

Purvi Verma

Indian Institute of Technology Bhubaneswar, Odisha, India

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Education

B.Tech in Civil Engineering, May 2024

Indian Institute of Technology Bhubaneswar, India

- Bachelor's Thesis : Detecting sexist texts targeted at Women in Indian context.
- CGPA: 8.2/10

Higher Secondary Exam (12th Standard), March 2020
AISSCE Board

- Score: 92.2%

Matriculation Exam (10th Standard), March 2018
AISSE Board

- Score: 91.6%

Awards and Achievements

- Finalist in the Google Cloud AgenticAI Day Hackathon 🏆.
- Achieved AIR 211 in the JLR Gearshift Code Rally.
- Secured 1st place in the General Championship 2024 (Machine Learning-based Real-time Age and Gender Detection), IIT Bhubaneswar.
- Secured 5th place in the General Championship 2023 (CSS Battle), IIT Bhubaneswar.
- Ranked in the top 25% in Kaggle's Playground Prediction Competition: Regression with Mohs Hardness Dataset.
- Qualified in the Pre-Regional Mathematical Olympiad (PRMO), 2020.

Research Experience

Part-time Research Intern

August 2025 – Present

School of Infrastructure, Indian Institute of Technology Bhubaneswar

Civil Engineering Department, Indian Institute of Technology Bombay

- Advisors: Prof. Mohammad Masiur Rahaman and Prof. Tushar K. Mandal
- Project Title: “**Thermodynamically Consistent Neural Network Plasticity Modeling**”
- Developed finite element simulations in **Julia** using **ADfem** to model nonlinear plastic deformation and stress-strain responses and automatic differentiation frameworks (**Flux**, **Zygote**, **Enzyme**) for scalable and efficient neural network training. 🧠.
- Designed deterministic neural-network-based plasticity models (GAM, NAM, etc.) with thermodynamic consistency constraints to accurately capture constitutive material behavior.

Research Intern 🧠

May 2023 - May 2024

SMMME, Indian Institute of Technology Bhubaneswar

Institute of Computer Science, University of Tartu

- Advisors: Prof. Kisor Kumar Sahu and Prof. Rajesh Sharma
- Project Title: “**Detecting Sexist Texts Targeted at Women in the Indian Context**”
- Collected and preprocessed social media data using **snsrape** (Twitter) and **PRAW** (Reddit), including language normalization, stop-word removal, tokenization, and handling imbalanced class distributions.
- Engineered textual features such as TF-IDF, n-grams, and sentiment scores, and integrated contextual embeddings using **BERT** and **RoBERTa**.
- Developed machine learning and deep learning models including Multinomial Naive Bayes, KNN, ANN, RNN, LSTM, and CNN, experimenting with hybrid architectures for enhanced sequence modeling.

Industry Experience

Senior Associate Data Science

July 2024 - Present

Publicis Sapient

- Designed and implemented AI safety guardrails for Mondelez by integrating computer vision, deep learning, and large language models (LLMs), deploying them as scalable APIs for adaptive protection.
- Developed a multi-turn conversational agent with “bring-your-own-guardrail” capability using LLM orchestration and modular safety layers for dynamic tool invocation and context-aware responses.
- Integrated Multimodal Content Processing (MCP) tools to enforce fine-grained policies and enable user-specific safety adaptation across diverse applications.
- Built ATOMS, an automated system to extract structured elements (titles, authors, figures, disclosures) from scientific posters using vision and NLP, in collaboration with Pfizer and Eli Lilly.

- Collected, cleaned, and structured a large video dataset from YouTube, including subclipping, class-wise organization, and handling missing or invalid data, to prepare it for deep learning model training.
- Designed and implemented a Generative Adversarial Network (GAN) for generating new video frames from single images, optimizing both generator and discriminator architectures and managing adversarial training for improved frame realism. 

Projects

AI-Powered Agricultural Assistant

- Developed a multimodal AI assistant to support Indian farmers by bridging the information gap across the agriculture lifecycle.
- Built using LangGraph, Gemini (Vertex AI), Google Cloud Platform, and Firestore, enabling voice, image, and text input for dynamic advisory on crop selection, government schemes, market prices, and weather alerts.
- Deployed LLM-powered agentic architecture with task-specific agents.
- Integrated real-time geolocation, speech translation, plant disease detection, and market intelligence.
- Engineered a scheme recommendation engine with vector search to match farmers to relevant subsidies.
- Designed for scalability with Kubernetes, Firebase, and future integration with national agriculture APIs.

