Computing (ICMC)*, pages 297–308. Springer, 2020, DOI: https://doi.org/10.1007/978-981-15-8061-1_24.
- C1 **Atonu Ghosh**. Intelligent appliances controller using raspberry pi. In *Information Technology, Electronics and Mobile Communication Conference (IEMCON)*, IEEE, pages 1–5. IEEE, 2016, DOI: <https://doi.org/10.1109/IEMCON.2016.7746253>.
- [Book Chapter](#)
- B1 **Atonu Ghosh**, Koushik Majumder, and Debashis De, A Systematic Review of Digital, Cloud and IoT Forensics, In *The “Essence” of Network Security: An End-to-End Panorama*, Springer, 2021. DOI: https://doi.org/10.1007/978-981-15-9317-8_2.

Work Experiences

- Jan 2021 – **Ph.D. Research Scholar, Indian Institute of Technology, Kharagpur.**
- Present Working under Prof. Sudip Misra on IoT, IIoT, Edge Computing, Low Power Networks, Condition Monitoring, and Digital Transformation.
- **EOT Crane Condition Monitoring at Tata Steel Downstream Products Limited**
Led a team of 4 to build a full-stack Condition Monitoring System for Electric Overhead Traveling Crane at Tata Steel Downstream Products Limited, Jamshedpur, Jharkhand, India – deployed in production.
Used Raspberry Pi 5, ESP32 Microcontroller, Micropython, Python, MQTT, Django, Bootstrap, Docker, PostgreSQL, Redis, Azure Virtual Server, and Grafana.
 - **Water Distribution Pipe Pressure Monitoring at Haldia Water Services Pvt. Ltd.**
Designed an IoT system for domestic water distribution pipe pressure monitoring for Haldia Water Services Pvt Ltd (HWSPL). The system was built as a part of the research project sponsored by the Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Housing and Urban Affairs, Government of India. The system periodically sent pressure readings to the cloud server, where it was stored in a database for further analysis by a separate team of researchers at IIT Kharagpur. The system could be configured remotely.
Used Pressure Sensor, ESP32, 4G Modem, 12V 20W Solar Panel, Rechargeable Battery, 30A Charge Controller, MQTT, AWS EC2.
 - **IoT Enablement of Legacy Sensors at Bokaro Steel Plant**
Led a team of 3 for Proof-of-Concept (PoC) implementation at Bokaro Steel Plant, Bokaro, Jharkhand, India, to retrofit 4-20 mA-based legacy gas sensors by Honeywell and fetch data to be sent over LoRaWAN to the central server.
Used ESP32 Microcontroller, Micropython, Python, RFM95W LoRa Transceiver, AWS.

- **Automate Ductile Iron Pipe Coating Thickness Measurement at Tata Steel**
Single-handedly implemented Proof-of-Concept (PoC) at Tata Steel Plant, Gokulpur, West Bengal, India (formerly Tata Metaliks) to retrofit a Siemens S7-1200 Programmable Logic Controller (PLC) and a hand-held coating thickness measurement gauge for an automated ductile iron pipe coating thickness measurement system. The system automatically performed measurements and pushed the data to a PLC register over the network. Used Raspberry Pi, Python, Alcometer Gauge, and Siemens S7-1200 PLC
- **Full TLS Handshake Over LoRa for Secure IoT**
Developed a transparent proxy that accepts HTTPS requests from a WiFi-enabled device, sends the request over LoRa backhaul, and the proxy device on the other end forwards requests to the remote web server. Establishes an end-to-end TLS handshake over LoRa. Used ESP32, RFM95W LoRa Transceiver, Raspberry Pi, Python, Nginx, TLS 1.3
- **LoRa MIMO Testbed**
Designed and implemented a 4x4 MIMO system for LoRa. It leverages spatial multiplexing to exchange data in parallel streams. Performed a thorough evaluation. Used ESP32, RFM95W LoRa Transceiver, Micropython.
- **Implemented HTTP Over LoRa**
Designed and implemented an application layer proxy to enable HTTP access over the LoRa channel. To address the payload limitations of LoRa, implemented a message chunking and reassembly method. For enhanced performance in the presence of interferences, implemented FHSS. Used ESP32, RFM95W LoRa Transceiver, Micropython.
- **Lightweight Blockchain on Microcontroller**
Implemented a lightweight blockchain framework on a resource-constrained microcontroller to achieve decentralized, tamper-proof logging and data exchange across IoT nodes without relying on cloud infrastructure. Used ESP32 and Micropython.
- **Live Ambulatory Patient Monitoring System**
Led a team of 3 for hardware and software development for an ambulatory patient monitoring device measuring ECG, BP, Body Temperature, and Pulse Rate. The device captured measurements, sent those to the local smartphone (with our Android application installed) over Bluetooth. The smartphone provides Local analysis and recommendations, along with relaying data to the cloud. Used ESP32, Sensors, Micropython, Docker, Django, REST API, ChartJS, Bootstrap.

