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Saint Louis, MO 63132, USA

RESEARCH AND PROFESSIONAL EXPERIENCE

- **Donald Danforth Plant Science Center** [🌐] December 2022 – Present
Engineering Research Scientist Saint Louis, United States
 - **FieldDock** [fielddock.org]: An Integrated Smart Farm Platform for Real-Time Agronomic Optimization and Accelerated Crop Breeding.
 - * **Responsibilities:** Project Leader, API design, edge computing, drone landing, GWAS integration
 - * **Skills:** django, Docker, GWAS, middleware, sensors networks, and UAV
 - **SoftFarmNet** [refer C.7]: Reconfigurable Wi-Fi HaLow Networks for Precision Agriculture.
 - * **Responsibilities:** Prototype development and data collection
 - * **Skills:** Wi-Fi HaLow, Arduino, C Programming
 - **SubeterraAI** [[GitHub](https://github.com)]: A Software Platform for Automating Image-Based Root Phenotyping with Non-Invasive Data Collection.
 - * **Responsibilities:** Project Leader, API creation, model development
 - * **Skills:** django, Neural Networks, pytorch
- **Indian Institute of Technology, Kharagpur** [🌐] August 2019 – August 2021
Research Associate Kharagpur, India
 - **Unified Software-Defined Architecture for Industrial Internet of Things**
 - * **Responsibilities:** Project leader, Implementation of SD-IoT network
 - * **Skills:** Dell EMC switch, Open vSwitch, Raspberry Pi
- **North-Eastern Hill University, Shillong** [🌐] November 2015 – August 2019
Project Scientist Shillong, India
 - **WiLD-Net** [refer J.30]: QoS Provisioning in Internet of Things (IoT)
 - * **Responsibilities:** Project leader, Implementation of 6LoWPAN-based IoT networks, Remote agricultural IoT
 - * **Skills:** C Programming, Raspberry Pi, Contiki OS
- **North-Eastern Hill University, Shillong** [🌐] August 2013 – January 2015
Junior Research Fellow Shillong, India
 - **QoS Provisioning in WiFi-based Long Distance Wireless Networks for Hilly Terrain Areas**
 - * **Responsibilities:** Implementation of long distance Wi-Fi networks
 - * **Skills:** Atheros Wi-Fi driver, C Programming, Network Simulator 2

EDUCATION AND TRAINING

- **Dartmouth College** [🌐] January 2022 – December 2022
Postdoctoral Scholar Hanover, United States
 - **Security and Privacy in the Lifecycle of IoT for Consumer Environments**
- **Indian Institute of Science** [🌐] September 2021 – December 2021
Postdoctoral Fellow Bangalore, India
 - **Designing SDN-enabled intent-driven network architecture.**
- **North-Eastern Hill University** [🌐] August 2016 – August 2020
Doctor of Philosophy (Ph.D.) Shillong, India
 - **Thesis:** Designing IEEE 802.11ah-based scalable network architecture for Internet of Things.
- **North-Eastern Hill University** [🌐] July 2014 – August 2016
Master of Technology Shillong, India
 - **Thesis:** Designing a MAC protocol for Internet of Things (IoT).
 - **GPA:** 7.9/10
- **North-Eastern Hill University** [🌐] June 2009 – August 2013
Bachelor of Technology Shillong, India
 - **GPA:** 6.5/9

