

# Ranak Roy Chowdhury

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## SUMMARY

Researcher crafting robust and data-efficient time-series algorithms for speech, sensory and healthcare applications.

## HONORS and AWARDS

- Qualcomm Innovation Fellowship 2022. One of the *19 winners among 132 participants* across North America. [\[Link\]](#)
- Halicioglu Data Science Institute Graduate Fellowship 2019. One of the *10 winners among 3906 applicants*. [\[Link\]](#)

## WORK EXPERIENCE

### University of California San Diego Graduate Student Researcher Sep 2019 – Present

- Crafted a self-supervised pretraining method for irregular, asynchronous time-series through sampling density-aware contrastive learning and time-sensitive data reconstruction techniques, improving few-shot downstream performance.
- Developed a self-supervised task-aware data reconstruction technique that uses end-task knowledge to customize the learned representation to boost end task performance, **improving time-series classification** by **2.7%**.
- Devised a globally-attentive multiscale Super-Resolution GAN that uses irregularly spaced sparse data to generate high-resolution spatiotemporal data for regions with no physical sensors, **reducing reconstruction loss** by **3.7%**.
- Innovated a Fourier-transform (FT) inspired weight initialization and learnable Short-Time FT layer redesign to integrate time and frequency domain information, **improving F1 score** for sensory time-series classification by **2.3%**.
- Built an encoder-decoder architecture to model label name semantics that harnesses the shared sub-structure of label names to distill knowledge across classes, **improving accuracy** of human activity recognition tasks by **1.7%**.

### Amazon Web Services, Inc. Applied Scientist II Intern Jun 2022 – Sep 2022

- Built a pre-trained model for accent-robust speech representation that improves performance on several downstream tasks, like **Speech Recognition** by **20.4%** and **Speaker Verification** by **6.3%**, across **12 minority accents** with few minutes of training data. Used Domain Adversarial Training with Masked Reconstruction to induce an accent-invariant output and Accent Classification with Contrastive Learning to infuse accent knowledge into the model acoustic space.

### Nokia Bell Labs Data Science Intern Jun 2021 – Aug 2021

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

### Amazon Web Services, Inc. Software Development Engineer Intern Jun 2020 – Sep 2020

- Built a SHAP-based ML Interpretability framework from SQL surface for AWS Redshift, enabling users to write SQL queries to introspect and evaluate ML model predictions. Reduces data transfer by minimizing S3 access which **improves execution speed** by **2x** and **reduces memory footprint** by **90%** over existing workflow using Sagemaker.

### Bangladesh University of Engineering and Technology Research Assistant Jan 2019 – Aug 2019

- Formulated a **novel** algorithm for dimensionality reduction on streaming data, Real Time Principal Component Analysis (Real Time PCA). Algorithm proven by spectral analysis and Bhattacharyya Distance of **over 0.90**.

## EDUCATION

### University of California San Diego Sep 2019 – Mar 2024 (Expected)

Ph.D. in Computer Science and Engineering. PI: Professor Rajesh K. Gupta

### University of California San Diego Sep 2019 – Jun 2022

M.S. in Computer Science and Engineering. Major: Artificial Intelligence and Machine Learning

### Bangladesh University of Engineering and Technology Jul 2014 – Oct 2018

B.Sc. in Computer Science and Engineering. Major: Artificial Intelligence

## SELECTED PUBLICATIONS

- Ranak Roy Chowdhury**, Jiacheng Li, Xiyuan Zhang, Dezhi Hong, Jingbo Shang, Rajesh K. Gupta. PrimeNet: Pre-training for Irregular Multivariate Time-Series. *AAAI* 2023.
- Xiyuan Zhang, **Ranak Roy Chowdhury**, Dezhi Hong, Jingbo Shang, Rajesh K. Gupta. ESC-GAN: Extending Spatial Coverage of Physical Sensors. *WSDM* 2022. [\[Link\]](#)
- Ranak Roy Chowdhury**, Xiyuan Zhang, Jingbo Shang, Rajesh K. Gupta, Dezhi Hong. TARNet: Task-Aware Reconstruction for Time-Series Transformer. *KDD* 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**, Muhammad Abdullah Adnan, Rajesh K. Gupta. Real Time Principal Component Analysis. *TDS* 2020 [\[Link\]](#), *ICDE* 2019. [\[Link\]](#)
- Xiyuan Zhang, **Ranak Roy Chowdhury**, Jingbo Shang, Rajesh K. Gupta, Dezhi Hong. Enhancing Human Activity Recognition via Label Name Modeling. *[under submission]*

## SOFTWARE PROFICIENCIES

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