Manav Nitin Kapadnis

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Education

Carnegie Mellon University — Pittsburgh, USA
Master of Science in Intelligent Information Systems — *Aug' 2024 – Dec'2025*

Indian Institute Of Technology Kharagpur — Kharagpur, India
Integrated Dual Degree (B. Tech + M. Tech) in Electrical Engineering; Minor in Computer Science; CGPA: 9.00/10.00 — *2019 – 2024*

Shubham Raje Jr. College — Mumbai, India
Grade XII (MH-HSC); Valedictorian; Percentage : 91.24% — *2017 – 2019*

Achievements & Awards

- Awarded the prestigious **Prof. G. S. Sanyal Cup** for the highest contribution to Technology among the graduating students of IIT Kharagpur in the academic year 2023-24.
- Bestowed **Institute Order of Merit** for outstanding performance in Technology among the graduating students of IIT Kharagpur
- Awarded **5000 USD Guru Krupa Foundation Scholarship** by **IIT KGP Foundation of USA** for summer internship at **Inria, Paris**
- Selected to be part of **Google Research Week 2024** amongst the top **150** undergraduate researchers from all over India
- Achieved an All India Rank of **1367** and **4463** in JEE Advanced 2019 and JEE Mains 2019 out of 945k and 236k students respectively

Publications And Preprints

1. **A. Nandy*, M.N. Kapadnis*, Y. Agarwal, M. Das, A. Patwa, P. Goyal, and N. Ganguly - MPSLIP: Multimodal Pre-training Framework for Procedural Reasoning on Text and Image Data** : Under-Review at CIKM 2024
2. **B. Mohapatra*, M.N. Kapadnis*, L. Romary, and J. Cassell - Evaluating the Effectiveness of Large Language Models in Establishing Conversational Grounding** : Under-Review at April ARR 2024
3. **A. Nandy*, M.N. Kapadnis*, S. Patnaik, Y. Butala, P. Goyal, and N. Ganguly - FastDoc: Domain-Specific Fast Pre-training Technique using Document-Level Metadata** : Accepted at Transactions on Machine Learning Research (TMLR)
4. **M.N. Kapadnis*, S. Patnaik*, A. Nandy, S. Ray, P. Goyal, and D.Sheet - SERPENT-VLM: Self-Refining Radiology Report Generation Using Vision Language Models**: Accepted at Clinical NLP workshop at NAACL 2024
5. **A. Nandy*, M.N. Kapadnis*, P. Goyal, and N. Ganguly - CLMSM: A Multi-Task Learning Framework for Pre-training on Procedural Text** : Accepted at EMNLP-Findings 2023
6. **A. Mullick*, A. Nandy*, M.N. Kapadnis*, S. Patnaik, R. Raghav, and R. Kar - An Evaluation Framework for Legal Document Summarization** : Accepted at LREC 2022
7. **A. Mullick*, A. Nandy*, M.N. Kapadnis*, S. Patnaik, and R. Raghav - Fine-grained Intent Classification in the Legal Domain** : Accepted at AAAI 2022 (SDU Workshop)
8. **M.N. Kapadnis, A. Subasi, and A. Bhattacharya- Artificial Intelligence based Alzheimer's Disease Detection using Deep Feature Extraction**
   Book Chapter in the Book published by Elsevier - Applications of Artificial Intelligence in Medical Imaging
9. **M.N. Kapadnis*, S. Patnaik*, S.S. Panigrahi*, V. Madhavan*, and A. Nandy - Leveraging Pre-trained Language Models for Key Point Matching** : Accepted at EMNLP 2021 (Argument Mining Workshop)
10. **G.H. Seng, T.Maul, and M.N. Kapadnis - CoCoTiNe : Compositional Committees of Tiny Networks**
    Accepted in Main conference at International Conference On Neural Information Processing 2021

Research Experience And Internships

Conversational Grounding Acts Understanding in Large Language Models | ALMAnaCH Team | Inria — June 2023 – Aug 2023
*NLP Research Intern at under **Prof. Justine Cassell**, Research Director at Inria, Paris* — *Paris, France*

