Ranak Roy Chowdhury

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SUMMARY

Machine Learning for time-series in Supply Chain, Forecasting, Wearable Motion, Speech, Audio & Music applications.

WORK EXPERIENCE

Amazon Web Services, Inc. **Applied Scientist II - L5** *(Forecasting)* **Sep 2024 – Present**

Developed and launched a scalable Demand Forecasting toolkit for AWS Supply Chain, delivering $378M in net cash flow gains for hundreds of B2B/B2C clients by reducing stock-outs, excess inventory, and manual forecasting effort.

- Designed a custom forecast evaluation metric that quantifies the business impact of forecast error by balancing overstock vs. stockout costs, providing clear monetary tradeoffs in terms of revenue, cash flow, and profitability.
- Engineered hierarchical forecasting across temporal, spatial, and product hierarchies using top-down, bottom-up and middle-out approaches, plus statistical and ML-based reconciliation, improving accuracy at all aggregation levels.
- Improved forecast accuracy for sparse demand using a novel split-peak attention model and integrated multivariate signals like holidays, pricing and promotions. Resolved the cold-start problem via product lineage and lifecycle graph.

Amazon Web Services, Inc. **Applied Scientist II Intern** *(Audio, Music & LLM)* **Jun 2023 – Sep 2023**

- Developed an LLM with music integration that generates text responses, including music genre, instruments used, mood, and theme, based on music files. Used Encodec audio features in conjunction with FLAN-T5 LLM. [Link]

Qualcomm, Inc **Research Fellow** *(Wearable Sensing)* **Oct 2022 – Sep 2023**

- Developed physics-informed generation model with real-time development on edge devices and text-based contextual knowledge driven framework to enhance zero-shot learning in Human Activity Recognition. [Link]

Amazon Web Services, Inc. **Applied Scientist II Intern** *(Speech, LLM)* **Jun 2022 – Sep 2022**

- Built an accent-robust speech pre-trained model, improving Speech Recognition by 20.4% and Speaker Verification by 6.3%**,** across 12 minority accents**.** Used Domain Adversarial Training with Contrastive Learning on HuBERT. [Link]

Nokia Bell Labs **Data Science Intern** *(Multimodal Time-series & Text Modeling)* **Jun 2021 – Aug 2021**

- Developed an ML pipeline to automate ticket resolution. Conducted data cleaning, preprocessing, visualization on time-series semi-structured system-level log corpus, followed by statistical feature extraction and classification. [Link]

Amazon Web Services, Inc. **Software Development Engineer Intern** *(Explainable AI)* **Jun 2020 – Sep 2020**

- Built a SHAP-based ML Interpretability framework for AWS Redshift, enabling users to write SQL queries to introspect ML model predictions. Improved query execution speed by 2x and memory footprint by 90%. [Link]

EDUCATION

PhD in CS - University of California San Diego **Sep 2019 – Aug 2024**

Thesis: Robust and Data-Efficient Learning for Time-series

MS in CS - University of California San Diego **Sep 2019 – Jun 2022**

BSc in CSE - Bangladesh University of Engineering and Technology **Jul 2014 – Oct 2018**

SELECTED PUBLICATIONS

- **Ranak Roy Chowdhury**, Ritvik Kapila, Ameya Panse, Xiyuan Zhang, Diyan Teng, Rashmi Kulkarni, Dezhi Hong, Rajesh Gupta. ZeroHAR: Contextual Knowledge Augments Zero-Shot Human Activity Recognition. **AAAI** 2025.
- H. Guo, R. Hosseini, R. Zhang, SA Somayajula, **Ranak Roy Chowdhury**, R. Gupta, P. Xie. MLO-MAE: Downstream Task Guided Masking Learning in Masked Autoencoders Using Multi-Level Optimization. **TMLR** 2025. [Link]
- Xiyuan Zhang, Diyan Teng, **Ranak Roy Chowdhury**, Shuheng Li, Dezhi Hong, Rajesh Gupta, Jingbo Shang. UniMTS: Unified Pre-training for Motion Time Series. **NeurIPS** 2024. [Link]
- X Zhang, **RR Chowdhury**, R Gupta, J Shang. Large Language Models for Time Series: A Survey. **IJCAI** 2024. [Link]
- Xiyuan Zhang**, Ranak Roy Chowdhury**, Dezhi Hong, Rajesh K. Gupta, Jingbo Shang. SHARE: Unleashing the Power of Shared Label Structures for Human Activity Recognition. **CIKM** 2023. [Link]
- **Ranak Roy Chowdhury,** Jiacheng Li, Xiyuan Zhang**,** Dezhi Hong, Jingbo Shang, Rajesh K. Gupta. PrimeNet: Pre-training for Irregular Multivariate Time-Series. **AAAI** 2023. [Link]
- X. Zhang, X. Fu, D. Teng, C. Dong, K. Vijayakumar, J. Zhang, **Ranak Roy Chowdhury**, J. Han, D. Hong, R. Kulkarni, J. Shang, R. Gupta. PILOT: Physics-Informed Data Denoising for Real-Life Sensing Systems. **SenSys** 2023. [Link]
- Xiyuan Zhang**, Ranak Roy Chowdhury**, Jingbo Shang, Rajesh K. Gupta, Dezhi Hong. STAug: Towards Diverse and Coherent Augmentation for Time-Series Forecasting. **ICASSP** 2023. [Link]
- **Ranak Roy Chowdhury**, Xiyuan Zhang**,** Jingbo Shang, Rajesh K. Gupta, Dezhi Hong. TARNet: Task-Aware Reconstruction for Time-Series Transformer. **KDD** 2022. [Link]
- X Zhang**, RR Chowdhury**, J Shang, R Gupta. Extending Spatial Coverage of Physical Sensors. **WSDM** 2022. [Link]
- Shuheng Li, **Ranak Roy Chowdhury**, Jingbo Shang, Rajesh K. Gupta, Dezhi Hong. UniTS: Short-Time Fourier Inspired Neural Networks for Sensory Time Series Classification. **SenSys** 2021. [Link]
- **Ranak Roy Chowdhury**, M Adnan, R Gupta. Real Time Principal Component Analysis. **ICDE** 2019 [Link]. **TDS** [Link]

SOFTWARE PROFICIENCIES

Python, Linux, Git, PyTorch, Keras, Tensorflow, fairseq, Hugging Face, NumPy, pandas, SciPy, Matplotlib, Seaborn, scikit-learn, statsmodels, Pillow, OpenCV, NLTK, CoreNLP, Gensim, spaCy, C, C++, Java, Matlab, SQL, PostgreSQL