Soumen Kumar Mondal
Center for Machine Intelligence and Data Science (CMInDS)
Indian Institute of Technology Bombay
Specialization: **Artificial Intelligence and Data Science**
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M.S. by Research
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Qualification	Specialization	Institute	Year	CPI/% (R)
MS by Research	Artificial Intelligence & Data Science	Indian Institute of Technology, Bombay	2023 - 2026	9.83 (1^{st})
MTech	Structural Engineering	Indian Institute of Science, Bangalore	2018 - 2020	9.30 (4^{th})
BTech	Civil Engineering	Jadavpur University, Kolkata	2014 - 2018	8.74 (6^{th})
12^{th} Standard	Science (PCM), Languages	Haldia High School (West Bengal Board)	2012 - 2014	89.60 (1^{st})
10^{th} Standard	Science, Arts, Languages	Haldia High School (West Bengal Board)	2011 - 2012	86.85 (2^{nd})

TECHNICAL SKILLS

- **Programming & Scripting Languages:** Python, C, C++, MATLAB
- **Tools and Technologies:** PyTorch, HuggingFace, NumPy, Pandas, TensorFlow, Scikit-Learn, LaTeX, Git, Linux

M.S. BY RESEARCH

- **Improving Alignment and Control in Multilingual LLMs via Preference Optimization and Reinforcement Learning**
  (M.S. Thesis, Advisor: Prof. Preethi Jyothi, CSE, IIT Bombay) *(Spring 2025 - Present)*
  - This work focuses on enhancing the alignment of multilingual LLMs, particularly for low-resource languages, by leveraging preference optimization and reinforcement learning techniquessuch as PPO, RLHF, DPO, SimPO, and CPOto enable advanced model editing, steering, and arithmetic capabilities.
  - Code: https://github.com/soumenkm/ModelEditing (Currently Private)

- **Improving Downstream Task Performance in Multi-lingual LLMs by Intervening Language Specific Neurons**
  (M.S. Thesis, Advisor: Prof. Preethi Jyothi, CSE, IIT Bombay) *(Autumn 2024)*
  - This work investigates language-specific neurons in multilingual LLMs, employing methods like LAPE and activation probability techniques to enhance cross-lingual transfer, but finds that targeted interventions yield limited improvements. The paper **"Language-specific Neurons Do Not Facilitate Cross-Lingual Transfer"** has been accepted (oral) at NAACL 2025 and is available on arXiv at https://arxiv.org/abs/2503.17456.
  - Code: https://github.com/soumenkm/LangSpecificNeurons

- **IIT Bombay - Amazon Collaboration: Localizing Text Across Domains Using RARR Attribution Technique**
  (M.S. R&D Project, Advisor: Prof. Preethi Jyothi, CSE, IIT Bombay) *(Grade: 10, Spring 2024)*
  - Investigated generalizing text generation for localization across domains, e.g., Show me CNN news → Show me NDTV news, using the RARR attribution technique. Developed the benchmark to evaluate LLMs' ability to perform localization, leading to the paper **"LoFTI: Localization and Factuality Transfer to Indian Locales"** (arXiv: https://arxiv.org/abs/2407.11833, accepted at ACL 2025.)
  - Code and Report: https://github.com/soumenkm/RnD_Project

- **Cross-lingual Factual Knowledge Transfer in Multi-lingual Language Models**
  (M.S. Seminar, Advisor: Prof. Preethi Jyothi, CSE, IIT Bombay) *(Grade: 10, Spring 2024)*
  - Inspected the representation of facts in mBERT for cross-lingual knowledge transfer using probeless method.
  - Code and Report: https://github.com/soumenkm/TracingRootFacts

MACHINE LEARNING COURSE PROJECTS

- **FairPO: Robust Preference Optimization for Fair Multi-Label Learning**
  (*Course Project, Optimisation for ML, Prof. Ganesh Ramakrishnan, CSE, IIT Bombay)* *(Spring 2025)*
  - A multi-label classification framework inspired by GRPO partitions labels into privileged and non-privileged set and uses a DPO/SimPO/CPO preference loss to boost fairness (arXiv: https://arxiv.org/pdf/2505.02433, under review at NeurIPS 2025).
  - Code and Report: https://github.com/soumenkm/FairPO

- **Vision Transformer (ViT) Model Fine-Tuning with MillionAID Dataset using LoRA**
  (*Course Project, Advanced Deep Learning for CV, Prof. Biplab Banerjee, CSRE, IIT Bombay)* *(Autumn 2024)*
  - Implemented LoRA from scratch to fine-tune a DINOv2 pretrained ViT model on the MillionAID dataset.
  - Code and Report: https://github.com/soumenkm/IITB-GNR650-ADLCV/tree/main/CodingProject