Oct 2020 – **Research Fellowship, Indian Institute of Technology, Kharagpur.**

Dec 2023 **Senior Research Fellowship** (Oct 27, 2022 – Dec 31, 2023)

Junior Research Fellowship (Oct 22, 2020 – Oct 22, 2022)

Worked under Prof. Sudip Misra in the **Ministry of Electronics and Information Technology (MeitY), Government of India**, sponsored research project entitled *TribeConnect: Integrated Smart Tribal Eco-Platform – A Proof of Concept in Chhattisgarh*.

Project *TribeConnect* aimed at the upliftment and empowerment of the tribal community through the application of IoT and Machine Learning in the fields of agriculture and healthcare.

- **LoRa Network for Research Project Funded by MeitY, Government of India**
Designed and tested low-power LoRa IoT networks enabling reliable rural communication over kilometers as part of the research project.
Developed a hardware-based system to enable WiFi-enabled devices to exchange messages over LoRa backhaul.
Used ESP32, RFM95W LoRa Transceiver, Micropython.

- **IoT Gateway with Optional Electrical Load Controller**

Designed and implemented an IoT gateway with GSM backhaul to be deployed in the field. It collected data and transmitted it to a remote web server exposing an API. The gateway could also be attached with an optional power control device, enabling remote control of non-IoT devices in the field. The power control device supported multiple wireless protocols.

Used Raspberry Pi, Solid State Relay, ESP32 Microcontroller, GPS.

- **Live Server Management**

Was responsible for managing a live web server installed at IIT Kharagpur. Managed users, dockerized web applications and deployed on the server, managed reverse-proxy.

Used Ubuntu Server, Nginx, Docker, Django

- **Developed IoT Dashboard & Automatic Database Replication**

Developed a full-stack dashboard for the agricultural vertical of the project. Exposed APIs for the insertion and retrieval of data. Had also set up SQL database replication to prevent data loss due to connectivity issues.

Used Django, MariaDB, Bootstrap, and ChartJS.

Mar 2020 – **System Architect, *SensorDrops Networks Pvt. Ltd., Kharagpur.***

Oct 2025 Contributed voluntarily without pay to this startup founded by my Ph.D. supervisor.

- **Pet Immune Human Intruder Detection and Alert System**

Edge computing and Machine Learning (ML) based pet immune human intruder detection system for domestic and commercial spaces. Integrated seamlessly with existing CCTV DVRs, fetched live feed, analyzed, sent phone calls and SMSs along with raising local alarm and actuation.

Used Python, Django, YOLO, GSM Modem, Custom Circuit, ONVIF, and RTSP protocol.

- **Machine and Ambient Condition Monitoring System**

Redesigned the existing system to include electrical parameters along with vibration and temperature monitoring of electrical motors.

Modularized the system so that it can be used for other applications, such as Warehouse Condition Monitoring, with minimal changes.

Used Raspberry Pi, ESP32, Django, Python, InfluxDB, MQTT, Modbus

- **Smartphone Controller for Electrical Lights and Fans**

Managed a team of 3 to develop a system that connects with existing electrical wiring and enables the existing lights and fans to be controlled using a smartphone application.

