

# KANCHON KANTI PODDER

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## RESEARCH INTEREST

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My research focuses on **lifelong robot learning** for continual adaptation to changing tasks and users. Leveraging computer vision, machine learning, and signal/image processing, I develop robust, uncertainty-aware perception for human–robot collaboration in construction, and assistive settings.

## EDUCATION

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**PhD in Interdisciplinary Engineering** 2023 - May 2026 (*Expected*)  
*Specialization: Intelligent Robotic Systems* GPA: 4.0/4.0

Kennesaw State University, USA

Dissertation: General Intelligence for Robots Using Gesture Recognition in Incremental Learning Scenarios

**M.S. in Biomedical Physics & Technology** 2018 - 2019  
*Specialization: Biomedical Engineering* GPA: 3.78/4.0 (WES: 3.87)

University of Dhaka, Bangladesh

Thesis: Bangla Sign Language Interpretation by Convolutional Neural Network(CNN)

**B.Sc. in Electrical & Electronic Engineering** 2012 - 2017  
Chittagong University of Engineering & Technology, Bangladesh GPA: 2.94/4.0 (WES: 3.08)

Thesis: On Chip Power Management of PWM by PVT Control

## RESEARCH EXPERIENCE

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**Graduate Research Assistant** January 2023 – Present  
*Embodied Intelligence Lab, Kennesaw State University, USA*

- Addressed uncertainty in human–robot interaction by developing video-based gesture understanding with conformal prediction for trustworthy embodied communication.
- Studied lifelong robot learning under distribution shift by designing and evaluating continual learning frameworks for adaptive robotic perception.
- Applied masked autoencoders for self-supervised road anomaly detection and RFID indoor localization.
- Deployed multimodal perception model on physical robots, validating sim-to-real performance.
- Contributed to experimental design, proposal development, and peer-reviewed papers in conferences and journals.

**Research Assistant** July 2021 - August 2022 and December 2022  
*Machine Learning Group, Qatar University*

- Built end-to-end deep learning pipelines for medical imaging: landmarking, CT-ICH segmentation, ocular analysis, and thermography.
- Developed deep learning models for biomedical and industrial time-series for anomaly detection from physiological and IoT sensor data.
- Developed signer-independent Arabic Sign Language recognition from video for robust human-centered computer vision.
- Delivered interpretable and data-efficient ML through ensemble learning, biomarker-driven features, explainability, and multi-institutional dataset curation.
- Co-invented a US-filed patent on ML-based stratification for early diabetic foot complications using thermographic imaging.

## Research Assistant

September 2022 - November 2022

*College of Engineering, Qatar University*

- Developed feature engineering and meta-learning methods for medical image classification.
- Built deep learning models to classify Parkinson's disease from corneal confocal microscopy images.

## Research Fellow

July 2019 – June 2020

*Dept. of Biomedical Physics and Technology, University of Dhaka, Bangladesh*

*Fellowship funded by ICT Division, Government of Bangladesh*

- Built large-scale image datasets and developed preprocessing pipelines in MATLAB and Python.
- Delivered end-to-end ML systems, including CNN-based real-time inference and classification.

## TEACHING EXPERIENCE

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### Instructional Support

January 2026 – May 2026

*Wireless Mobile Networking; Primary Instructor: Dr. Sumit Chakravarty*

*Research in Computer Science; Primary Instructor: Dr. Jian Zhang*

- Designed and developed supporting materials for a Computer Networks / Network Security module, including lesson outlines, slides, and practice questions on cryptography, digital signatures, secure email, TLS/HTTPS, IPsec/VPNs, Wi-Fi & cellular security, and firewalls/IDS.
- Facilitated review and recitation sessions to reinforce core concepts and provided guidance and feedback on security-focused assignments.
- Mentored Master's students across the research lifecycle—from topic refinement and literature mapping to hypothesis formulation and milestone planning—supporting independent research and scholarly problem-solving.
- Advised students on experimental design and evaluation (methodology, baselines, metrics, reproducibility) and supported academic writing and the publication workflow.

### Teaching Assistant

January 2021 – June 2021

*DDS AI Academy, Dream Door Soft. Ltd., Bangladesh*

- Designed and delivered RPA and ML/DL training modules for 50+ students, integrating conceptual instruction with hands-on programming.
- Mentored students on RPA workflows, deep learning concepts, and applied programming within a project-based learning environment.
- Assessed student progress through assignments, project milestones, and grading, providing structured feedback to improve learning outcomes.
- Integrated a student ML/DL project into my ongoing research agenda, guiding contributions to data preparation via student-developed software and experimental evaluation, and leading the research design, analysis, and first-author publication.

## WORK EXPERIENCE

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### Service Engineer

June 2017 – May 2018

*Healthcare Division, O.M.C. (Pvt.) Ltd., Bangladesh*

- Performed installation, commissioning, maintenance, servicing of Chemistry and Immunoassay analyzer.
- Developed hands-on experience on Blood Gas analyzer and Hematology machine.
- Performed installation, commissioning, maintenance, and servicing of chemistry and immunoassay analyzers.