Journal Articles

- [J.1] M. Alam, N. **Ahmed**, R. Matam, and F. A. Barbhuiya, "Analyzing the suitability of IEEE 802.11ah for next generation Internet of Things: A comparative study," *Ad Hoc Networks*, vol. 156, p. 103437, 2024. [Online]. Available: <https://doi.org/10.1016/j.adhoc.2024.103437>
- [J.2] B. Gano, N. **Ahmed**, and N. Shakoor, "Drone-based imaging sensors, techniques, and applications in plant phenotyping for crop breeding: A comprehensive review," *The Plant Phenome Journal*, vol. 7, no. 1, e20100, 2024. [Online]. Available: <https://doi.org/10.1002/ppj2.20100>
- [J.3] M. Alam, N. **Ahmed**, R. Matam, and F. A. Barbhuiya, "OptiFog: A Framework for Acquiring State Information and Predicting Resource Availability for Task Offloading in Cooperative Fog-Networks," *IEEE Transactions on Services Computing*, 2024. [Online]. Available: <https://doi.org/10.1109/TSC.2024.3414371>
- [J.4] L. C. Thungon, N. **Ahmed**, D. De, and M. I. Hussain, "A Survey on 6LoWPAN Security for IoT: Taxonomy, Architecture, and Future Directions," *Wireless Personal Communications*, vol. 137, no. 1, pp. 153–197, 2024. [Online]. Available: <https://doi.org/10.1007/s11277-024-11382-y>
- [J.5] S. Misra, S. Pal, N. **Ahmed**, and A. Mukherjee, "SDN-Controlled Resource-Tailored Analytics for Healthcare IoT System," *IEEE Systems Journal*, 2023. [Online]. Available: <https://doi.org/10.1109/JSYST.2023.3245816>
- [J.6] M. A. Mondal, N. **Ahmed**, and M. I. Hussain, "IoT-MAC: A Channel Access Mechanism for IoT Smart Environment," *Array*, vol. 18, p. 100285, 2023. [Online]. Available: <https://doi.org/10.1016/j.array.2023.100285>
- [J.7] N. **Ahmed** and M. I. Hussain, "A QoS-aware scheduling with node grouping for IEEE 802.11ah," *Wireless Networks*, vol. 29, no. 4, pp. 1799–1814, 2023. [Online]. Available: <https://doi.org/10.1007/s11276-022-03206-3>
- [J.8] M. Alam, N. **Ahmed**, R. Matam, M. Mukherjee, and F. A. Barbhuiya, "SDN-based re-configurable edge network architecture for industrial Internet of Things," *IEEE Internet of Things Journal*, 2023. [Online]. Available: <https://doi.org/10.1109/JIOT.2023.3268375>
- [J.9] R. K. Das, N. **Ahmed**, A. K. Maji, and G. Saha, "Edge Controller-Assisted SDN Architecture for Internet of Things," *IEEE Sensors Journal*, 2023. [Online]. Available: <https://doi.org/10.1109/JSEN.2023.3317841>
- [J.10] N. **Ahmed**, M. Alam, R. Matam, F. A. Barbhuiya, and M. Mukherjee, "Pro-Edge: A Programmable Edge Network Architecture for Industrial Internet of Things," *IEEE Preprints*, 2023. [Online]. Available: <https://doi.org/10.36227/techrxiv.16885003.v1>
- [J.11] M. Alam, N. **Ahmed**, R. Matam, and F. A. Barbhuiya, "IEEE 802.11ah-Enabled Internet of Drone Architecture," *IEEE Internet of Things Magazine*, vol. 5, no. 1, pp. 174–178, 2022. [Online]. Available: <https://doi.org/10.1109/IOTM.005.2100099>
- [J.12] K. Medhi, N. **Ahmed**, and M. I. Hussain, "Dew-based offline computing architecture for healthcare IoT," *ICT Express*, vol. 8, no. 3, pp. 371–378, 2022. [Online]. Available: <https://doi.org/10.1016/j.ict.2021.09.005>
- [J.13] A. Shukla, N. **Ahmed**, A. Roy, and S. C. Misra, "Softwarized management of 6G network for green Internet of Things," *Computer Communications*, 2022. [Online]. Available: <https://doi.org/10.1016/j.comcom.2022.01.018>
- [J.14] F. Gazi, N. **Ahmed**, S. Misra, and W. Wei, "Reinforcement learning-based MAC protocol for underwater multimedia sensor networks," *ACM Transactions on Sensor Networks (TOSN)*, vol. 18, no. 3, pp. 1–25, 2022. [Online]. Available: <https://doi.org/10.1145/3484201>
- [J.15] F. Gazi, N. **Ahmed**, S. Misra, and M. K. Tiwari, "ProStream: Programmable underwater IoT network for multimedia streaming," *IEEE Internet of Things Journal*, vol. 9, no. 18, pp. 17417–17424, 2022. [Online]. Available: <https://doi.org/10.1109/JIOT.2022.3159404>
- [J.16] F. Gazi, N. **Ahmed**, and S. Misra, "RE-MAC: A Hybrid MAC Protocol for Underwater Multimedia Communication System," *IEEE Systems Journal*, vol. 17, no. 1, pp. 840–847, 2022. [Online]. Available: <https://doi.org/10.1109/JSYST.2022.3185015>
- [J.17] R. K. Das, N. **Ahmed**, A. K. Maji, and G. Saha, "Nx-IoT: Improvement of conventional IoT Framework by incorporating SDN Infrastructure," *IEEE Internet of Things Journal*, 2022. [Online]. Available: <https://doi.org/10.1109/JIOT.2022.3215650>
- [J.18] N. **Ahmed** and M. I. Hussain, "Scalable Internet of Things Network Design Using Multi-hop IEEE 802.11ah," *Telecommunication Systems*, vol. 78, no. 4, pp. 577–588, 2021. [Online]. Available: <https://doi.org/10.1007/s11235-021-00832-8>
- [J.19] N. **Ahmed** and S. Misra, "Collaborative Flow-Identification Mechanism for Software-Defined Internet of Things," *IEEE Internet of Things Journal*, 2021. [Online]. Available: <https://doi.org/10.1109/JIOT.2021.3099822>

