DR. PALLAV KUMAR DEB (PH.D.)

(+91)8436942458 ⋄ pallv.deb@gmail.com (personal)
Lead Research Engineer, FT RPD SSP DAE - IN
Siemens Technology and Services Pvt. Ltd.

WORK EXPERIENCE

Siemens Technology and Services Pvt. Ltd. Jan 2022 – Present
Lead Research Engineer

· IoT & Edge computing

Samsung Research Institute Sep 2021 – Dec 2021
Internship

· Digital Twin

National Programme on Technology Enhanced Learning (NPTEL) Jun 2020 – 2021
Teaching Assistant

· Introduction to Internet of Things (by Prof. Sudip Misra)

SensorDrops Networks Pvt. Ltd., Kharagpur Dec 2018 – 2021
R&D Consultant

· Developed multiple Internet of Things (IoT) devices dedicated towards addressing basic societal as well as industrial needs.
· Developed multiple Android applications for interacting with the IoT devices and also for other activities, such as sensing and actuating.
· Worked closely with the founders during the creation of SensorDrops Networks Pvt. Ltd.

Indian Institute of Technology, Kharagpur Jun 2017 – Nov 2021
Teaching Assistant

· Programming and Data Structures Lab
· Software Engineering
· Architecture and Protocols for Internet of Things
· Cloud computing

Tezpur University Jun 2015 – Jun 2017
Teaching Assistant

· Information and Communication Technology
· Introductory Computing
· Computer Graphics
· Computer Organization and Architecture

West Coast Frozen Foods Pvt. Ltd., Mumbai Jul 2014 – Dec 2014
In-house Software Developer

· Assisted in creation of websites.
· Developed smart inventory system for incoming and outgoing packages.

EDUCATION

Indian Institute of Technology, Kharagpur *August 2017 - Nov 2021*
Doctor of Philosophy
Department of Computer Science & Engineering

Tezpur University *August 2015 - August 2017*
Master of Technology CGPA: 9.08
Information Technology

Royal Group of Institutes, Gauhati University *August 2010 - August 2014*
Bachelor of Engineering Overall Percentage: 74.39
Department of Computer Science & Engineering

RESEARCH INTERESTS

Thesis topic: Resource Orchestration in Constrained IoT environments.

Interests (but not limited to): Networking, resource allocation, fog computing, constrained devices, AI/ML-based solutions, Internet of Things, UAVs, Swarm of UAVs, e-health, THz communications, nano-networks.

MAJOR PROJECTS

Driving Research Topics 2022 – Present

I drive research initiatives in edge computing, with a particular emphasis on code portability across heterogeneous environments. My earlier work focused on Function-as-a-Service (FaaS) architectures, while my current efforts center around WebAssembly (WASM) and its orchestration within Kubernetes. I am currently developing a lightweight federated shim using WAMR (WebAssembly Micro Runtime) to onboard highly constrained devices such as microcontrollers into the Kubernetes ecosystem, enabling seamless participation in modern cloud-native workflows. Additionally, the solution is targetted for operating systems like Zephyr (RTOS), Linux, Windows, and others.

SITRANS hub IQ 2024 – Present

In parallel with my research, I work as a contractual backend developer (Python and JavaScript) on SITRANS hub IQa fleet management solution for Siemens and third-party sensors. I collaborate closely with cross-functional teams to implement core backend features such as database connectivity, over-the-air firmware updates, and service integrations. Beyond coding, I frequently step into architectural discussions, contributing to design decisions and helping align the system's technical direction. This role has strengthened my ability to work effectively in diverse teams, communicate across disciplines, and contribute to building scalable, reliable backend systems in a collaborative environment.

AI4Safety 2023 – 2024

An AI-driven worker compliance monitoring system deployed in a factory in AurangabadI collaborated with the vision team, who developed the object detection model, to integrate scene understanding into a broader compliance framework. I designed and implemented a Java-based rule engine with both temporal and non-temporal logic to evaluate safety violations based on detected objects. The system triggered real-time alerts such as hooters and sent automated email notifications via AWS SNS. Additionally, I set up a secure reverse proxy tunnel using an AWS EC2 instance to enable remote access to the on-premise server in Aurangabad from Bangalore.

