Soumen Kumar Mondal
Center for Machine Intelligence and Data Science (CMInDS)
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Specialization: **Artificial Intelligence and Data Science**
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Qualification	Specialization	Institute	Year	CPI/%
MS by Research	Artificial Intelligence & Data Science	Indian Institute of Technology, Bombay	2023 - 2025	9.70
MTech	Structural Engineering	Indian Institute of Science, Bangalore	2018 - 2020	9.30
BTech	Civil Engineering	Jadavpur University, Kolkata	2014 - 2018	8.74
12^{th} Standard	Pure Science, Languages	Haldia High School (West Bengal Board)	2012 - 2014	89.60
10^{th} Standard	Science, Arts, Languages	Haldia High School (West Bengal Board)	2011 - 2012	86.85

TECHNICAL SKILLS

- **Programming & Scripting Languages:** C, C++, Python, MATLAB
- **Tools and Technologies:** NumPy, Pandas, PyTorch, TensorFlow, Keras, Scikit-learn
- **Machine Learning** Neural Networks, CNN, RNN, Transformers, Data Structures & Algorithms
- **Other Skills:** LaTeX, Git & GitHub, Linux

M.S. BY RESEARCH

- **IIT Bombay - Amazon Collaboration: Localizing Text Across Domains Using RARR Attribution Technique**
  (M.S. R&D Project, Advisor: Prof. Preethi Jyothi, CSE, IIT Bombay) *(Jan 2024 - April 2024)*
  - **Problem of localization:** Can we generalize the process of text generation in controlled environment applied to new domains? E.g., "Show me CNN news" $\rightarrow$ "Show me NDTV news".
  - Development of attribution systems to attribute the localized target text generated by modifying the reference text based on target domain. This involves generating questions to attribute the target claim, searching the evidences from internet and finally editing the claim based on the agreement with the collected evidence.

- **Cross-lingual Knowledge Transfer in Multi-lingual Language Models**
  (M.S. Seminar, Advisor: Prof. Preethi Jyothi, CSE, IIT Bombay) *(Jan 2023 - April 2024)*
  - Carried out the literature survey of fine-tuning methods of LLM such as adapter based methods (MAD-X) and sparse fine-tuning methods (Composable SFT)
  - Carried out the literature survey of multi-lingual dataset (mLAMA) and models (mBERT, XLM-R) for effective cross-lingual transfer. Reviewed the geometry of representation of the context from multi-lingual LLM. Inspected the representation of facts in multi-lingual LLM for cross-lingual knowledge transfer using neuron-probe analysis.

MACHINE LEARNING PROJECTS

- **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)* *(July 2023 - Nov 2023)*
  - Developed a calorie estimation system from food images across 19 different food items by integrating YOLO (You Only Look Once) version 8 for food item detection in images and GrabCut algorithm for precise segmentation.
  - Implemented the system using Faster RCNN method for object detection and compared it with YOLO algorithm.
  - Achieved the average **mean absolute error of 7.6%** over the 19 food classes using the YOLO algorithm.

- **Implementation of Deep Learning algorithms**
  (*Hands-on, Foundations of Machine Learning, Prof. Sunita Sarawagi, CSE, IIT Bombay)* *(July 2023 - Nov 2023)*
  - Implemented a feed forward neural network and backpropagation algorithm using *only NumPy* to classify the MNIST digits dataset. Different optimization methods and activation functions are explored.
  - Implemented an encoder-decoder based transformer model using *only Keras layers and Adam optimizer* to develop a machine translation system from English to Portuguese.

- **Fine grained classification on CUB dataset using EfficientNet**
  (*Course Project, Deep Learning for CV, Prof. Biplab Banerjee, CSRE, IIT Bombay)* *(Jan 2024 - April 2024)*
  - Addressed the challenging task of fine-grained classification in computer vision, where objects are categorized into highly specialized classes with subtle differences.
  - Obtained best accuracy-parameter trade-off (**75% test accuracy with just 4.2 million parameters**) in EfficientNet after experimenting and comparing with different other pretrained CNN models such as ResNet, InceptionNet etc. Tuned several hyper-parameters extensively to obtain the best accuracy.

- **Image Deblurring Using Stripformer**
  (*Course Project, Deep Learning for CV, Prof. Biplab Banerjee, CSRE, IIT Bombay)* *(Jan 2024 - April 2024)*
  - Addressed the challenging task of image deblurring in computer vision that involves removing the blurring artifacts from images or videos to restore the original, sharp content.
  - Obtained best PSNR-parameter trade-off (**33% test PSNR with just 3.8 million parameters**) in Stripformer after experimenting and comparing with different other models such as Unet, Deblur-GAN etc.

WORK EXPERIENCE

- **General Electric (GE Renewable Energy), Bengaluru**
  (Edison Engineering Development Program) *(Aug 2020 - July 2022)*
  - Involved in the development of Python based modules to mitigate the fatigue and extreme exceedances for mechanical components of wind turbines. Incorporated Python in simulation software (ANSYS) to automate the calculation of stress and displacements using finite element analysis.
  - Applied Python and Matlab extensively to implement the mathematical models behind the load case optimisation method and for data visualization. **Received a GE spotlight impact award** for reducing the extreme load case seeds of more than 70% than the current methodology.
  - Won the **Innovate 2021 AI/ML challenge** organized by GE for designing a sensor that automatically detects metallic objects in real time in front of MRI room to prevent accidents.

  (System Value Optimisation Engineer) *(July 2022 - July 2023)*
  - Developed a Python based module that creates a wind turbine configuration and checks the stability and operability issues of the Flex model. Developed a Python based systems level load comparison method to mitigate the wind turbine loads.
  - Contributed as a developer in a Python based prototype tool to reduce the cost of simulation as a part of fatigue simulation optimisation efforts.

MAJOR COURSES AT IIT BOMBAY

- CS 725: Foundations of Machine Learning, Prof. Sunita Sarawagi, CSE (*Grade: 10, Autumn 2023*)
- EE 635: Applied Linear Algebra, Prof. Dwaipayan Mukherjee, EE (*Grade: 9, Autumn 2023*)
- IE 621: Introduction to Probability & Stochastic Process I, Prof. KSM Rao, IEOR (*Grade: 9, Autumn 2023*)
- SC 607: Optimisation, Prof. Avishek Ghosh, SysCon (*Grade: 10, Spring 2024*)
- GNR 638: Deep Learning for Computer Vision, Prof. Biplab Banerjee, CSRE (*Grade: 10, Spring 2024*)
- DS 691: R&D Project, Prof. Preethi Jyothi, CSE (*Grade: 10, Spring 2024*)
- DS 694: Seminar, Prof. Preethi Jyothi, CSE (*Grade: 10, Spring 2024*)

POSITIONS OF RESPONSIBILITY

- **Teaching Assistant, IIT Bombay**
  - **DS 303: Introduction to Machine Learning** *(Spring 2024)*
    Assisted a diverse batch of Bachelors to clear their difficulties, conducted coding tutorial sessions and also helped the professor in evaluation.

ACHIEVEMENTS

- Scored **97.11** percentile in GATE 2023 CS among **97,630** candidates *(2023)*
- Secured **Department Rank 4** among 20 students of MTech batch at IISc Bangalore *(2020)*
- Secured **AA grade** in MTech project at IISc Banagalore *(2020)*
- Scored **98.71** percentile in GATE 2018 CE among **154,496** candidates *(2018)*
- Secured **Department Rank 5** among 120 students of BTech batch at Jadavpur University *(2018)*

HOBBIES

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