- [J.20] N. **Ahmed**, D. De, F. A. Barbhuiya, and M. I. Hussain, "MAC protocols for IEEE 802.11ah-based Internet of Things: A Survey," *IEEE Internet of Things Journal*, vol. 9, no. 2, pp. 916–938, 2021. [Online]. Available: <https://doi.org/10.1109/JIOT.2021.3104388>
- [J.21] S. Nayak, N. **Ahmed**, and S. Misra, "Deep learning-based reliable routing attack detection mechanism for industrial Internet of Things," *Ad Hoc Networks*, vol. 123, p. 102661, 2021. [Online]. Available: <https://doi.org/10.1016/j.adhoc.2021.102661>
- [J.22] M. Hussain, N. **Ahmed**, Z. Iqbal, and N. Sarma, "QoS Provisioning in Wireless Mesh Networks: A Survey," *Wireless Personal Communications*, 2021. [Online]. Available: <https://link.springer.com/article/10.1007/s11277-021-08893-3>
- [J.23] N. **Ahmed** and M. I. Hussain, "Periodic traffic scheduling for IEEE 802.11ah networks," *IEEE Communications Letters*, vol. 24, no. 7, pp. 1510–1513, 2020. [Online]. Available: <https://doi.org/10.1109/LCOMM.2020.2981087>
- [J.24] R. K. Das, N. **Ahmed**, F. H. Pohrmen, A. K. Maji, and G. Saha, "6LE-SDN: An Edge-based Software-Defined Network for Internet of Things," *IEEE Internet of Things Journal*, vol. 7, no. 8, pp. 7725–7733, 2020. [Online]. Available: <https://doi.org/10.1109/JIOT.2020.2990936>
- [J.25] L. Chom Thungon, N. **Ahmed**, S. C. Sahana, and M. I. Hussain, "A lightweight authentication and key exchange mechanism for IPv6 over Low-power Wireless Personal Area Networks-based Internet of Things," *Transactions on Emerging Telecommunications Technologies*, p. e4033, 2020. [Online]. Available: <https://doi.org/10.1002/ett.4033>
- [J.26] M. I. Hussain, N. **Ahmed**, and S. K. Das, "Dynamic Bandwidth Allocation Schemes for Multi-hop Wireless Mesh Networks," *International Journal of Next-Generation Computing*, vol. 10, no. 2, 2019. [Online]. Available: <https://doi.org/10.47164/ijngc.v10i2.162>
- [J.27] N. **Ahmed**, H. Rahman, and M. I. Hussain, "An IEEE 802.11 ah-based scalable network architecture for Internet of Things," *Annals of Telecommunications*, vol. 73, pp. 499–509, 2018. [Online]. Available: <https://doi.org/10.1007/s12243-018-0647-2>
- [J.28] H. Rahman, N. **Ahmed**, and M. I. Hussain, "A QoS-aware hybrid data aggregation scheme for Internet of Things," *Annals of Telecommunications*, vol. 73, pp. 475–486, 2018. [Online]. Available: <https://doi.org/10.1007/s12243-018-0646-3>
- [J.29] N. **Ahmed**, D. De, and I. Hussain, "Internet of Things (IoT) for smart precision agriculture and farming in rural areas," *IEEE Internet of Things Journal*, vol. 5, no. 6, pp. 4890–4899, 2018. [Online]. Available: <https://doi.org/10.1109/JIOT.2018.2879579>
- [J.30] L. C. Thungon, N. **Ahmed**, and M. I. Hussain, "Comparison of AES and present block cipher for 6LoWPAN based internet-of-things," *International Journal of Computational Intelligence & IoT*, vol. 1, no. 2, 2018. [Online]. Available: <https://ssrn.com/abstract=3354723>
- [J.31] N. **Ahmed**, H. Rahman, and M. I. Hussain, "A comparison of 802.11 ah and 802.15.4 for IoT," *ICT Express*, vol. 2, no. 3, pp. 100–102, 2016. [Online]. Available: <https://doi.org/10.1016/j.ict.2016.07.003>
- [J.32] M. I. Hussain, S. K. Dutta, N. **Ahmed**, and I. Hussain, "A WiFi-based reliable network architecture for rural regions," *ADB University Journal of Engineering Technology*, vol. 3, 2015. [Online]. Available: <https://journals.dbuniversity.ac.in/ojs/index.php/AJET/article/view/119>

