

Rameen Mahmood

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EDUCATION

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| New York University, Tandon School of Engineering Doctor of Philosophy in Electrical & Computer Engineering GPA: 4.00 Advisor: Prof. Danny Huang | Brooklyn, NY Sept. 2023 – May 2028 (expected) |
| New York University Abu Dhabi Bachelor of Science in Electrical Engineering (Honors) | Abu Dhabi, UAE Sept. 2019 – May 2023 |

EXPERIENCE

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| Ph.D. Candidate <i>mLab, NYU Tandon School of Engineering</i> | Sept. 2023 – Present Brooklyn, NY |
| Research Intern <i>Clinical AI Lab, NYU Abu Dhabi</i> | Jan. 2023 – Aug. 2023 Abu Dhabi, UAE |
| Undergraduate Research Intern <i>NYU Tandon Summer Research Program</i> | Jun. 2022 – Aug. 2022 Brooklyn, NY |
| Undergraduate Research Intern <i>eBRAIN Lab, NYU Abu Dhabi</i> | Jun. 2021 – Aug. 2021 Abu Dhabi, UAE |
| Undergraduate Research Intern <i>x-Lab (Lab of Computer-Human Intelligence), NYU Abu Dhabi</i> | Sept. 2021 – Jan. 2022 Abu Dhabi, UAE |
| Undergraduate Research Intern <i>Emirates Mars Mission, NYUAD Center for Space Science</i> | Sept. – Dec. 2020 Abu Dhabi, UAE |

SELECTED PROJECTS

A few of my research projects are listed below:

RouterSense. Passive, always-on behavioral monitoring system that infers longitudinal health markers from encrypted home network traffic. Designed a transformer with a shared population backbone and per-user residual adapters for personalized drift detection at scale. *Developed with neurologists at Harvard Medical School, OHSU, and Northwestern.*

What's on My Network? Large Language Models for IoT Device Identification. Fine-tuned LLaMA 3.1 8B on network traffic metadata to identify smart home devices, achieving 98.69% Top-1 and 90.73% macro accuracy across 2,015 vendors on the largest real-world IoT traffic dataset to date. *Deployed in production on IoT Inspector. Provisional patent filed. In collaboration with Google Research.*

Measuring AI Adoption via Network Traffic. Measured AI tool adoption and usage patterns among university students (ChatGPT, Gemini, Copilot) via passive network traffic analysis.

Network Traffic Analysis for Accessibility Research. Developed a multiclassification framework for characterizing assistive technology usage patterns in blind and low-vision users from encrypted network traffic. *In collaboration with ophthalmologists at NYU Langone.*

Embryo Viability Prediction. Contributed to the curation and preprocessing pipeline of a 14,776-embryo multi-modal ART dataset. Developed and evaluated ViT, ResNet-LSTM, and 3D ResNet models, surpassing clinical baselines by >5% in blastocyst viability prediction.

Interpretability & Generalization in CNNs. Characterized CNN generalization via symmetry constraints — embedding anti-symmetry and time-reversal invariance into network design to improve robustness under temporal noise. *Presented at the IEEE Undergraduate Research Technology Conference, MIT.*

SELECTED PUBLICATIONS

- **R. Mahmood**, D. Hu, A. David, Z. Beattie, J. Kaye, et al., D. Y. Huang. “Digital Phenotyping via Passive Network Traffic Monitoring.” *Journal of Medical Internet Research (JMIR)*, 2025 (accepted). [link]
- **R. Mahmood**, T. Ahmed[†], S. T. Peddinti[†], D. Y. Huang. “Large Language Models for Real-World IoT Device Identification.” *ACM CoNEXT 2026* (under review). [preprint] [deployment] [†]Google Research
- D. Hu, **R. Mahmood**, A. David, D. Y. Huang. “Network Traffic as a Scalable Ethnographic Lens for Understanding Students’ AI Tool Practices.” *arXiv:2510.09763*, 2025. [link]
- **R. Mahmood**, D. Y. Huang. “Inferring Speech Dynamics from Encrypted Network Traffic for Early Alzheimer’s Detection.” *Alzheimer’s Association International Conference (AAIC)* (Poster), 2026.
- **R. Mahmood**, D. Y. Huang. “RouterSense: Passive, In-Home Health Monitoring for Older Adults.” *AAAI Fall Symposium on AI for Aging in Place* (Poster), 2024. [PDF]
- **R. Mahmood**, D. Y. Huang. “Your Router as Fitbit: Health Monitoring with Network Traffic.” *IEEE EMBS Body Sensor Networks* (Poster), 2024. [PDF]
- D. Zhylyko, R. Del Gallego, S. Pardo, **R. Mahmood**, et al. “Assisted Reproductive Technology Dataset of Embryo Time-lapse Images and Clinical Data.” *medRxiv*, 2024. [link]

TEACHING

- Teaching Assistant: Machine Learning, Digital Logic, Electronics, Circuits, Signals & Systems (NYU)
- Guest Lecturer: ML for Big Data (CUSP-GX 8083); Network Security (ECE-GY 9383); Big Data Pipelines (ECE-GY 9113) — NYU, 2024–2025

TECHNICAL SKILLS

- **Languages:** Python, C/C++, SQL, Bash, JavaScript, MATLAB, Verilog
- **ML & LLMs:** PyTorch, HuggingFace, QLoRA, PEFT, LoRA, Unsloth, vLLM, DeepSpeed, bitsandbytes, DDP, AutoGluon, TensorFlow, Scikit-learn
- **Networking & Systems:** Wireshark, Scapy, nPrint, Tshark, FastAPI
- **Data & Infra:** SQLite, DuckDB, MongoDB, Docker, GCP, Weights & Biases, BeautifulSoup, Pandas, NumPy, SciPy, SLURM

HONORS & AWARDS

- Finalist, Rhodes Scholarship – Pakistan
- David and Cecilia M. Chang Leadership Award, NYU Tandon