# PUBLICATIONS

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Equal contribution as co-first author is marked with \* and the student I mentored is marked as †

## Patent

Khandakar, A., M. E. Chowdhury, M. B. I. Reaz, S. H. M. Ali, S. Kiranyaz, T. Rahman, R. Alfkey, A. A. A. Bakar, R. A. Malik, M. A. Ayari, M. H. Chowdhury, **K. K. Podder**, and M. A. Hasan (Apr. 2024). *Machine learning model for stratification of early diabetic foot complication using thermogram images*. US Patent App. 18/378,479.

## Conference Papers

- K. K. Podder**, P. Dutta, X. Wang, J. Zhang, and S. Mao (2026). “DILoc: Replay-Based Domain-Incremental Learning for Lifelong Multimodal Wi-Fi–Magnetic Indoor Localization”. In: IEEE International Conference on Communications (May 24–28, 2026). Glasgow, Scotland, UK. Accepted.
- K. K. Podder**, P. Dutta, and J. Zhang (2026). “GLaRe: Gaussian Latent Replay for Class-Incremental Gesture Recognition in Human–Robot Interaction”. In: 2026 IEEE/RSJ international conference on intelligent robots and systems (IROS) (Sept. 27, 2026). PITTSBURGH, PA, USA. Submitted.
- K.K. Podder**, J. Zhang, and S. Mao (2025). “Memory-Efficient Rehearsal-Based Class Incremental Learning for Robot Hand Signal Recognition”. In: *2025 IEEE Annual Congress on Artificial Intelligence of Things (AIoT)*. IEEE, pp. 302–309.
- K.K. Podder**, J. Zhang, S. Mao, and Z. Yu (2025). “Uncertainty-Aware Domain Incremental Learning for Gesture Recognition in Robotic IoT Systems”. In: *2025 IEEE 11th World Forum on Internet of Things (WF-IoT)*. IEEE, pp. 1–7.
- Dutta, P., **K. K. Podder**, J. Zhang, C. Hecht, S. Swarna, and P. Bhavsar (2024). “A Self-Supervised Learning Approach to Road Anomaly Detection Using Masked Autoencoders”. In: *International Conference on Transportation and Development 2024*, pp. 536–547.
- K. K. Podder**, J. Zhang, and S. Mao (2024). “Trustworthy Hand Signal Communication Between Smart IoT Agents and Humans”. In: *2024 IEEE 10th World Forum on Internet of Things (WF-IoT)*. IEEE, pp. 595–600.
- K. K. Podder**, J. Zhang, and L. Wang (2024). “Universal Sign Language Recognition System Using Gesture Description Generation and Large Language Model”. In: *International Conference on Wireless Artificial Intelligent Computing Systems and Applications*. Springer Nature Switzerland Cham, pp. 279–289.
- K. K. Podder**, J. Zhang, and Y. Wu (2024). “IHSR: A Framework Enables Robots to Learn Novel Hand Signals From a Few Samples”. In: *2024 IEEE International Conference on Advanced Intelligent Mechatronics (AIM)*. IEEE, pp. 959–965.
- P. Dutta†, J. Zhang, B. Amoah, X. Wang, **K. K. Podder**, and S. Mao (2024). “Enhancing RFID Observations Using Masked Autoencoders for Improved Indoor Localization”. In: *2024 IEEE International Conference on RFID Technology and Applications (RFID-TA)*, pp. 149–152. DOI: 10.1109/RFID-TA64374.2024.10965153.
- K. K. Podder**, S. Tabassum, L. E. Khan, K. M. A. Salam, R. I. Maruf, and A. Ahmed (2021). “Design of a sign language transformer to enable the participation of persons with disabilities in remote

healthcare systems for ensuring universal healthcare coverage”. In: *2021 IEEE Technology & Engineering Management Conference-Europe (TEMSCON-EUR)*. IEEE, pp. 1–6.

