Mohammad Junayed Hasan

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Research Summary

Efficiency-focused NLP and ML researcher aiming to develop robust methods for reasoning, multimodal learning, and multilingual processing under compute, memory, and data constraints. Track record includes 8+ peer-reviewed publications, a $35K research grant for women's health in South Asia, and multiple merit scholarships. NeurIPS workshop and IEEE ICDM oral+poster presenter with 4+ years of RA/TA and US industry research experience.

Education

Expected December 2025	**Master of Science in Engineering in Computer Science** Johns Hopkins University, Baltimore, MD GPA: 3.83/4.00

- *Thesis:* ''ParaCycle: Reinforcement Learning with Bidirectional Paraphrase Consensus for Reference-Free Translation''

- *Research Advisor:* Prof. Philipp Koehn [**Profile**], *Academic Advisor:* Prof. Anjalie Field [**Profile**]

- *Relevant Coursework:* Natural Language Processing, Advanced NLP, Machine Translation, Human Language Technology, Machine Learning, Computer Vision, Cloud Computing

December 2023	**Bachelor of Science in Computer Science and Engineering** North South University, Dhaka, Bangladesh GPA: 3.95/4.00 (4.00/4.00 in CS), *Summa Cum Laude*, Top 0.4% of Class

- *Thesis:* ''Bridging classical and quantum machine learning: Knowledge transfer from classical to quantum neural networks using knowledge distillation''

- *Advisor:* Prof. Mahdy Rahman Chowdhury [**Profile**]

Research Experience

January 2025 to Present	**Graduate Researcher** Center for Language and Speech Processing (CLSP), Johns Hopkins University, Baltimore, MD

- Developed **ParaCycle**, a novel reinforcement learning framework for low-resource machine translation using bidirectional paraphrase consensus, eliminating dependency on parallel corpora while improving translation quality on four English↔X language pairs using FLORES-200 benchmark

- Designed and implemented semantic consistency rewards and customized RL objectives for unsupervised quality estimation, formulating translation quality optimization as a reinforcement learning problem

- Architected **HadaSmileNet**, a Hadamard-fusion framework integrating handcrafted and deep-learning features for genuine smile recognition, accepted at *IEEE ICDM 2025* with oral+poster presentation

- Achieved 26% reduction in parameters, training time, and inference latency while maintaining superior accuracy compared to multi-task learning baselines in facial emotion recognition

- Collaborated with domain experts and previous authors to ensure reproducibility and clinical relevance across both NLP and computer vision research directions

May 2025 to Present	**Research Intern** Mayo Clinic, Rochester, MN

- Extended HER2 biomarker detection across 7 cancer types via domain adaptation techniques; formulated cross-cancer generalization as transfer learning problem; achieved >90% accuracy across all classes

- Developed and evaluated ML models (LGB, XGB, LSTM, Transformers) for blood utilization prediction; engineered features from multi-modal clinical time-series data; reduced forecast error by 3.8% vs. baselines

- Collaborated with pathologists to formalize blood transfusion assessment as computational problem; reduced manual analysis time by >75% through automated pipeline design

- Designed and implemented end-to-end analytics platform serving real-time predictions to 500+ clinicians; optimized model serving latency to sub-200 ms for clinical workflow integration

January 2024 to Present

AI Research Assistant
Mahdy Research Academy, North South University (Remote)

- Conceptualized 15+ research projects across NLP, computer vision, and quantum machine learning; co-authored 12 high-quality manuscripts with research groups, submitting 10 to Q1 journals

- Created and managed research infrastructure and educational materials used by 150+ students across groups

- Developed **CLKD-MED** and **TransMed**, the first interpretable cross-lingual frameworks for clinical outcome prediction in low-resource languages using multi-strategy back-translation and distillation; now under review at *Expert Systems with Applications* and *CMPB* respectively

- Led the design of **TabFusion** and **BGCA-Fusion**, multimodal frameworks with lightweight fusion of tabular-image data using GCNs for skin cancer detection, and text-image data for breast cancer diagnosis respectively, now accepted at *Knowledge-Based Systems* and submitted at *Medical Image Analysis* respectively

- Supervised research on developing **Distill-FusionNet**, a lightweight and interpretable architecture for cross-domain lung cancer diagnosis, now under review at *Knowledge-Based Systems*

- Pioneered hybrid quantum-classical frameworks including **CQ-CNN** (achieving 1300× compression for Alzheimer's detection) and **QuantumMedKD**, with manuscripts published in *PLOS ONE* and *Alexandria Engineering Journal*, respectively