- Created a robust **conversational grounding** dataset, rigorously evaluating it across LLMs such as **T5, Godel, Llama, and GPT4** and used diverse perplexity metrics and conducted comprehensive **Meetup** Dataset testing, including Anaphora, Perplexity, & Encoder tests
- Evaluated model performance, showcasing GPT-4's improvement with **100%** accuracy in perplexity tests in Request - Acknowledgment and **80% accuracy** in Reference Ambiguity tests, and conducted comparative assessments against models such as GPT-3.5 and T5
- Concluded that advanced models like GPT-4 exhibit superior conversational grounding capabilities, demonstrated by their high performance ratios, through in-depth analysis, indicating a promising direction for future research in dialog systems

AI Research & Development Team, AWL Inc. — May 2023 – June 2023
Machine Learning Researcher under Dr. Intisar Chowdhury, Team lead Advance R & D at AWL Inc. — *Remote*

- Spearheaded an SSL project for Re-Identification, enhancing pre-training with a novel similarity-based preprocessing pipeline
- Performed deduplication of the PA-100K dataset to optimize it by **20%** by employing K-Nearest Neighbour based cosine similarity preprocessing and deduplication pipeline; achieved a Rank@1 score of **0.376** with the ViT model on the MarketReID dataset
- Implemented **Soft Mixture of Experts** in Self-Supervised Learning models' analysis on very poor-quality in-house image datasets, achieving **30%** improvement over company SoTA in age prediction using MegaAge-Asian and Tiny Faces datasets

Sony Research India — Dec 2022 – April 2023
Recommendation Systems Researcher under Prosenjit Biswas, Research Scientist at SRI — *Bangalore, India*

- Developed a **knowledge-aware recommendation system** with NMCLK framework using KG-based graph attention networks, introducing three graph views and performing Contrastive Learning leading to **8.77% improvement** in NDCG@20 over KGAT model
- Outperformed existing models by achieving a **0.279 NDCG@20** score and a **0.4156 MRR@20** score on the MovieLens-100k dataset, through the integration of knowledge graph embedding and multi-level contrastive learning in the NMCLK framework
- Optimized the NMCLK framework with a noise injection strategy, thus elevating its recommendation robustness, and achieving a **2.2% rise** in Recall@20 on the ML-100K dataset and a striking **11.13% leap** in MRR@20 on the larger ML-1M dataset

Racism and Violent Incidents Detection in Historical Archives | **Rutgers University** Nov 2021 – Jan 2022
Data Analytics Intern under Prof. Kiran Garimella (Ex-MIT) and Prof. Aaditya Dar (ISB, Hyderabad) *Remote*

- Conducted an analytical study of violent incidents throughout the country over a period of **100** years with the help of newspaper articles
- Achieved an accuracy score of **94.5%** by implementing **BART**, a pre-trained Transformer as classifier of violent and non-violent articles
- Analysed the causation of violent incidents and riots in the country by collaborating with a team from **ISB Hyderabad** and **MIT**

Complex Networks Research Group | **IIT Kharagpur** Aug 2021 – Jan 2022
NLP Researcher under Prof. Pawan Goyal and Prof. Niloy Ganguly *Kharagpur, India*

- Devised a **fast pretraining strategy** for transformer based document encoder using **document metadata** and **product taxonomy**
- Proposed a novel loss function by combining **triplet margin** (anchor, similar & dissimilar documents) and **hierarchical loss**
- Achieved **1%** increment in Macro F1 score by leveraging **FastDoc BERT, RoBERTa** models on QA datasets like SQuAD 2.0, TechQA

Complex Networks Research Group | **IIT Kharagpur** | **Paper accepted at LREC 2022** June 2021 – Aug 2021
NLP Research Intern under Prof. Pawan Goyal and Prof. Niloy Ganguly *Kharagpur, India*

- Developed a new summarization metric, which takes the help of intent of the document for the evaluation of generated summary
- Achieved better relevance and overall human satisfaction scores as compared to other automated metrics such as **BLEU** & **ROUGE-L**
- Achieved best **Spearman's correlation** of **0.34** for the proposed metric when contrasted with automated metrics using **human scores**