Safeguard Toolkit — Open-Source Python Security Scanner

- Designed and developed an open-source security analysis toolkit using Python, demonstrating modular design, file system operations, and static code analysis.
- Built custom scanners like **PermissionsChecker** (auditing directory and file permissions) and **EvalExecScanner** (detecting insecure use of `eval()` and `exec()`), showcasing expertise in secure coding practices.
- Packaged and distributed via PyPI with well-documented architecture to support future extensibility.
- Emphasizes strengths in Python packaging, automation, and secure coding, suitable for integration into CI/CD pipelines for pre-deployment risk checks.
- Install the latest release from PyPI: `pip install safeguard_toolkit`.

Physics-Informed Neural Networks for Nonlinear Cantilever Beam Analysis

- Leveraged PyTorch to implement Physics-Informed Neural Networks (PINNs) for analyzing a nonlinear cantilever beam system.
- Compared results from the neural network model with finite element analysis, improving understanding and accuracy of the beam's behavior.
- Conducted comparative study of Galerkin Method vs PINN for solving the nonlinear exact equation of deflection of an elastic beam.

Technical Skills

Programming: Python, C/C++, Julia

Machine Learning & AI: Pandas, NumPy, Scikit-learn, TensorFlow, Keras, PyTorch, SciPy, Seaborn, Matplotlib, Plotly, NLTK, SpaCy, OpenCV, XGBoost, LightGBM, CatBoost

LLM Ops & Frameworks: MLflow, LangChain, LangGraph, LangFlow

Databases: MySQL, MongoDB

DevOps & Cloud: Docker, Kubernetes

Software: Abaqus, STAAD Pro, AutoCAD

Relevant Coursework

ME1L001: Mechanics; CE2L001: Solid Mechanics; CE2L004: Structural Analysis; CS1L001: Programming and Data Structures; CE3L001: Design of Reinforced Concrete Structures; CE3L004: Design of Steel Structures; PHIL001: Physics; MA2L003: Probability, Statistics and Stochastic Process; CE2L005: Hydraulics; CE6L304: Advanced Concrete Technology; MLSL001: Introduction to Machine Learning for Engineers; ME6L011: Finite Element Methods; CE6L029 : Structural Health Monitoring; MI3L012: Mineral Processing Plant Design

Positions of Responsibility

Core Head, Sponsorship Team

April 2022 - May 2023

Civil Engineering Fourn, Indian Institute of Technology Bhubaneswar

- Supervised a team of 40 juniors in contacting sponsoring agencies and preparing them for a seamless transition.
- Secured corporate sponsorships for Civista (civil engineering fest), raising over 1 lakh rupees from 15 partners.

Governor

May 2021 - May 2022

Souls for Solace, Social Welfare Society, Indian Institute of Technology Bhubaneswar

- Led social welfare initiatives including teaching and mentoring orphanage and village students, organizing cleaning drives, conducting animal vaccination campaigns, and coordinating donation drives for clothes and other essentials.

Team Lead

November 2021 - May 2022

Covid Protocol Management Team, Indian Institute of Technology Bhubaneswar

- Ensured compliance with the institute's COVID guidelines at social events, taking corrective actions as needed, particularly during Winter Fiesta (Dec 2021), Republic Day (Jan 2022), and General Championship 2022.

Extra Curricular Activities

- Top 10 finalist in Mime competition at InterIIT'22.
- Captain of Civil Women's Football Team, GC'22 Tournament, IIT Bhubaneswar.
- Winner of dramatics event "Emotional Damage", GC'22 Tournament, IIT Bhubaneswar.
- Hobbies:
 - **Dancing:** Trained Kathak dancer with experience in various dance forms, enhancing creativity, expression, and stage presence.
 - **Pen Art:** Skilled in detailed pen artwork, showcasing patience, precision, and artistic imagination.
- Volunteering:
 - **Fundraising Volunteer, Team Aashraya, Prashraya Welfare Foundation (Jul 2022 – Aug 2022):** Participated in a fundraising campaign, raising 20,000 rupees to support social welfare initiatives; developed teamwork, organizational, and community service skills.