Sameep Chattopadhyay

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RESEARCH STATEMENT

Computer Science Ph.D. student at the **University of Washington** with a strong interest in developing speech-based multimodal AI systems for conversational use cases; published work at venues like **EMNLP**, **NAACL**, and **NeurIPS**.

EDUCATION

University of Washington (Seattle) Sep 2025 – Dec 2029 (expected)
Ph.D. in Computer Science, Advisor: Prof. Mari Ostendorf, GPA: 4.0/4.0

Indian Institute of Technology Bombay Nov 2020 - Jul 2025
B.Tech. & M.Tech. in Electrical Engineering + Minor in AI and Data Science, CPI: 9.56/10.00, Department Rank - 1

PUBLICATIONS

- Stateful Inference for Streaming ASR in Conversational Voice Agents* – **EMNLP 2026 (Main)**
- The Cost of Sounding Different: Accent Bias in Audio Language Models – **EMNLP 2026 (Main-** Outstanding Paper**)**
- AMPS: ASR with Multimodal Paraphrase Supervision – **NAACL 2025**
- Parameter-efficient Adaptation of Multilingual Multimodal Models for ASR* – **EMNLP 2024 (MRL Workshop)**
- Observation-free Attacks on Online Learning to Rank* – **NeurIPS 2025 (ACA Workshop)**
- Low-Regret and Low-Complexity Learning for Hierarchical Inference* – Journal Submission
- Context Matters: Leveraging Contextual Features for Time Series Forecasting* – Journal Submission

** denotes primary authorship/contribution.*

RESEARCH EXPERIENCE

Streaming ASR Inference for Voice Agents Jan 2026 – Jun 2026
Research Project under Prof. Mari Ostendorf, University of Washington

- Developed novel **inference-time state management strategies** for streaming ASR models to **preserve useful cross-utterance context** while mitigating errors caused by **long silences** and **conversational backchannels**.
- Demonstrated a **~20% relative reduction** in **turn-onset WER** across two streaming ASR models (**FastConformer-114m** and **Nemotron-0.6b**) on conversational speech benchmarks like **Switchboard** and **CallHome**.
- Achieved consistent improvements for **sub-250 ms latency ASR**, with memory overhead of < **0.6%** of model size.

Accent Biases in Audio-language Models Sep 2025 – Mar 2026
Research Project under Prof. Noah A. Smith, University of Washington

- Developed an empirical **evaluation framework** for measuring biases across accents in audio-language models.
- Performed controlled evaluations of **accent-driven response variation** in audio-language models for **700+** simulated **synthetic interview dialogues**, showcasing systemic biases against speakers of Asian and African accents.
- Conducted human evaluation study (68 participants) to assess the biases under real-world conversational settings.

Speech Recognition for Low-resource Indian Languages Nov 2023 - Oct 2024
Collaborative Project between Amazon India and IIT Bombay under Prof. Preethi Jyothi

- Involved in the development of a **multilingual speech-to-text model** for **10+ low-resource Indian languages**.
- Proposed a novel approach that combines **parameter-efficient finetuning** and **text-only adaptation**, utilizing **cross-lingual transfer learning** for enhancing multimodal multilingual ASR models like **SeamlessM4T**.
- Demonstrated a method forenhancing ASR performance by utilizing **prosodic characteristics** from related languages in **zero-shot settings**, without any labeled speech data in the target low-resource language.
- Obtained a **zero-shot WER reduction** of **17%** using our approach for IndicVoices-Odia, with SeamlessM4T baseline.

Resource-efficient Hierarchical Inference in Edge AI Systems Nov 2024 - Jun 2025

Masters Thesis Project (Part-II)

- Developed a novel **low-cost inference offloading technique** to optimize resource-constrained tiny-ML applications.
- Reformulated the inference offloading process into an uncertainty estimate-based **bandit framework** (HI-LCB)
- Provided the **theoretical bounds** for latency costs and computational complexity for HI-LCB and demonstrated its efficacy over SOTA Hedge-HI with **7% accuracy increase** with lower costs for multi-class image classification.

Adversarial Attacks on Online Ranking Systems May 2024 - Oct 2024

Masters Thesis Project (Part-I)

- Developed low-information attack strategies to promote sub-optimal items in **combinatorial bandit**-based webpage rankers across various **user feedback models** to achieve a **linear regret** with **logarithmic attack costs**.
- Proposed an efficient attack for **combinatorial-UCB1** algorithm with **cascade** and **position-based click models**.
- Simulated a successful attack using under **5K bot-clicks** for recommending horizon of **1 million** on **Cascade-UCB**.

SCHOLASTIC ACHIEVEMENTS

- Received the **Institute Silver Medal** as the **Valedictorian** of the IIT B EE program in a batch of 99 - *2025*
- Awarded **Dora Zee Ling Fellowship** by the Paul G. Allen School of Computer Science & Engineering - *2025*
- Conferred with **Undergraduate Research Award** for exemplary work done in Dual Degree Thesis - *2025*
- Conferred with **Passing Out Color** honor by IIT Bombay for service to the institute beyond academics - *2025*
- Awarded a **$10,000 fellowship** by the **University of Texas at Austin** for research in Multimodal AI - *2024*
- Awarded a **400,000 JPY fellowship** by **Kyushu Institute of Technology** for research in Wearable Robotics - *2022*
- Secured a rank of **355** in **JEE Advanced** and a percentile of **99.86** in **JEE Mains** out of 1.2M candidates - *2020*

PROFESSIONAL EXPERIENCE

Context-aware Time Series Forecasting Summer 2024

*Visiting Scholar at **University of Texas at Austin***

- Developed a novel transformer-based framework for **integrating multimodal contextual information**, such as environmental factors, financial market trades, and textual news articles, into **pre-existing time-series forecasters**.
- Showcased the effectiveness of our technique in **enhancing the prediction quality** of SOTA forecasters across various real-world applications, including **retail sales, energy consumption**, and **air quality forecasting**.
- Achieved an overall **MSE reduction of 13.9%** for the **PatchTST** and **15.5%** for the **iTransformer** architectures by integrating context-aware modules through a plug-and-play finetuning setup across multiple experiments.