## Journal Papers

- Podder, K. K.**, P. Dutta, and J. Zhang (2025). “Replay-Based Domain Incremental Learning for Cross-User Gesture Recognition in Robot Task Allocation”. In: *Electronics* 14.19, p. 3946.
- Sumon, M. S. I., K. R. Islam, S. A. Hossain, T. Rafique, R. Ghosh, G. S. Hassan, **K. K. Podder**, N. Barhom, F. Tamimi, and M. E. Chowdhury (2025). “Self-CephaloNet: a two-stage novel framework using operational neural network for cephalometric analysis”. In: *Neural Computing and Applications*, pp. 1–29.
- P. Dutta\*, **K. K. Podder\***, M. S. I. Sumon, M. E. Chowdhury, A. Khandakar, N. Al-Emadi, M. H. Chowdhury, M. Murugappan, M. A. Ayari, S. Mahmud, et al. (2024). “GearFaultNet: Novel network for automatic and early detection of gearbox faults”. In: *IEEE Access* 12, pp. 188755–188765.
- K. K. Podder**, M. E. Chowdhury, S. Al-Maadeed, N. N. Nisha, S. Mahmud, F. Hamadelneil, T. Almkhlef, H. Aljofairi, A. Mushtak, A. Khandakar, et al. (2023). “Deep learning-based middle cerebral artery blood flow abnormality detection using flow velocity waveform derived from transcranial Doppler ultrasound”. In: *Biomedical Signal Processing and Control* 85, p. 104882.
- K. K. Podder**, M. Ezeddin, M. E. Chowdhury, M. S. I. Sumon, A. M. Tahir, M. A. Ayari, P. Dutta, A. Khandakar, Z. B. Mahbub, and M. A. Kadir (2023). “Signer-independent Arabic Sign Language recognition system using deep learning model”. In: *Sensors* 23.16, p. 7156.
- K. K. Podder**, L. E. Khan, J. Chakma, M. E. Chowdhury, P. Dutta, K. M. A. Salam, A. Khandakar, M. A. Ayari, B. K. Bhawmick, S. A. Islam, et al. (2023). “Self-ChakmaNet: A deep learning framework for indigenous language learning using handwritten characters”. In: *Egyptian Informatics Journal* 24.4, p. 100413.
- Khan, M. M., M. E. Chowdhury, A. S. Arefin, **K. K. Podder**, M. S. A. Hossain, A. Alqahtani, M. Murugappan, A. Khandakar, A. Mushtak, and M. Nahiduzzaman (2023). “A deep learning-based automatic segmentation and 3D visualization technique for intracranial hemorrhage detection using computed tomography images”. In: *Diagnostics* 13.15, p. 2537.
- Khandakar, A., M. E. Chowdhury, M. B. I. Reaz, S. Kiranyaz, A. Hasan, T. Rahman, S. H. M. Ali, A. A. A. Bakar, **K. K. Podder**, M. H. Chowdhury, et al. (2023). “DSPNet: A self-ONN model for robust DSPN diagnosis from temperature maps”. In: *IEEE Sensors Journal* 23.5, pp. 5370–5381.
- N. N. Nisha\*, **K. K. Podder\***, M. E. Chowdhury, M. Rabbani, M. S. I. Wadud, S. Al-Maadeed, S. Mahmud, A. Khandakar, and S. M. Zughair (2023). “A deep learning framework for the detection of abnormality in cerebral blood flow velocity using transcranial Doppler ultrasound”. In: *Diagnostics* 13.12, p. 2000.
- K. K. Podder**, M. E. Chowdhury, A. M. Tahir, Z. B. Mahbub, A. Khandakar, M. S. Hossain, and M. A. Kadir (2022). “Bangla sign language (bdsl) alphabets and numerals classification using a deep learning model”. In: *Sensors* 22.2, p. 574.
- Rahman, T., A. Khandakar, F. F. Abir, M. A. A. Faisal, M. S. Hossain, **K. K. Podder**, T. O. Abbas, M. F. Alam, S. B. Kashem, M. T. Islam, et al. (2022). “QCovSML: A reliable COVID-19 detection system using CBC biomarkers by a stacking machine learning model”. In: *Computers in Biology and Medicine* 143, p. 105284.

**K. K. Podder**, M. Chowdhury, Z. B. Mahbub, and M. Kadir (2020). “Bangla sign language alphabet recognition using transfer learning based convolutional neural network”. In: *Bangladesh J. Sci. Res* 31.1, pp. 20–26.

## Book Chapters

**K. K. Podder**, M. K. Alam, Z. S. Siam, K. R. Islam, P. Dutta, A. Mushtak, A. Khandakar, S. Pedersen, and M. E. Chowdhury (2023). “Deep Learning-Based Conjunctival Melanoma Detection Using Ocular Surface Images”. In: *Deep Learning Applications in Image Analysis*. Springer, pp. 113–131.

## Workshop Paper

**K. K. Podder**, J. Zhang, Y. Wu, and P. Dutta (May 2025). “Robust Human-Robot Interaction Through Domain-Incremental Gesture Recognition Across Real-World Environments”. In: *Proceedings of the Workshop on The Future of Intelligent Manufacturing: From Innovation to Implementation (ICRA 2025)*. Workshop paper. IEEE. Atlanta, GA, USA.

## SERVICE, AWARDS & OUTREACH

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### Peer Review

Reviewer, *PeerJ Computer Science*

2025–Present

### Professional Service & Leadership

Vice President & Treasurer, IEEE Student Branch, Kennesaw State University  
Student Branch Chair, IEEE CUET

May 2025–Present  
2016–2017

### Awards & Honors

Doctoral Completion Stipend (Nominated) - Kennesaw State University  
NSF Student Travel Award — IEEE/ASME AIM  
Best Poster — IEEE Region 10 Humanitarian Technology Conference

2026  
2024  
2017

### Visits & Exchanges

Sakura Science Exchange Program, Kyushu Institute of Technology, Japan

2019

## REFERENCES

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**Dr. Jian Zhang**, Assistant Professor, Kennesaw State University

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**Dr. Shiwen Mao**, Professor, Auburn University

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**Dr. Sumit Chakravarty**, Associate Professor, Kennesaw State University

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**Dr. Xiangyu Wang**, Assistant Professor, The University of Alabama

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