Public Transport Integration for Comfy App 2022 – 2023

Spearheaded the development of a real-time public transport component within the Comfy app, integrating both bus and train data by consuming official German government APIs. Ensured seamless user experience through efficient data parsing, caching mechanisms, and responsive UI integration. Leveraged real-time data on vehicle arrivals to conceptualize and drafted innovative patent applications, focusing on smart fleet coordination and dynamic routing strategies derived from live transport patterns.

SkopEdge: A Smart Digital Stethoscope 2019 – 2021

In this work, we developed a low-cost and easy-to-use IoT-based digital stethoscope (using Raspberry Pi) that records heart sounds and automatically counts the number of heartbeats. Due to changing network conditions, the stethoscope changes the quality of the audio files and sends it to remote locations. The results are then made available for analysis by remote doctors along with a visualization for the same. This work has been accepted for presentation at the IEEE International Conference on Communications (ICC) 2020, in Dublin, Ireland. The project is backed by IoT-based protocols such as MQTT (initially we used WebSockets) and is fully dockerized (Django, PostgreSQL, and MongoDB). It is also the recepient of the *Honorary Mention* in the prestigious IEEE ComSoc Student Competition 2020.

IndustryEdge: An IoT-Based Temperature & Humidity Monitor 2020 – 2021

In this work, we developed an IoT-based temperature and humidity monitor for industrial spaces. We developed this using off-the-shelf low-cost devices such as NodeMCUs and Raspberry Pi. This is backed up by deployments over the cloud using Amazon EC2 for real-time monitoring.IndustryEdge has the potential to detect emergencies and informs the concerned personnel using SMS and mailing services. This work has been procured by Ceratizit (West Bengal division), India, a manufacturer of hard material products for wear protection and cutting tools. TCS has also procured a similar project from us.

TECHNICAL STRENGTHS (8+ YEARS IN IOT)

Edge Computing	WebAssembly (WASM), AWS, OpenFaaS, LLMs
Programming	Python, Java, JavaScript, Rust, C
Software & Tools	MS Office, Latex, Docker, Kubernetes, OpenFaaS, Grafana, Prometheus, Selenium
Databases	MySQL, PostgreSQL, InfluxDB, MongoDB, DynamoDB
Hardwares	Raspberry Pi (3B+, 4, Zero), NodeMCU, Arduino
Operating Systems	Linux, Windows

TEACHING ASSISTANTSHIPS

National Programme on Technology Enhanced Learning (NPTEL) 2020 – 2021

- Introduction to Internet of Things

Indian Institute of Technology, Kharagpur 2017 – 2021

- Introduction to Internet of Things
- Cloud Computing
- Software Engineering
- Programming and Data Structures Lab

Tezpur University Jun 2015 – Jun 2017

- Information and Communication Technology
- Introductory Computing
- Computer Graphics
- Computer Organization and Architecture

WORKSHOPS AND TALKS

Guest Lecture March 2025
Tezpur University

Invited talk on *Introduction to Edge Computing and WebAssembly.*

4^{th} **International Conference on Smart Systems: Innovations in Computing** Oct 2023
Manipal University, Jaipur

Invited as Keynote Speaker.

Guest Lecture: Online Mode Dec 2021
IIIT-NR

Invited talk on *Introduction to Research and Student Interaction.*

Guest Lecture: Online Mode June 2020
Jorhat Engineering College

Invited talk on *Introduction to Fog Computing.*

SGRIP-Sponsored Short Term Course on Modern Wireless Networks and IoT October 2019
IIT Kharagpur

Hands-on Session on IoT devices and Android programming.

PUBLICATIONS

JOURNALS

1. R. Ajmeria, M. Mondal, R. Banerjee, T. Halder, **P. K. Deb**, D. Mishra, P. Nayak, S. Misra, S. K. Pal, and D. Chakravarty, "A Critical Survey of EEG-based BCI Systems for Applications in Industrial Internet of Things", in ***IEEE Communications Surveys & Tutorials***, 2023, doi: 10.1109/COMST.2022.3232576.
2. **P. K. Deb**, A. Mukherjee, D. Singh and S. Misra, "Loop-the-Loops: Fragmented Learning Over Networks for Constrained IoT Devices," *in* ***IEEE Transactions on Parallel and Distributed Systems***, 2022, doi: 10.1109/TPDS.2022.3220221.
3. R. Saha, S. Misra, A. Chakraborty, C. Chatterjee and **P. K. Deb**, "Data-Centric Client Selection for Federated Learning over Distributed Edge Networks," *in* ***IEEE Transactions on Parallel and Distributed Systems***, 2022, doi: 10.1109/TPDS.2022.3217271.
4. R. Tapwal, **P. K. Deb**, S. Misra and S. K. Pal, "Traces: Inkling Blockchain for Distributed Storage in Constrained IIoT Environments," *in* ***IEEE Transactions on Industrial Informatics***, 2022, doi: 10.1109/TII.2022.3208311.
5. R. Tapwal, S. Misra and **P. K. Deb**, "i-Sheet: A Low-Cost Bedsheet Sensor for Remote Diagnosis of Isolated Individuals," *in* ***IEEE Sensors Journal***, 2022, doi: 10.1109/JSEN.2022.3198140.