Conference Publications

- [C.1] M. Khanafer, L. Kostick, C. Wang, W. Zegeye, W. He, B. Kaplan, N. **Ahmed**, K. Kornegay, D. Kotz, and T. J. Pierson, "Device Discovery in the Smart Home Environment," in *Proc. IEEE/ACM Workshop on the Internet of Safe Things (SafeThings)*, May 2024. [Online]. Available: <https://doi.org/10.1109/SPW63631.2024.10705647>
- [C.2] M. Alam, N. **Ahmed**, R. Matam, and F. A. Barbhuiya, "RedgeX: Meta-Learning based Optimal Analytical Model for Programmable Edge Intelligence," in *Proc. 2024 IEEE Wireless Communications and Networking Conference (WCNC)*, pp. 1–6, 2024. [Online]. Available: <https://doi.org/10.1109/WCNC57260.2024.10570981>
- [C.3] N. **Ahmed**, F. Esposito, and N. Shakoor, "Bridging IoT Education Through Activities: A Game-Oriented Approach with Real-time Data Visualization," in *Proc. 2024 IEEE Integrated STEM Education Conference (ISEC)*, pp. 1–6, 2024. [Online]. Available: <https://doi.org/10.1109/ISEC61299.2024.10665136>
- [C.4] B. Gano, N. **Ahmed**, and N. Shakoor, "Machine learning-based prediction of sorghum biomass from UAV multispectral imagery data," in *Proc. 2023 4th International Conference on Computing and Communication Systems (I3CS)*, pp. 1–5, 2023. [Online]. Available: <https://doi.org/10.1109/I3CS58314.2023.10127516>
- [C.5] R. Saha, N. **Ahmed**, and S. Misra, "Node Behaviour-Aware Secure Flow Control Mechanism for IoT-Based Big Data," in *Proc. GLOBECOM 2023 IEEE Global Communications Conference*, pp. 7321–7326, 2023. [Online]. Available: <https://doi.org/10.1109/GLOBECOM54140.2023.10437785>