Used ESP8266 Microcontroller, MicroPython, Custom PCB, Android, and UDP

Academic Achievements & Recognitions

2024 **Qualcomm Innovation Fellowship**, Finalist

2022 **Keynote Speaker**, Workshop on **Internet of Things**, Maryland Institute of Technology & Management, Jamshedpur, Jharkhand, India

2024 Invited to conduct lab sessions in a **Training Program on IoT**, at **IIT Patna, Bihar, India**

Instructor in Live/Hands-on Sessions

July, 2024 Security for Internet of Things and DevSecOps, **Tata NeuSkills**

April, 2024 Security for Internet of Things and DevSecOps, **Tata NeuSkills**

Jan, 2024	Short Term Course on Hands-on Introduction to Internet of Things with Machine Learning, IIT Kharagpur
Dec, 2023	Short Term Course on Hands-on Introduction to Internet of Things with Machine Learning, IIT Kharagpur
Dec, 2023	Security for Internet of Things and DevSecOps, Tata NeuSkills
Dec, 2023	Introduction to Cloud Computing, IIT Kharagpur
Jul, 2023	Short Term Course on Hands-on Introduction to Internet of Things with Machine Learning, IIT Kharagpur
April, 2023	Introduction to Cloud Computing, IIT Kharagpur

Experiences as Reviewer

Journals	Internet of Things , IEEE Scientific Reports , Springer Nature Journal of Computer Virology and Hacking Techniques , Springer Nature Software: Practice and Experience , Wiley
Books	Technical reviewer for books by Apress, Springer Nature. Title: Supply Chain Software Security: AI, IoT, and Application Security. Title: Biotech and IoT: An Introduction Using Cloud-Driven Labs. Title: Emerging Technologies in Healthcare 4.0. Title: Unmanned Aerial Vehicles Swarm for Protecting Smart Cities. Title: Blockchain, IoT, and AI Technologies for Supply Chain Management. Title: IoT System Testing. Title: Build Your Own IoT Platform.

NPTEL Teaching Assistantship

The National Programme on Technology Enhanced Learning (NPTEL) — a joint initiative of the Ministry of Human Resource Development, Government of India, seven IITs, and IISc Bangalore (launched 2003) — provides open-access, high-quality courses from IIT faculty to learners across India.

July – Oct, 2025	Introduction to Internet of Things, Prof. Sudip Misra, IIT Kharagpur.
Jan – Aril, 2025	Introduction to Internet of Things, Prof. Sudip Misra, IIT Kharagpur.
July – Oct, 2024	Introduction to Internet of Things, Prof. Sudip Misra, IIT Kharagpur.
Jan – Aril, 2024	Introduction to Internet of Things, Prof. Sudip Misra, IIT Kharagpur.
July – Oct, 2023	Introduction to Internet of Things, Prof. Sudip Misra, IIT Kharagpur.
Jan – Aril, 2023	Introduction to Internet of Things, Prof. Sudip Misra, IIT Kharagpur.

Institute Teaching Assistantship

Spring, 2025 – 2026	Computer Networks Laboratory, Prof. Sandip Chakraborty, IIT Kharagpur.
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Autumn, 2024 – 2025 Programming and Data Structures, Prof. Sudip Misra, IIT Kharagpur.

Spring, 2024 – 2025 Programming and Data Structures, Prof. Sudip Misra, IIT Kharagpur.

Autumn, 2023 – 2024 Programming and Data Structures, Prof. Sudip Misra, IIT Kharagpur.

Spring, 2023 – 2024 Programming and Data Structures, Prof. Sudip Misra, IIT Kharagpur.

Autumn, 2022 – 2023 Ubiquitous Computing, Prof. Sudip Misra, IIT Kharagpur.

Spring, 2022 – 2023 Computer Networks Laboratory and Programming & Data Structures, Prof. Sudip Misra, IIT Kharagpur.

Autumn, 2021 – 2022 Programming and Data Structures, Prof. Sudip Misra, IIT Kharagpur.

Spring, 2021 – 2022 Computer Networks Laboratory, Prof. Sudip Misra, IIT Kharagpur.

Skills

IoT Hardware Raspberry Pi, Microcontrollers (ESP32, ESP8266, Raspberry Pi Pico, 8051), LoRa Transceivers, Sensors, Actuators, Discrete Components

Programming Languages Python, Micropython, C

Web & Cloud Django, Docker, Nginx, REST API, Apache, HTML, CSS, JavaScript, PHP, AWS, Google Cloud, Azure, OpenStack, and Digital Ocean

Database SQL, MySQL, PostgreSQL, MariaDB, InfluxDB, SQLite, Redis

Tools GitHub, Wireshark, Altium Designer, Fusion 360, Proteus, and Keil μ Vision

Miscellaneous Mentoring B.Tech., M.Tech., and Ph.D. Students, Project & Lab Management, Academic Research, Consulting Projects, Project Proposal Writing

Position of Responsibility

2022-2023 **Secretary of IEEE Student Branch**, IIT Kharagpur.