Compositional Committees of Tiny Networks |**University of Nottingham**| **Paper accepted at ICONIP 2021**May 2021–June 2021
Deep Learning Intern under Prof. Tomas Maul *Nottigham, Malaysia*

- Designed and implemented a new form of compositional ensembles that speeds up computations in deep neural networks
- Achieved an increase in speed by **25.7** times in a standard CPU setup as compared to 6-layered CNN without any reduction in accuracy
- Surpassed **MLP-Mixer** (SOTA) in terms of speed by exploiting the composition of the hidden representations of classifiers

AI based Alzheimer's Detection using Deep Feature Extraction | **University of Turku, Finland** Dec 2020 – Jan 2021
Deep Learning Researcher Under Prof. Abdulhamit Subasi *Turku, Finland*

- Designed 2 and 3 layered CNNs, achieving **95%** accuracy in classifying Brain MRI scans into four different Alzheimer's stages
- Enhanced model performance by fine-tuning the **VGG-16** architecture on Alzheimer's dataset, elevating classification accuracy to **96%**
- Integrated Machine Learning models with the **ResNet-50** pre-trained architecture, pushing the classification accuracy beyond **96.5%**

Positions Of Responsibility

Head | **Technology Robotix Society, IIT Kharagpur** **August 2019 - April 2024**

- Spearheading a **4-tier** team of over **45** robotics enthusiasts in spreading the culture of Robotics & Artificial Intelligence throughout India
- Organised several robotics events, tutorials, and workshops with an annual footfall of **2000+** students achieving a **20% YOY** increment
- Successfully organised **Winter School of AI Robotics** sponsored by **IEEE** Kharagpur and mentored **500+** freshers in a **14-day** workshop

Senior Member | **Kharagpur Data Analytics Group, IIT Kharagpur** **August 2021 - August 2023**

- Launched workshops on **ML/DL** for students across the country & organized **research paper-reading sessions** for 100+ students
- Organized Kharagpur Data Science Hackathon & Summer AI Challenge with **2200** and **1600** registrations and prize pool of **60000 INR**
- Conducted **Panel Discussions** on Research Internships in AI/ML & **Guest Lectures** on Role of Data Science in Business Problems

Relevant Coursework

Computer Science : Probability and Stochastic Processes (EX) | Machine Learning Foundations and Applications (EX) | Deep Learning Foundations and Applications (EX) | Machine learning for Earth System Sciences (EX) | Computer Architecture And Operating System (A) | Algorithms-I (A) | Algorithms Lab (A) | Artificial Intelligence Foundations & Applications (*) | Data Analytics (*)

Others: Linear Algebra in Signals & Systems (A) | Medical Image Analysis (A) | Signal Processing And Systems Design Laboratory (EX) |

Skills And Expertise

Programming: C | C++ | Python | LATEX | MATLAB | MySQL | **OS**: Windows | Linux | Ubuntu | MacOS |
Libraries and Frameworks: Tensorflow | Pytorch | Numpy | Pandas | OpenCV | Matplotlib | Git | HuggingFace | Plotly | Tableau |

Extra Curricular Activities

- Mentored five freshmen students under the **Student Welfare Program**, under the aegis of the Dean of Student Affairs, IIT Kharagpur
- Volunteered with **Swarajya Pratishthan** in **Satana**, playing a key role in **COVID-19** relief efforts. Organized and distributed essential supplies, collaborated with health officials for awareness campaigns, and assisted in establishing temporary healthcare facilities
- **Volunteering**: Actively contributed to **EMNLP 2021** and **COLING 2022** by meticulously coordinating workshop schedules, ensuring timely sessions, and providing comprehensive, dedicated support to presenters throughout the duration of the conferences
- **Reviewer**: Main Conference @ NAACL 2024, SDU Workshop @ AAAI 2022 , SMM4H Workshop @ COLING 2022
- **Teaching Assistantship**:
  - Assisted lab sessions and ensured students grasped the hands-on applications of the Control And Instrumentation Lab (Fall '23) & Deep Learning (Spring '24)
  - Graded lab reports, offered constructive feedback, and held weekly office hours to address student queries and provide further assistance
  - Successfully mentored a batch of **56 students**, with **95%** of them achieving a grade of 'B' or higher in the lab component