- [C.6] N. **Ahmed**, A. Roy, and S. Misra, "Programming Edge-Based 6TiSCH Networks for Control-Loop Communication," in *Proc. GLOBECOM 2023 IEEE Global Communications Conference*, pp. 2632–2637, 2023. [Online]. Available: <https://doi.org/10.1109/GLOBECOM54140.2023.10437380>
- [C.7] N. **Ahmed**, F. Esposito, and N. Shakoor, "SoftFarmNet: Reconfigurable Wi-Fi HaLow Networks for Precision Agriculture," in *Proc. 2023 IEEE 12th International Conference on Cloud Networking (CloudNet)*, pp. 212–220, 2023. [Online]. Available: <https://doi.org/10.1109/CloudNet59005.2023.10490078>
- [C.8] M. Alam, N. **Ahmed**, R. Matam, and F. A. Barbhuiya, "L3Fog: Fog node selection and task offloading framework for mobile IoT," in *Proc. IEEE INFOCOM 2022—IEEE Conf. on Computer Communications Workshops (INFOCOM WKSHPS)*, pp. 1–6, 2022. [Online]. Available: <https://doi.org/10.1109/INFOCOMWKSHPS54753.2022.9798118>
- [C.9] R. Saha, N. **Ahmed**, and S. Misra, "Dynamic Fog Intelligence with Flow Control for Green Internet of Things," in *Proc. GLOBECOM 2022 IEEE Global Communications Conference*, pp. 01–06, 2022. [Online]. Available: <https://doi.org/10.1109/GLOBECOM48099.2022.10001266>
- [C.10] N. **Ahmed**, A. Roy, A. Mondal, and S. Misra, "SDN-based link recovery scheme for large-scale Internet of Things," in *Proc. 2021 IEEE 22nd Int. Conf. on High Performance Switching and Routing (HPSR)*, pp. 1–6, 2021. [Online]. Available: <https://doi.org/10.1109/HPSR52026.2021.9481842>
- [C.11] N. **Ahmed**, A. Roy, S. Misra, and D. Tandur, "Programmable IEEE 802.11ah Network for Internet of Things," in *Proc. ICC 2021—IEEE Int. Conf. on Communications*, pp. 1–6, 2021. [Online]. Available: <https://doi.org/10.1109/ICC42927.2021.9500610>
- [C.12] M. Alam, N. **Ahmed**, R. Matam, and F. A. Barbhuiya, "ioFog: Prediction-based Fog computing architecture for offline IoT," in *Proc. 2021 Int. Wireless Communications and Mobile Computing (IWCMC)*, pp. 1387–1392, 2021. [Online]. Available: <https://doi.org/10.1109/IWCMC51323.2021.9498796>
- [C.13] R. Saha, N. **Ahmed**, and S. Misra, "SDN-controller triggered dynamic decision control mechanism for healthcare IoT," in *Proc. 2021 IEEE Global Communications Conference (GLOBECOM)*, pp. 1–6, 2021. [Online]. Available: <https://doi.org/10.1109/GLOBECOM46510.2021.9685911>
- [C.14] S. Misra, K. Sarkar, and N. **Ahmed**, "Blockchain-based controller recovery in SDN," in *Proc. IEEE INFOCOM 2020—IEEE Conf. on Computer Communications Workshops (INFOCOM WKSHPS)*, pp. 1063–1068, 2020. [Online]. Available: <https://doi.org/10.1109/INFOCOMWKSHPS50562.2020.9162659>
- [C.15] N. **Ahmed** and S. Misra, "Channel access mechanism for IEEE 802.11ah-based relay networks," in *Proc. ICC 2020—2020 IEEE Int. Conf. on Communications (ICC)*, pp. 1–6, 2020. [Online]. Available: <https://doi.org/10.1109/ICC40277.2020.9148917>
- [C.16] S. Nayak, N. **Ahmed**, S. Misra, and K.-K. R. Choo, "Blockchain-Based Programmable Fog Architecture for Future Internet of Things Applications," in *Proc. GLOBECOM 2020—2020 IEEE Global Communications Conference*, pp. 1–6, 2020. [Online]. Available: <https://doi.org/10.1109/GLOBECOM42002.2020.9347969>
- [C.17] F. Gazi, S. Misra, N. **Ahmed**, and A. Mukherjee, "UnRest: Underwater reliable acoustic communication for multimedia Streaming," in *Proc. GLOBECOM 2020—2020 IEEE Global Communications Conference*, pp. 1–6, 2020. [Online]. Available: <https://doi.org/10.1109/GLOBECOM42002.2020.9348152>
- [C.18] S. Misra, R. Saha, and N. **Ahmed**, "Health-flow: Criticality-aware flow control for sdn-based healthcare IoT," in *Proc. GLOBECOM 2020—2020 IEEE Global Communications Conference*, pp. 1–6, 2020. [Online]. Available: <https://doi.org/10.1109/GLOBECOM42002.2020.9348058>
- [C.19] N. **Ahmed**, D. De, and M. I. Hussain, "A QoS-aware MAC protocol for IEEE 802.11 ah-based Internet of Things," in *Proc. 2018 Fifteenth Int. Conf. on Wireless and Optical Communications Networks (WOCN)*, pp. 1–5, 2018. [Online]. Available: <https://doi.org/10.1109/WOCN.2018.8556133>
- [C.20] A. Kalita, N. **Ahmed**, H. Rahman, and M. I. Hussain, "A QoS-aware MAC protocol for large-scale networks in Internet of Things," in *Proc. 2017 IEEE Int. Conf. on Advanced Networks and Telecommunications Systems (ANTS)*, pp. 1–6, 2017. [Online]. Available: <https://doi.org/10.1109/ANTS.2017.8384132>
- [C.21] N. **Ahmed** and M. I. Hussain, "Relay-based IEEE 802.11 ah network: A Smart City solution," in *Proc. 2016 Cloudification of the Internet of Things (CIoT)*, pp. 1–6, 2016. [Online]. Available: <https://doi.org/10.1109/CIOT.2016.7872922>
- [C.22] H. Rahman, N. **Ahmed**, and M. I. Hussain, "A hybrid data aggregation scheme for Internet of Things (IoT)," in *2016 IEEE Annual India Conference (INDICON)*, pp. 1–6, 2016. [Online]. Available: <https://doi.org/10.1109/INDICON.2016.7838884>
- [C.23] H. Rahman, N. **Ahmed**, and M. I. Hussain, "A hybrid data aggregation scheme for provisioning Quality of Service (QoS) in Internet of Things (IoT)," in *Proc. 2016 Cloudification of the Internet of Things (CIoT)*, pp. 1–5, 2016. [Online]. Available: <https://doi.org/10.1109/CIOT.2016.7872917>
- [C.24] S. S. Ahmed, I. Hussain, and N. **Ahmed**, "Driver level implementation of TDMA MAC in long distance WiFi," in *Proc. 2015 Int. Conf. on Computational Intelligence and Networks (CINE)*, pp. 80–85, 2015. [Online]. Available: <https://doi.org/10.1109/CINE.2015.25>