Non-linearity Modeling for Telecom Signals Summer 2023

*Involved in designing transceiver chips for high-bandwidth telecom applications at **Texas Instruments, Bangalore***

- Modeled the nonlinear behavior of radio frequency power amplifiers using **generalized memory polynomials**.
- Simulated a **digital pre-distortion module** to correct the nonlinearities for ultra high-frequency telecom signals.
- Designed an equalizer for correcting transmission **channel frequency response** and preventing any channel leakage.

Incorrect Posture Identification in Caregivers Winter 2022

*Visiting Researcher at **Kyushu Institute of Technology**, **Japan***

- Contributed to the development of a smart **artificial muscle suit for posture correction** and **skill training in healthcare workers,** as part of a project funded by the **Japan Society for the Promotion of Science (JSPS)**.
- Engineered a novel **LSTM-VAE model** for efficient encoding and reconstruction of caregiver motions, utilizing **multimodal sensor data** such as temperature, pressure, and gyroscope measurements captured by the muscle suit.
- Implemented **anomaly detection algorithms** using **latent space curve** and **reconstruction SNR** on motion data.

Industrial Energy Data Analysis Summer 2022

Involved in KPI tracking and process benchmarking for sustainable manufacturing at Siemens Ltd. Mumbai

- Performed **predictive time-series analysis** using statistical and machine learning models on industrial energy data.
- Developed **anomaly detection algorithms** and **data quality validation methods** for the Siemens energy meters.
- Presented a proposal for optimizing the **anomaly detection** and data cleansing software across **23** locations.

MENTORSHIP, LEADERSHIP & TEACHING EXPERIENCE

Institute Academic Cabinet Head May 2024 - May 2025

*Led an institute-wide **Academic Rehabilitation Program** with a team of 80+ mentors*

- Heading a guidance program for **120+** vulnerable students, helping them navigate academic and social challenges.
- Drafted policy proposals to standardize course substitution for undergraduate students across all departments.

Alumni & Corporate Engagement Manager May 2022 - May 2023

Headed a team of student coordinators to foster strong alumni ties with the Department of EE

- Catalyzed the process of generating **INR 30 Million** for the department through alumni and corporate donations.
- Introduced policies for alumni-supported **Industry Mentored Projects** to promote core undergraduate research.

Teaching Assistant, IIT Bombay

Created assignments, conducted doubt sessions, and aided with the evaluation for the following courses:

- EE 706: Communication Networks. Instructor: Prof. Sharayu Moharir. Spring 2025
- EE 325: Probability And Random Processes. Instructor: Prof. Sharayu Moharir. Fall 2024
- CS 753: Automatic Speech Recognition. Instructor: Prof. Preethi Jyothi. Spring 2024

SELECTED ACADEMIC PROJECTS

Advancements in Spoken Language Technologies Spring 2023

CS 753: Automatic Speech Recognition

- **Finetuned** a pre-trained **CRDNN ASR** model and utilized it to develop an audio sentiment detection system, obtaining a **word error rate** of **0.37** and a **sentiment detection accuracy** of **76%** on the **Hugging Face SER dataset**.
- Authored a blog and designed a poster scrutinizing some of the latest developments in spoken language technology.
- Analyzed, replicated and presented **MusicYOLO**, a state-of-the-art framework for **musical note detection** and **Automatic Singing Transcription**, winning the **1st prize** for presentation out of the **40+ teams** in the course.

Transformer Models for Seizure Detection Fall 2023

DH 302: Public Health Informatics

- Performed comparative analysis on **time-series transformer autoencoder** and **vision transformer** for EEG data.
- Implemented **data pre-processing methods** for denoising, feature selection, and transformation to spectral domain.
- Achieved **93% accuracy** in seizure identification on the **CHB-MIT** dataset with time-series transformers, utilizing only 4 out of 23 sensor channels, making the model suitable for embedding in wearable devices like headphones.

Non-uniform Sampling Approach for Audio Compression Spring 2023

EE 779: Advanced Topics in Signal Processing

- Implemented algorithms for non-uniform sampling and **time encoding of continuous-time audio signals** using level-crossing detectors and predictive coding techniques, resulting in a binary sparse array representation.
- Utilized methods such as **run length encoding** and **Huffman coding** for efficient storage of binary sparse array.
- Achieved average **reconstruction SNR** of **26 dB** and **compression ratio** of **15.78** for audio stored as wav files.

KEY COURSES

Computer Science and Machine Learning: Advanced ML, Automatic Speech Recognition, Natural Language Processing, Distributed Optimization, Policy for AI, Public Health Informatics, Data Structures and Algorithms

Electrical Engineering: Probability and Random Processes, Speech Processing, Image Processing, Online Learning, Markov Chains and Queuing Processes, DSP, Communication Networks