

ANURAN BHATTACHARYA

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RESEARCH PROFILE

Computer Science researcher specializing in representation learning, verifiable natural language processing, and imitation learning. Proven capability in engineering deterministic, physically-grounded algorithmic architectures and bypassing heavy framework abstractions to design custom neural typologies from scratch. Deeply interested in advancing scalable, trustworthy AI systems that bridge theoretical mathematical foundations with high-stakes, real-world deployment, directly aligning with decision-making and imitation paradigms in modern machine learning.

EDUCATION

University of Calcutta

Kolkata, India

Master of Technology (M.Tech.) in Computer Science & Engineering

Aug 2024 – Jun 2026

CGPA: 8.53 / 10.0 (Grade: 'Ex' - Exceptional)

Dissertation: PHORENSICS: Physics Forensics Framework for Deepfake Detection (Awarded Perfect 10/10)

Focus: Scalable Distributed Systems, Computational Forensics, Deep Learning Architecture

University of Calcutta

Kolkata, India

Master of Science (M.Sc.) in Computer Science

Dec 2022 – Jun 2024

CGPA: 7.48 / 10.0 (Grade: 'O' - Outstanding)

Thesis: BEN-RS-ANN: An Innovative Approach for Revealing Emotion from Bengali Text (Awarded Perfect 10/10)

The Bhawanipur Education Society College

Kolkata, India

Bachelor of Science (B.Sc.) Honours in Computer Science

May 2019 – Jun 2022

CGPA: 8.59 / 10.0

Capstone: Accommodation Rent Prediction in India using Machine Learning (Awarded A+ Grade)

PEER-REVIEWED PUBLICATIONS

1. **Bhattacharya, A.**, Singhanian, A. V., Banerjee, P., Majumdar, R., & Bhounik, D. (2023). "A User Independent Recommendation System for Web Series." *Emerging Technologies in Data Mining and Information Security (Proceedings of IEMIS 2022)*. Springer Lecture Notes in Networks and Systems (LNNS). pp. 595-603.
 - Proposed a personalized recommendation engine that localizes similarity within user-set parameters, programmatically isolating and removing the influence of external user bias.
2. Seal, T., **Bhattacharya, A.**, Das, S., Patra, S., Dawn, D. D., Khan, A., & Setua, S. K. (2025). "BEN-RS-ANN: An Innovative Approach for Revealing Emotion from Bengali Text with Exposure to Polysemy Resolution." *Applied Computing for Software and Smart Systems (Proceedings of ACSS 2024)*. Springer LNNS, pp. 207-223.
 - Engineered a Resource-Scarce Artificial Neural Network (RS-ANN) featuring a novel deterministic

mathematical approach for optimal hidden-layer configuration in low-resource computational linguistic environments.

SELECTED RESEARCH & OPEN-SOURCE ENGINEERING

End-to-End Autonomous Vehicle Navigation (Imitation Learning)

Python, OpenCV, Flask

Behavioral Cloning & CNN Regression | Jul 2020 – Jan 2021

- Engineered an end-to-end behavioral cloning architecture based on the NVIDIA DAVE-2 CNN to learn complex perception-to-control mapping directly from visual data without explicit lane-detection rules.
- Developed robust data preprocessing and augmentation engines utilizing raw RGB telemetry and randomized affine transformations to dramatically improve policy generalization.
- Architected a bidirectional closed-loop client-server environment (Flask/Socket.IO) to stream concurrent real-time telemetry and execute predictive steering control logic dynamically.

AI-Powered Fact Verification System

Python, LLMs, SentenceTransformers

Hybrid NLP & Automated Reasoning | Oct 2025

- Developed a hybrid verification framework combining local Gemma3 LLM reasoning, semantic tracking, and iterative self-improvement loops to validate factual claims against dynamically retrieved documents.
- Implemented an adaptive patience-based convergence mechanism that halts the retrieval/refinement loop once document similarity vectors mathematically stabilize.
- Achieved state-of-the-art performance against the FEVER baseline, improving Precision by +8% and F1-Score by +10% via custom cross-document scrutiny and cosine similarity thresholds.

TxtVis: Multimodal Latent Space Representation

PyTorch, Metric Learning, Streamlit

Manifold Visualization & Topology Construction

- Engineered a “Tabula Rasa” (from-scratch) dual-path PyTorch research pipeline for extracting and visualizing high-dimensional embeddings in both NLP (Skip-Gram) and Computer Vision modalities.
- Bypassed generalized foundational models to design a custom Convolutional Siamese Network, utilizing Contrastive Loss to mathematically force topological embedding separation without pre-trained macro-domain bias.
- Hooked asynchronous UI rendering directly into the PyTorch epoch loop, forcing live telemetry updates (PCA projection, Loss curves) without bottlenecking GPU tensor operations.

PHORENSICS: Physics Forensics Engine for Synthetic Media

Python, Docker, PySpark

Distributed Systems & Generative AI Security | Aug 2025 – Jun 2026

- Published the core algorithmic framework to PyPI (`pip install phorensics`), decoupling core logical operations from Deep Learning dependencies to ensure deterministic, reproducible computational outcomes.

- Architected pure Python routines for Global Spectral Analysis (Fast Fourier Transform), calculating spatial frequency against signal energy to mathematically isolate Generative AI origins beyond standard semantic AI limits.
- Engineered dynamic VRAM tracking and automatic CPU/GPU hot-swapping to prevent Out-Of-Memory (OOM) tensor crashes, encapsulated within a distributed PySpark Docker cluster for parallelized processing.

Accommodation Rent Prediction via Gradient Boosting

CatBoost, Scikit-Learn

Predictive Analytics & Feature Engineering

- Modeled highly nonlinear relationships within structured real-estate datasets using specialized CatBoost regression, mitigating overfitting through ordered boosting.
- Trained computationally efficient, independent localized regression models across major Indian metropolitan datasets to preserve regional micro-economic variance.

ACADEMIC EXPERIENCE

Youth Career Hub

Kolkata, India

Project Instructor – Computer Vision

Jul 2024 – Jan 2026

- Engineered custom architectural solutions for advanced Computer Vision projects, mentoring students in applied AI, test-driven development, and scalable machine learning pipeline design.
- Directed technical code-reviews focused on the strict separation of core Python logic from Deep Learning dependencies (e.g., PyTorch, Keras) to ensure highly maintainable, mathematically rigorous systems.

TECHNICAL SKILLS

Core Engineering: Python (Expert), C++, SQL, PyTorch, Keras/TensorFlow, OpenCV

Systems & Deployment: Docker, Apache Spark / PySpark Cluster Distribution, Linux/UNIX, REST APIs

Machine Learning: Imitation Learning, Metric Learning (Siamese Networks), Contrastive Loss, NLP Transformers

Research Methodologies: Hardware/Memory Management, Custom Algorithm Design, Python Library Packaging