- Directed research on **QSiamNet**, the first hybrid quantum-classical siamese network for enhanced similarity-based learning, and **QuantDent**, the first hybrid quantum-classical architecture for oral disease detection, resulting in manuscripts submitted at *Neurocomputing* and *Quantum Machine Intelligence* respectively

November 2023 to July 2024

AI Research Engineer
Apurba Technologies Ltd., Dhaka, Bangladesh

- Designed **DeepMarkerNet**, a novel multi-task transformer framework for genuine smile detection via auxiliary supervision from handcrafted features to automatic transformer features

- Improved state-of-the-art accuracy by 1-3% across all CNN, RNN, and transformer-based methods on 4 benchmark datasets; first-authored research published in *Pattern Recognition Letters*

- Secured $35K research funding through proposal development and presentation at a national conference

January 2023 to November 2023

Undergraduate Research Assistant
Apurba NSU R&D Lab, North South University, Dhaka, Bangladesh

- Developed **OptimCLM**, a compression pipeline combining ensemble distillation, pruning, and quantization, achieving 22.9× compression and 28.7× latency reduction while retaining 98% performance

- First-authored publication in *International Journal of Medical Informatics*; achieved state-of-the-art on 4 clinical NLP tasks fine-tuning 32 clinical LLMs on EHR data using the proposed method

May 2022 to December 2023

Undergraduate Researcher
North South University, Dhaka, Bangladesh

- Developed first hybrid quantum-classical framework via logit distillation, bridging classical networks with quantum circuits; manuscript under review in *IEEE Transactions in Quantum Engineering* with 12 preprint citations; advised by Dr. Mahdy Rahman Chowdhury, *ICO Galileo Galilei Medal Award winner, 2023*

- Co-first authored **Shadow Loss**, reducing memory complexity from $O(N^2)$ to $O(N)$ for deep metric learning while accelerating convergence 1.5-2×; validated on CUB-200, CARS-196, and large-scale retrieval datasets; under review at *CVPR 2026*

- Engineered feature learning and LLM-based approaches for life satisfaction prediction from tabular data, achieving 93.8% accuracy; published in *Heliyon* (May 2024) with deployed public model

Peer-Reviewed Publications

*: Equal contributions

Accepted Rashik Iram Chowdhury, Nusrat Kabir Nuha, Muhtasimul Hasan, **Mohammad Junayed Hasan**, and M.R.C. Mahdy. ''TabFusion: Lightweight early fusion of tabular and image data with graph-convolutional neural networks for skin cancer detection'', *Knowledge-Based Systems* (**KBS**). [Status]

2026 MD Nahid Hassan Nishan*, **Mohammad Junayed Hasan***, and M.R.C. Mahdy. ''QuantumMedKD: A hybrid quantum-classical knowledge distillation framework for medical image analysis'' (2026), *Alexandria Engineering Journal* (**AEJ**), vol. 134, pp. 49-68. [Paper]

2025 **Mohammad Junayed Hasan***, Suhra Noor*, and Sifat Momen. ''A novel framework for detection of noncommunicable diseases via prompt engineering and domain knowledge integration'' (2025), *Alexandria Engineering Journal* (**AEJ**), vol. 133, pp. 586–614. [Presentation] [Paper]

Mohammad Junayed Hasan, Nabeel Mohammed, Shafin Rahman, and Philipp Koehn. ''HadaSmileNet: Hadamard fusion of handcrafted and deep-learning features for enhancing facial emotion recognition of genuine smiles'' (2025), *IEEE International Conference on Data Mining* (**ICDM**). Presented (oral + poster) November 15, 2025. [Paper] [Code] [Poster] [Presentation]

Mohammad Junayed Hasan, Jannat Sultana, Silvia Ahmed, and Sifat Momen. ''Early detection of occupational stress: Enhancing workplace safety with machine learning and large language models'' (2025), **PLOS ONE**, 20(6), e0323265. Accepted to *Women in Machine Learning Workshop@* **NeurIPS** *2025*. [Abstract] [Paper] [Code]

Mohammad Junayed Hasan, Fuad Rahman, and Nabeel Mohammed. ''OptimCLM: Optimizing clinical language models for predicting patient outcomes via knowledge distillation, pruning and quantization'' (2025), *International Journal of Medical Informatics* (**IJMEDI**), *195, 105764*. [Paper] [Code]

