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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] N. **Ahmed**, and Nadia Shakoor, "Advancing Agriculture through IoT, Big Data, and AI: A Review of Smart Technologies Enabling Sustainability," *Smart Agricultural Technology*, vol. – , pp. –, 2025. [Accepted]
- [J.2] 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.3] 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.4] 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.5] 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.6] 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.7] 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.8] 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.9] 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.10] 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.11] 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.12] 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.13] 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.14] 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.15] 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.16] 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.17] 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.18] 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.19] 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.20] 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.21] 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.22] 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.23] 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.24] 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.25] 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.26] 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.27] 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.28] 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.29] 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.30] 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.31] 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.32] 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.33] 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

In Submission

- [S.1] N. **Ahmed**, D. Azzaro, J. Stanton, B. Gano, N. Eck, J. Saxton, W. Kezele, and N. Shakoor, "FieldDock: An Integrated Smart Farm Platform for Real-Time Agronomic Optimization and Accelerated Crop Breeding," *Computers and Electronics in Agriculture*, in submission, 2025.
- [S.2] N. **Ahmed**, N. Narayanan, C. Patino, M. De Gracia, J. Stanton, B. Gano, N. Eck, J. Saxton, and N. Shakoor, "SubterraAI: A Software Platform for Automating Image-Based Root Phenotyping with Non-Invasive Data Collection," *Nature Methods*, in submission, 2025.
- [S.3] B. Gano, J. Saxton, M. D. G. Coquerel, N. Eck, J. Stanton, N. **Ahmed**, and N. Shakoor, "Assessing the potential of UAV Spectral Data and Machine Learning for Soil Organic Carbon Prediction in Sorghum Fields, in submission, 2024.
- [S.4] M. D. G. Coquerel, N. **Ahmed**, M. Payne, and N. Shakoor, "Sorghum Roots in Focus: Leveraging Minirhizotrons and Machine Learning for Root Growth Analysis and Prediction, in submission, 2024.

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

ACTIVITIES, HANDSONS, & TUTORIALS

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

1. **Dr. Nadia Shakoor**

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Relationship: [e.g., Project Supervisor]

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Relationship: [e.g., Academic Mentor]