- [C.25] H. Rahman, N. **Ahmed**, and M. I. Hussain, "Internet of Things (IoT): Advances and Research Challenges," in *Proc. Int. Conf. on Computing and Communication Systems (I3CS)*, pp. 89–96, 2015.
- [C.26] N. **Ahmed**, Z. I. Ahmed, S. I. Saikia, and I. Hussain, "Augmentation of directional and sector antenna support in NS2," in *Proc. 2015 Int. Conf. on Computational Intelligence and Networks (CINE)*, pp. 68–73, 2015. [Online]. Available: <https://doi.org/10.1109/CINE.2015.23>
- [C.27] I. Hussain, N. **Ahmed**, D. K. Saikia, and N. Sarma, "A QoS-aware multipath routing protocol for WiFi-based long distance mesh networks," in *Proc. 2014 2nd Int. Conf. on Emerging Technology Trends in Electronics, Communication and Networking*, pp. 1–8, 2014. [Online]. Available: <https://doi.org/10.1109/ET2ECN.2014.7044990>
- [C.28] I. Hussain, D. K. Saikia, N. Sarma, and N. **Ahmed**, "A fine-tuned packet scheduling for WiFi-based Long Distance networks," in *Proc. 2014 Applications and Innovations in Mobile Computing (AIMoC)*, pp. 97–103, 2014. [Online]. Available: <https://doi.org/10.1109/AIMOC.2014.6785526>

Book

- [B.1] T. Ojha, M. M. Hussain, S. Bera, N. **Ahmed**, and S. Misra (Eds.), *Edge-Enabled 6G Networking: Foundations, Technologies, and Applications*, in press, expected online April 2025. <https://edge6gbook.github.io>

Book Chapters

- [Bc.1] **Ahmed**, N. and N. Shakoor, "From Field to Cloud: IoT and Machine Learning Innovations in High-Throughput Phenotyping," in *Machine Learning for Social Transformation—Lecture Notes in Networks and Systems*, vol. 1131, p. 125, Springer Nature, 2025. [Online]. Available: https://doi.org/10.1007/978-981-97-7532-3_10
- [Bc.2] S. Sarkar, A. Sengupta, A. Das, D. De, and N. **Ahmed**, "Dew Computing Enabled Consumer Electronics for Sustainable Internet of Agricultural Things," in *Dew Computing: The Sustainable IoT Perspectives*, pp. 317–345, Springer, 2023. [Online]. Available: https://doi.org/10.1007/978-981-99-4590-0_15
- [Bc.3] B. Ghosh, S. Roy, N. **Ahmed**, and D. De, "Dew Aeroponics: Dew-Enabled Smart Aeroponics System in Agriculture 4.0," in *Dew Computing: The Sustainable IoT Perspectives*, pp. 261–287, Springer, 2023. [Online]. Available: https://doi.org/10.1007/978-981-99-4590-0_13
- [Bc.4] R. K. Das, A. Gupta, S. Boda, P. Joshi, and N. N. **Ahmed**, and D. De, "A Study on the Performance of Network Topologies in SDN-based Edge IoT Network," in *Springer book series "Lecture Notes in Networks and Systems"*, Electronic ISSN: 2367-3389, Print ISSN: 2367-3370, 2024, Springer, 2024. [Online]. Available:
- [Bc.5] N. **Ahmed**, H. Rahman, and M. I. Hussain, "Scalability Analysis of Medium Access Control Protocols for Internet of Things," in *Advances in Intelligent Systems and Computing*, vol. 508, pp. 601–611, Springer Singapore, 2017. [Online]. Available: https://doi.org/10.1007/978-981-10-2750-5_62

Thesis

- [T.1] N. **Ahmed**, "Designing IEEE 802.11ah-based scalable network for Internet of Things," *Ph.D. Thesis*, Department of Information Technology, North-Eastern Hill University, 2020. [Online]. Available: <http://hdl.handle.net/10603/348225>

Patents

- [P.1] G. Saha, R. K. Das, N. **Ahmed**, and A. K. Maji, "Multi-Purpose Switch Adaptable for a Specific SDN Based IoT Architecture," Indian patent granted on Apr. 2, 2021, 37 pages, 7 claims, Patent Ref.: 201931049931.
- [P.2] G. Saha, R. K. Das, N. **Ahmed**, and A. K. Maji, "An improved SDN based IoT system," Indian patent granted on Dec. 16, 2024, Patent Ref.: 202131017791.
- [P.3] N. Shakoor and N. **Ahmed**, "Networking System of Interconnected Devices for Emissions Data Collection in an Agricultural Environment," U.S. patent filed under Ref. 47004–233204, 2024