Mohammad Junayed Hasan, Suvodeep Mazumdar, and Sifat Momen. ''Deployable deep learning for cross-domain plant leaf disease detection via ensemble learning, knowledge distillation, and quantization'' (2025), **IEEE Access**, vol. 13, pp. 140313-140336. [Paper] [Code]

Mominul Islam, **Mohammad Junayed Hasan**, and M.R.C. Mahdy. ''CQ-CNN: A lightweight hybrid classical-quantum convolutional neural network for Alzheimer's disease detection using 3D structural brain MRI'' (2025), **PLOS ONE**, *20(9), e0331870*. [Paper] [Code]

2024 **Mohammad Junayed Hasan**, Kazi Rafat, Fuad Rahman, Nabeel Mohammed, and Shafin Rahman. ''DeepMarkerNet: Leveraging supervision from the Duchenne Marker for spontaneous smile recognition'' (2024), *Pattern Recognition Letters* (**PRL**), *186, 148-155*. [Paper] [Code]

Alif Elham Khan*, **Mohammad Junayed Hasan***, Humayra Anjum, Nabeel Mohammed, and Sifat Momen. ''Predicting life satisfaction using machine learning and explainable AI'' (2024), **Heliyon**, *10(10)*. [Paper] [Code]

Preprints & Submissions (Selected)

Under Review Alif Elham Khan*, **Mohammad Junayed Hasan***, Humayra Anjum*, and Nabeel Mohammed. ''Shadow loss: Memory-linear deep metric learning for efficient training'', **CVPR 2026.** [Preprint] [Status]

Mohammad Junayed Hasan, and M.R.C. Mahdy. ''Bridging classical and quantum machine learning: Knowledge transfer from classical to quantum neural networks using knowledge distillation'', *IEEE Transactions on Quantum Engineering* (**IEEE TQE**). (Under Review). [Preprint] [Code] [Poster] [Presentation] [Status]

Mahir Afser Pavel, Rafiul Islam, **Mohammad Junayed Hasan**, and M.R.C. Mahdy. ''CLKD-MED: A novel cross-lingual knowledge distillation framework for multilingual clinical outcome prediction'', *Expert Systems with Applications* (**ESWA**). [Status]

Md. Talat Mahmud Tomal, Zahrul Jannat Peya, Nurzahan Akter Joly, **Mohammad Junayed Hasan**, and M.R.C. Mahdy. ''Distill-FusionNet: Lightweight and interpretable deep learning for cross-domain lung cancer diagnosis'', *Knowledge-Based Systems* (**KBS**). [Status]

Waqilur Rahman Chowdhury, Urmi Sen, **Mohammad Junayed Hasan**, and M.R.C. Mahdy. ''QSiamNet: A hybrid quantum-classical siamese network for enhanced similarity-based learning'', *Neurocomputing*. [**Status**]

Rakib Ullah, Mimjamam Ul Haque Monmoy, Syed Nadim Mehdi, **Mohammad Junayed Hasan**, and M.R.C. Mahdy. ''TransMed: A cross-lingual framework for clinical outcome prediction in low-resource healthcare settings,'' *PLOS Digital Health* (**PDIG**). [**Status**]

With Editor   Progga Parmita Roy*, Fahim Shahriar*, Mrittika Roy*, **Mohammad Junayed Hasan**, and M.R.C. Mahdy. ''BGCA-Fusion: Bidirectional Gated Cross-Attention for Multimodal Breast Cancer Diagnosis from Mammograms and Clinical Reports,'' *Medical Image Analysis* (**MIA**). [**Status**]

Md. Shakhawat Hossain, Md. Mehedi Hasan, **Mohammad Junayed Hasan**, and M.R.C. Mahdy. ''QuantDent: A Resource-Efficient Hybrid Quantum-Classical Neural Network for Oral Disease Detection,'' *Quantum Machine Intelligence* (**QMI**).

GRANTS & AWARDS

2024   **Summa Cum Laude Honors**
North South University, Dhaka, Bangladesh
Highest academic distinction; CGPA 3.95/4.00, ranked 2nd (top 0.4%) in class

2023   **Research Grant – ''Best Innovation Idea''**
AdSEARCH, icddr,b, Dhaka, Bangladesh
$35,000 awarded for research proposal on ''Meno-Chat: An Assistive Chatbot Against Menstrual Problems and Menopause Health for Women'' addressing Sexual and Reproductive Health and Rights in Bangladesh
[**Proposal**] [**Poster**]

2022   **Full-Merit Scholarship**
North South University, Dhaka, Bangladesh
Awarded for academic excellence, consistently ranked within top 1% of class

