Niyar R Barman

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EDUCATION

National Institute of Technology Silchar, India	Dec 2021 - May 2025
Bachelors of Technology in Electronics and Communication Engineering	
Indian Institute of Technology Madras, India	Jan 2022 - Jul 2025
Bachelors of Science in Programming and Data Science	
Don Bosco Senior Secondary School, Guwahati, India	June 2018 - Mar 2020
AISSCE (Class 12)	
Don Bosco Senior Secondary School, Guwahati, India	Apr 2008 - Mar 2018
AISSE (Class 10)	

EXPERIENCE

Summer Research Intern — May 2024 - July 2024
Institut de Recherche en Informatique de Toulouse, France — Onsite

- Designed and implemented a novel number embedding system using Fourier transforms, enabling the model to handle a wide range of numerical values more accurately.
- Modified a GPT-style architecture to seamlessly integrate both text and numerical data processing. Trained this 125 M parameter model from scratch on a 800 M tokens dataset on a GPU cluster.
- Implemented a log-scale prediction system for numbers, allowing the model to handle values of vastly different magnitudes. Created a custom loss function and training process to optimize both textual and numerical predictions.

Research Intern — Oct 2023 - *Present*
Xu Lab at Carnegie Mellon Univeristy Computational Biology Department, United States — Remote

- Working on deep learning models for Cryo-ET data analysis and exploring the possibilty of implementing a Visual Question Answering (VQA) pipeline tailored for single particles from Cryo-EM.

Research Intern — Jan 2023 - *Present*
Artificial Intelligence Institute of UofSC, United States — Remote

- Visual Paraphrasing: Conducted an empirical analysis demonstrating the fragility and susceptibility of current image watermarking methods to visual paraphrasing techniques, highlighting their inability to withstand watermark removal. Investigated the effectiveness of visual paraphrasing in removing watermarks under two scenarios: with access to the original AI-generated prompt and when encountering potentially watermarked images in the wild.
- CT^2: Analyzed 100K data points with 15 language models to determine negative log curvature and perplexity values, performed a range of statistical tests, and developed task-specific pipelines.
- AGID: Implemented various existing 2D watermarking methods from scratch and devised strategies for adversarial attacks and visual paraphrasing to remove watermarks from images.
- DeHATE: Developed a pipeline for generating hateful images through stable diffusion, integrated DAAM to pinpoint areas impacted by hate words, and applied mosaic blurring to censor these regions. Additionally, generated hateful images using a hate speech dataset for analysis.

PUBLICATIONS

- Counter Turing Test CT^2: AI-Generated Text Detection is Not as Easy as You May Think – Introducing AI Detectability Index (2023). Megha Chakraborty, S. M Towhidul Islam Tonmoy, S M Mehedi Zaman, Krish Sharma, **Niyar R Barman**, Chandan Gupta, Shreya Gautam, Tanay Kumar, Vinija Jain, Aman Chadha, Amit P. Sheth, & Amitava Das. (*EMNLP MAIN 2023*) (**Honored with the Outstanding Paper Award in the Resources and Evaluation Track**)
- The Brittleness of Image Watermarking Techniques: Investigating Visual Paraphrasing for De-Watermarking AI-Generated Images (2024). **Niyar R Barman**, Krish Sharma, Ashhar Aziz, Shashwat Bajpai, Shwetangshu Biswas, Aman Chadha, Vasu Sharma & Amitava Das. (*Submitted to AAAI 2025*)
- A Transformer-Based Approach to Automate Disease Prediction from Patient Descriptions (2023). **Niyar R Barman**, Krish Sharma & Ranjay Hazra. (*IEEE CICT 2023*)
- Addressing Hate Speech: ATLANTIS for Efficient Hate Span Detection (2023). **Niyar R Barman**, Krish Sharma, Yashraj Poddar, Advaitha Vetagiri & Partha Pakray. (*FIRE 2023*)

OPEN SOURCE CONTRIBUTIONS

- **pytorch**/**examples**: Implemented Vision Transformer using only native PyTorch libraries, trained on the CIFAR-10 dataset

TECHNICAL SKILLS

Programming languages: Python, JavaScript, C, C++, Bash
Libraries & Frameworks: PyTorch, TensorFlow, Keras, Scikit, Django, FastAPI, ReactJS, NextJS, React Native
Tools: Git, Docker
Miscellaneous: AWS, LaTeX, Linux, Windows, Blender

Key Projects

swiftGPT ⚙ swiftGPT
- Developed SwiftGPT, a natural language generation model based on the GPT-2 architecture, specifically trained on an artist's songs dataset to emulate their writing style.
- Implemented a custom BigramLanguageModel using PyTorch, incorporating multi-head self-attention and feed-forward layers. Conducted 5000 training iterations with an AdamW optimizer and monitored train and validation loss to fine-tune the model for creative songwriting.

Viper ⚙ Viper
- Applied Reinforcement Learning and Deep Q Learning principles to develop an AI capable of playing the classic game Snake.
- Implemented the project from scratch using Pygame for the game environment and PyTorch for neural network-based decision-making.

MapSnap ⚙ MapSnap
- Developed MapSnap, a web application that leveraged the Segformer model for real-time semantic segmentation of satellite images. The application generated masked outputs that highlighted affected areas.
- Successfully fine-tuned the Segformer model using the IARAI landslide4sense dataset, resulting in accurate and efficient identification of landslide-prone areas.

DiagnoAI ⚙ DiagnoAI
- Fine-tuned the BERT transformer model to detect 24 common diseases and generate probability scores for the top 3 diseases.
- Curated and labeled a comprehensive dataset of 1200 symptom descriptions associated with 24 diseases, which was used for training and validating the model.

Honors and Awards

- Received a **Fully Funded Summer Research Internship (Travel and Living Cost + Stipend) in France** under Dr. Nicholas Asher.
- Winner of Outstanding Paper award in the Resources and Evaluation Track of **EMNLP 2023**
- 2nd in HateNorm'23, a component of HASOC 2023, by excelling in Task 3, which involved the identification of hateful spans within sentences already categorized as hateful.
- 1st in Neurathon'23, the annual machine learning hackathon organized by the ML Club at NIT Silchar.
- 4th in Un-Flood Assam'22 hackathon organized by the Ministry of Electronics & Information Technology.

Positions of Responsibility

- **EMNLP Presenter**: Presented Counter Turing Test CT^2 (Winner of **Outstanding Paper award** in the Resources and Evaluation Track) at **EMNLP Main** Poster Presentation 2023.
- **Teaching Assistant**/**Moderator**: Conducted introductory classes on Python and Machine Learning for freshmen and sophomores as part of the Machine Learning Club at NIT Silchar.