SKILLS

- **Programming Languages:** C, C++, Java, Python, PHP, TCL
- **Web Technologies:** HTML, CSS, Angular (2+), JavaScript, JSP, ASP.NET, Node.js/Express, ReactJS, Liferay, Django, Tomcat, Apache
- **Database Systems:** SQL (MySQL, PostgreSQL, SQLite), MongoDB, InfluxDB
- **Data Science & Machine Learning:** Neural Networks, scikit-learn, TensorFlow, Keras, Pandas, NumPy
- **Cloud Technologies:** Thingspeak, Kaa, iFogSim, AWS, Azure
- **DevOps & Version Control:** Git, Keycloak, Grafana
- **Specialized Area:** IoT & Networking (Contiki, Zephyr RTOS, COAP, MQTT, TelosB, CC2650, Arduino, ESP8266, Raspberry Pi, Wi-Fi HaLow, 6LoWPAN, OpenFlow, P4, Mininet, Mikrotik WinBox, Atheros Driver, OpenWrt, Edge Computing, Healthcare IoT, Smart Agriculture, Smart City, Smart Home, Smart Lighting)
- **Research Skills:** Academic research, teaching, training, consultation, academic writing, \LaTeX

5.1 Activities

- A.1 Smart sensor and actuator system for precision agriculture, **Education Research and Outreach Activity**, Donald Danforth Plant Science Center, St Louis, July 2023.
- A.2 Developed a real-time game application for teaching IoT and smart agriculture: “*Hydro-Heroes: Sorghum Sprint Sprout*”, **Education Research and Outreach Activity**, Donald Danforth Plant Science Center, St Louis, May 2023.
- A.3 Volunteered at **iSCORE Camp** – an outreach activity for grade 2–3 students, organized by Saint Louis University, St. Louis, April 2023.

5.2 Tutorials

- T.1 **ACM India Summer School’21**: “Programmable IoT,” IIIT Bangalore, 8 July, 2021.
- T.2 **WCNC’21**: “Programmability for Context-Aware Smart IoT Applications,” Half-day tutorial at IEEE Wireless Communications and Networking Conference (WCNC), 2021.

5.3 Handsons

- H.1 **University of Jammu**: “Introduction to Contiki-Cooja Simulator: A Demonstration,” Five-Day AICTE ATAL Faculty Development Programme (FDP) on Internet of Things (IoT), conducted by the Department of Computer Science & Information Technology, University of Jammu, 1–4 June 2021.
- H.2 **Mizoram University**: “Hands on Contiki-OS and Cooja Simulator,” Five-Day AICTE ATAL Online FDP on Internet of Things (IoT), conducted by the Department of Information Technology, Mizoram University, Aizawl, 1–4 Feb 2021.
- H.3 **Assam Don Bosco University**: “Implementation of IoT,” in the Two-Week National workshop-cum-Summer Internship on IoT and Android Applications Development, 11–23 Jun, 2019, conducted by the Department of CSE, Assam Don Bosco University, India.
- H.4 **NEHU Shillong**: “Implementation of IoT using 6LoWPAN-based Network,” in the MeitY-sponsored National workshop on *Internet of Things: Its Inside Out*, 12–13 May, 2017, conducted by the Department of IT, NEHU, Shillong, India.
- H.5 **NEHU Shillong**: “Protocol Implementation in Open Source Wireless Local Area (WLAN) Driver,” in the National workshop on Trends in Wireless Networks – Protocols and Practice, 29–30 Jan, 2015, Department of IT, NEHU, Shillong, India.
- H.6 **NEHU Shillong**: “Protocol Implementation and Simulation using Network Simulator 2 (NS2),” in the National workshop on Trends in Wireless Networks – Protocols and Practice, 29–30 Jan, 2015, Department of IT, NEHU, Shillong, India.

LECTURES

- L.1 **SRM University, AP, India** (Dec 9–15, 2022): “Edge computing” (**Guest Lecturer**).
- L.2 **MCKV Institute of Engineering, India**: “Integrating IoT and Edge Computing for Real-Time Crop Monitoring,” FDP on Smart Computing Applications – Innovative Computational Approaches, Monday, November 25, 2024.
- L.3 **ICFAI University, Tripura**: “Role of AI and ML in Next-generation Communication Networks,” Webinar, 18–19 July 2022.
- L.4 **Mizoram University**: “Role of Artificial Intelligence/Machine Learning in Next-generation Communication Networks,” International ATAL Faculty Development Programme (IFDP) on Data Analytics and Machine Learning, Mizoram University & North-Eastern Hill University, 21–25 March 2022.
- L.5 **Dartmouth College**: “Flow Identification for Secure SDN-Based IoT Networks,” SPLICE Webinar Series, 15 Feb 2022.
- L.6 **University of Jammu**: “Protocols and Platforms for Next Generation IoT,” Five-Day AICTE ATAL Faculty Development Programme (FDP) on Internet of Things (IoT), conducted by the Department of Computer Science & Information Technology, University of Jammu, 1–4 June 2021.
- L.7 **Mizoram University**: “Sensors & Actuators with Communication Protocols for Next-Generation IoT,” Five-Day AICTE ATAL Online FDP on Internet of Things (IoT), conducted by the Department of Information Technology, Mizoram University, Aizawl, 1–4 Feb 2021.
- L.8 **Mizoram University**: “Wireless Sensor & Actuator Network Using Contiki-Cooja Simulator,” Five-Day AICTE ATAL Online FDP on Internet of Things (IoT), conducted by the Department of Information Technology, Mizoram University, Aizawl, 1–4 Feb 2021.