2017   **Two-Year Talentpool Scholarship**
Dhaka Education Board, Bangladesh Government
National standing of 124 out of 1,651,523 students in the Secondary School Certificate (SSC) board examination

PRESENTATIONS & INVITED TALKS

2025   **Conference:** ''Hadamard fusion for facial emotion recognition'' | *IEEE ICDM* (Oral+Poster) [Slides] [Poster]
Conference: ''Predictive blood utilization for transfusion operations'' | *VIBE Summit*, Mayo Clinic [Poster]
NLP Reading Group: ''Are Reasoning Capabilities Present in Base Models?'' | JHU CLSP [Slides]
NLP Reading Group: ''When (and why) RL is effective for reasoning problem?'' | JHU CLSP [Slides]
Invited Talk: ''Evaluating an ambient clinical scribe technology'' | Mayo Clinic Research Symposium [Slides]
Course Research: ''LifeEmbedding: Cloud-native human trajectory modeling'' | JHU Cloud Computing [Slides]
Course Research: ''ICL and CoT based efficient data annotation for low-resource texts'' | JHU NLP [Poster]
Course Research: ''Multi-modal lip reading enhancement with textual and visual cues'' | JHU CV [Slides]

2024   **Course Research:** ''MT quality evaluation for low-resource clinical texts'' | JHU Machine Translation [Slides]
Invited Talk: ''Responsible AI practices in prompt engineering'' | BIGD, BRAC University [Slides]

2023   **Conference:** ''Predicting risks of miscarriage with SNOMED CT'' | SNOMED CT Expo [Slides] [Poster]

TEACHING EXPERIENCE

January 2025 to May 2025   **Graduate Teaching Assistant – Machine Learning**
Johns Hopkins University, Baltimore, MD

- Instructed 200+ graduate students in advanced ML, prompt engineering, and AI agents for Big Data Machine Learning course; used coding assistants to boost coding efficiency by >40%

- Developed 6 project-based assignments solving real-world business problems with big data frameworks
- Led weekly lab sessions on Scikit-learn and PyTorch; provided debugging and technical mentorship, receiving 99% positive teaching evaluations for instructional support and assignment design

January 2024 to Present

AI Instructor & Research Mentor
Mahdy Research Academy, North South University (Remote)

- Developed and delivered comprehensive fundamental and applied research curricula in deep learning, NLP, and quantum machine learning for 150+ students
- Ideated and supervised 15+ research projects in machine translation, medical imaging and clinical NLP, achieving >90% completion rate
- Mentored students through complete research lifecycle resulting in 12 manuscripts (10 submitted to Q1 journals); created open-source educational materials: [**DL Course**] [**QML Course**]
- Teaching slides: [**NLP**] [**GANs**] [**Model Efficiency**] [**QML**]

November 2023 to December 2023

Prompt Engineering Instructor
BRAC Institute of Governance and Development (BIGD), Dhaka, Bangladesh

- Designed and delivered training course on prompt engineering for data analysis, web development, and app development to 50+ beginner and expert freelancers
- Improved productivity by 70% and monthly income by $500/month on average; teaching slides: [**Data Analysis**] [**Web Dev**] [**App Dev**]

September 2020 to November 2023

Undergraduate Teaching Assistant
North South University, Dhaka, Bangladesh

- Instructed 800+ undergraduate students across 3 departments in Python and Java fundamentals, Intro to Machine Learning, Neural Networks and Pattern Recognition, and Intro to NLP courses
- Designed lab materials and led weekly programming sessions, improving student performance by 10-15%; provided technical mentorship for end-to-end term projects with 100% on-time completion

Service to Research Community

Served as reviewer for 10+ manuscripts across multiple academic Q1/Q2 journals (Scientific Reports, ESWA, BSPC, and others) in AI, ML, and NLP domains. 5+ reviews currently in progress. [**Certificates**]

Technical Skills

Programming Languages: Python, Java, C++, SQL, R, MATLAB
ML & Deep Learning: PyTorch, TensorFlow, Hugging Face Transformers, Scikit-learn, XGBoost
NLP: BERT variants, T5, GPT, spaCy, NLTK, Machine Translation, Prompt Engineering
Quantum Computing: Qiskit, PennyLane, TorchQuantum, Quantum Neural Networks
Research & Development: Git, Docker, AWS/GCP, Weights & Biases, TensorBoard, OpenCV, LaTeX
Languages: Bengali (Native), English (Fluent), Hindi (Conversational), Urdu (Conversational)

References

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