- **Learning to Classify Images under Noisy Labels using Turtle**
  (*Course Project, Advanced Deep Learning for CV, Prof. Biplab Banerjee, CSRE, IIT Bombay)* *(Autumn 2024)*
  - Tackled label noise learning by combining majority voting (CLIP+DINO trained ViT) with fine-tuning on 90% denoised labels, achieving **88% accuracy** on the CIFAR-100 test set despite 40% noisy labels in the training data.
  - Code and Report: https://github.com/soumenkm/IITB-GNR650-ADLCV/tree/main/Project1
- **Zero Shot Learning (ZSL) for image classification on AwA2 dataset**
  (*Course Project, Advanced Deep Learning for CV, Prof. Biplab Banerjee, CSRE, IIT Bombay)* *(Autumn 2024)*
  - Implemented ZSL using ViT, FastText and NN classifier with class normalization, achieving **40% test accuracy** on the AwA2 dataset (50:50 train-test split) which is fundamentally more challenging than conventional 80:20 split.
  - Code and Report: https://github.com/soumenkm/IITB-GNR650-ADLCV/tree/main/Project2
- **Fine Grained Image Classification on CUB Dataset using EfficientNet**
  (*Course Project, Deep Learning for CV, Prof. Biplab Banerjee, CSRE, IIT Bombay)* *(Spring 2024)*
  - Achieved **75% test accuracy** with only 4.2M parameters, optimizing the accuracy-parameter trade-off for the task.
  - Code and Report: https://github.com/soumenkm/GNR-638-Deep-CV/tree/main/mini-project1
- **Deep Learning based System to Estimate the Calorie Content in Food from Images**
  (*Course Project, Foundations of Machine Learning, Prof. Sunita Sarawagi, CSE, IIT Bombay)* *(Autumn 2023)*
  - Built a calorie estimation system using YOLOv8 for food detection and GrabCut for segmentation, achieving **7.6% mean absolute error** across 19 food classes.
  - Code and Report: https://github.com/soumenkm/CS725-FML-Project

MACHINE LEARNING "FROM SCRATCH" PROJECTS

- **Build GPT2 and BERT from Scratch**: Implemented multi-head self-attention, MLP blocks, and a multi-GPU trainer for pre-training, LoRA fine-tuning, and instruction tuning. Code: https://github.com/soumenkm/Build-LLM-from-scratch, https://github.com/soumenkm/Build-BERT-from-scratch *(Autumn 2024)*
- **Build Diffusion Model (DDPM) from Scratch**: Implemented forward, reverse, sampling processes and trained on CelebHQ dataset. Code: https://github.com/soumenkm/Diffusion-Model-from-Scratch *(Autumn 2024)*
- **Build FFNN from Scratch**: Developed forward, backpropagation and minibatch SGD training loop using NumPy for training a FFNN. Code: https://github.com/soumenkm/ML-Algorithms/tree/main/FFNN *(Autumn 2023)*

WORK EXPERIENCE

- **General Electric (GE Vernova), Bengaluru** *(Aug 2020 - July 2023)*
  System Value Optimisation Engineer (2022-2023): Developed Python modules for fatigue simulation optimization.
  Edison Engineering Development Program (2020-2022): Built Python modules to mitigate fatigue and extreme loads.

MAJOR COURSES AT IIT BOMBAY

- CS 769: Optimisation for Machine Learning, Prof. Ganesh Ramakrishnan, CSE (Dept. Elec.) (*Grade: 10, Spring 2025*)
- GNR 602: Advanced Satellite Image Processing, Prof. BK Mohan, CSRE (Dept. Elec.) (*Grade: 10, Spring 2025*)
- BB 610: Biomedical Micro-systems, Prof. Rohit Srivastava, Bio-Science (Institute Elec.) (*Grade: 10, Spring 2025*)
- GNR 650: Advanced Deep Learning for CV, Prof. Biplab Banerjee, CSRE (Dept. Elec.) (*Grade: 10, Autumn 2024*)
- CS 601: Algorithms and Complexity, Prof. Akash Kumar, CSE (Core) (*Grade: 10, Autumn 2024*)
- SC 607: Convex Optimisation, Prof. Avishek Ghosh, SysCon (Core) (*Grade: 10, Spring 2024*)
- GNR 638: Deep Learning for Computer Vision, Prof. Biplab Banerjee, CSRE (Dept. Elec.) (*Grade: 10, Spring 2024*)
- CS 725: Foundations of Machine Learning, Prof. Sunita Sarawagi, CSE (Core) (*Grade: 10, Autumn 2023*)
- EE 635: Applied Linear Algebra, Prof. Dwaipayan Mukherjee, EE (Core) (*Grade: 9, Autumn 2023*)
- IE 621: Introduction to Probability & Stochastic Process I, Prof. KSM Rao, IEOR (Core) (*Grade: 9, Autumn 2023*)

POSITIONS OF RESPONSIBILITY

- **Teaching Assistant, IIT Bombay**
  - CS 725: Foundations of Machine Learning *(Autumn 2024)*
  - DS 303: Introduction to Machine Learning *(Spring 2024)*

ACHIEVEMENTS

- Received the **Institute Academic Prize** for best academic performance (for securing rank 1) at IIT Bombay. *(2024)*
- Received a **GE spotlight impact award** for reducing cost of business operation at GE Vernova. *(2022)*
- Won the **Innovate 2021 AI/ML challenge** organized by GE Vernova. *(2021)*

HOBBIES

- Reading novels, Listening to music, Watching movies and TV series, Playing Cricket, Chess and Badminton.