- L.9 **NEHU Shillong**: “Software & Hardware platforms for NextGen IoT Implementation,” AICTE-sponsored workshop on IoT and its Applications, conducted by the Department of IT, NEHU, Shillong and CKolon, 5–9 Oct 2020.
- L.10 **NEHU Shillong**: “Technologies and Protocols for Internet of Things (IoT),” MeitY-sponsored National workshop on *Internet of Things: Its Inside Out*, conducted by the Department of IT, NEHU, Shillong, India, 12–13 May 2017.
- L.11 **Guided Border Security Force (BSF) Technical Team** (Jul 2018): *Deployment of WiFi-based Long Distance (WiLD) Network in Border Out Posts (BOPs)*, Ftr, HQ, BSF Frontier Shillong (2 March–4 April 2018).

PAPERS AND POSTERS PRESENTED

- P.1 **Bridging IoT Education Through Activities: A Game-Oriented Approach with Real-time Data Visualization**, in *Proc. 2024 IEEE Integrated STEM Education Conference (ISEC)*, Princeton University, New Jersey, pp. 1–6, 2024.
- P.2 **Integrating IoT and Machine Learning for Precision Carbon Footprint Management in Sorghum Cultivation** (Poster Presentation), at the *2024 Sorghum Improvement Conference of North America (SICNA)*, Apr. 2–4, 2024.
- P.3 **Dynamic Fog Intelligence with Flow Control for Green Internet of Things**, in *GLOBECOM 2022 – 2022 IEEE Global Communications Conference*, Virtual, 2022.
- P.4 **Programmable IEEE 802.11ah Network for Internet of Things**, in *IEEE International Conference on Communications (ICC)*, Virtual, 2021.
- P.5 **SDN-Based Link Recovery Scheme for Large-Scale Internet of Things**, in *IEEE HPSR’21*, Virtual, 2021.
- P.6 **Channel Access Mechanism for IEEE 802.11 ah-Based Relay Networks**, in *IEEE International Conference on Communications (ICC)*, Dublin, Ireland.
- P.7 **A QoS-aware MAC protocol for large-scale networks in Internet of Things**, in *11th IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, Bhubaneswar, Odisha, India, June 2020.
- P.8 **Augmentation of Directional and Sector Antenna Support in NS-2**, in *IEEE sponsored International Conference on Computational Intelligence and Networks (CINE)*, KIIT University, Bhubaneswar, Odisha, Jan. 2015.
- P.9 **Driver Level Implementation of TDMA MAC in Long Distance WiFi**, in *IEEE sponsored International Conference on Computational Intelligence and Networks (CINE)*, KIIT University, Bhubaneswar, Odisha, Jan. 2015.
- P.10 **A QoS-aware Multipath Routing Protocol for WiFi-based Long Distance Mesh Networks**, in *2nd IEEE Conference on Emerging Technology Trends in Electronics, Communication and Networking (ET2ECN)*, NIT Surat, Gujarat, Dec. 2014.

AWARDS AND FELLOWSHIPS

1. Received *Postdoctoral Fellowship* at the Indian Institute of Science, 2021.
2. Best Paper Award for the paper “A hybrid data aggregation scheme for Internet of Things (IoT)” at the 2016 IEEE Annual India Conference (INDICON) [refer [C.23]].
3. Awarded *Junior Research Fellowship* by the Department of Information Technology, Government of India, 2013.
4. Received *Anandaram Barua Award* from the Government of Assam, 2006.
5. Received highest scorer recognition in 10th Grade, Goalpara District, Assam, 2006.

PROFESSIONAL MEMBERSHIPS

- | | |
|--|---------------------|
| • ACM, Membership ID: 6893286 | Nov. 2022 - Present |
| • IEEE, Membership ID: 93544531 | Apr. 2020 - Present |
| • IEEE COMSOC, Membership ID: 93544531 | Apr. 2020 - Present |

ADDITIONAL INFORMATION

Languages: English (Fluent in reading, writing, speaking), Assamese (Fluent in reading, writing, speaking), Hindi (Fluent in reading, writing, speaking), Bengali (Fluent in reading, writing, speaking)

Interests: Coding, Cooking, Traveling, Playing Cricket

REFERENCES

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