6. R. Tapwal, **P. K. Deb**, S. Misra and S. K. Pal, "Shadows: Blockchain Virtualization for Interoperable Computations in IIoT Environments," *in* ***IEEE Transactions on Computers***, 2022, doi: 10.1109/TC.2022.3184271.

7. **P. K. Deb**, A. Mukherjee and S. Misra,"CEaaS: Constrained Encryption as a Service in Fog-Enabled IoT," in ***IEEE Internet of Things Journal***, vol. 9, no. 20, pp. 19803-19810, 15 Oct.15, 2022, doi: 10.1109/JIOT.2022.3167832.

8. A. Mukherjee, **P. K. Deb**, and S. Misra, "Tremors: Privacy-breaching Inference of Computing Tasks using Vibration-based Condition Monitors" *in* ***Transactions on Computers.***

9. **P. K. Deb**, A. Mondal, and S. Misra, "AuGrid: Edge-Enabled Distributed Load Management for Smart Grid Service Providers" *in* ***IEEE Transactions on Green Communications and Networking.***

10. A. Mukherjee, **P. K. Deb**, and S. Misra, "Timed Loops for Distributed Storage in Wireless Networks" *in* ***IEEE Transactions on Parallel and Distributed Systems.***

11. **P. K. Deb**, A. Mukherjee, and S. Misra, "XiA: Send-it-Anyway Q-Routing for 6G-Enabled UAV-LEO Communications", *in* ***IEEE Transactions on Network Science and Engineering.***

12. **P. K. Deb**, S. Misra, and A. Mukherjee, "Latency-Aware Horizontal Computation Offloading for Parallel Processing in Fog-Enabled IoT" *in* ***IEEE Systems Journal.***

13. S. Misra, A. Mukherjee, and **P. K. Deb**, "Channel Modeling of IoT Phantom Networks: Communications in the THz Band." *in* ***Transactions of the Indian National Academy of Engineering.***

14. N. Pathak, **P. K. Deb**, A. Mukherjee and S. Misra, "IoT-to-the-Rescue: A Survey of IoT Solutions for COVID-19-like Pandemics," *in* ***IEEE Internet of Things Journal***.

15. S. Misra, **P. K. Deb**, N. Koppala, A. Mukherjee and S. Mao, "S-Nav: Safety-Aware IoT Navigation Tool for Avoiding COVID-19 Hotspots", *in* ***IEEE Internet of Things Journal***.

16. S. Misra, S. P. Rachuri, **P. K. Deb** and A. Mukherjee, "Multi-Armed Bandit-based Decentralized Computation Offloading in Fog-Enabled IoT," *in* ***IEEE Internet of Things Journal***.

17. **P. K. Deb**, S. Misra, T. Sarkar and A. Mukherjee, "Magnum: A Distributed Framework for Enabling Transfer Learning in B5G-Enabled Industrial-IoT," *in* ***IEEE Transactions on Industrial Informatics***.

18. R. Saha, S. Misra and **P. K. Deb**, "FogFL: Fog Assisted Federated Learning for Resource-Constrained IoT Devices," *in* ***IEEE Internet of Things Journal***.

19. **P. K. Deb**, C. Roy, A. Roy and S. Misra, "DEFT: Decentralized Multiuser Computation Offloading in a Fog-Enabled IoV Environment", *in* ***IEEE Transactions on Vehicular Technology***.

CONFERENCES

1. **P. K. Deb** and H. K. Singh, "Function-as-a-Service on Edge for Industrial Digitalization: An Off-The-Shelf Case Study", 12^{th} ***International Workshop on Service Oriented, Holonic and Multi-Agent Manufacturing Systems for Industry of the Future***, Bucharest, Romania, 2022

2. S. Misra, **P. K. Deb**, and K. Saini, "Dynamic Leader Selection in a Master-Slave Architecture-Based Micro UAV Swarm", ***IEEE Global Communications Conference (GLOBECOM)***, Madrid, Spain, 2021

3. S. Misra, **P. K. Deb**, N. Pathak and A. Mukherjee, "Blockchain-Enabled SDN for Securing Fog-Based Resource-Constrained IoT", ***IEEE INFOCOM Workshop***, Toronto, Canada, July 6-9 2020.

4. **P. K. Deb**, S. Misra, A. Mukherjee and A. Jamalipour, "SkopEdge: A Traffic-Aware Edge-Based Remote Auscultation Monitor", ***IEEE International Conference on Communications (ICC)*** 2020, Dublin, Ireland, June 7-11, 2020.

MAGAZINES

1. **P. K. Deb**, A. Mukherjee and S. Misra, "Fido: A String-Based Fuzzy Logic Mechanism for Content Extraction from UAV Data Lakes", ***IEEE IoT Magazine***

2. **P. K. Deb**, S. Misra, A. Mukherjee and S. Shaw, "Eaves: An IoT-Based Acoustic Social Distancing Assistant for Pandemic-Like Situations", ***IEEE IoT Magazine***

3. **P. K. Deb**, A. Mukherjee and S. Misra, "CovChain: Blockchain-Enabled Identity Preservation and Anti-Infodemics for COVID-19", ***IEEE Network Magazine***

BOOK CHAPTERS

1. **P. K. Deb**, S. Misra, A. Mukherjee and A. Bandyopadhyay, "Containing the Spread of COVID-19 with IoT: A Visual Tracing Approach", **Computational Modelling and Data Analysis in COVID-19 Research**, CRC Press, USA.

PATENTS

1. S. C. Misra, D. Das, V. Udutalapally, V. Kotiyal, and **P. K. Deb**, "Paridhi: An Edge-based Autonomous Student Conduct-cum- Screening Regulatory System", India, 2021.

2. S. Misra, D. Das, V. Udutalapally, A. Ghosh, and **P. K. Deb**, "MDHYM: A secured Edge-based automated power control and communication system for legacy IoT infrastructures", India, 2021.

3. 10+ ID applications filed in Siemens and awaiting grant decisions.

ACHIEVEMENTS

1. First place in Innovathon Aavishkar 2025 in the theme Industrial AI and Digital Twin.

2. Technical Excellence award from Siemens Advanta Measuring Intelligence (MI) in 2025.

3. Inner Circle Collaborator of the year 2024 in Inventor of the Year event in Siemens.

4. ID Champion in Siemens for submitting the highest number of patents from a business unit.

5. Secured national rank in GATE 2015 for securing admission into M.Tech.

6. Received a ***Honorary Mention*** in the 2020 IEEE Communications Society Student Project Competition "*Communications Technology Changing the World*".

7. Received two ***Honorary Mentions*** in the 2021 IEEE Communications Society Student Project Competition "*Communications Technology Changing the World*".

ACADEMIC REFEREE SERVICE

IEEE	IEEE Transactions on Vehicular Technology
IEEE	IEEE Transactions on Mobile Computing
IEEE	IEEE Transactions on Industrial Informatics
IEEE	IEEE Internet of Things Journal
IEEE	IEEE Systems Journal
IEEE	IEEE Journal on Selected Areas of Communications
IEEE	IEEE Internet of Things Magazine
IEEE	IEEE International Conference on Communications
IEEE	IEEE International IOT, Electronics, and Mechatronics Conference
Springer	Springer Nature Scientific Reports

EXTRA-CIRRUCULAR

Badminton enthusiast.

Co-Organized Counter Strike 2013 - a gaming event in Royal Group of Institutions.

Ranked 1660 in NIIT 8^{th} national aptitude test.

Secured second position in movie making competition 2015 at Tezpur University.

Secured first position in movie making competition 2016 at Tezpur University.

Might find me pretending to play the guitar sometimes.

PERSONAL TRAITS

Highly motivated and eager to learn new things.

Strong motivational and leadership skills.

Ability to work as an individual as well as in group.