Nischal Ashok Kumar

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SUMMARY

Researcher experienced in Machine Learning (ML) and Natural Language Processing (NLP) designing algorithms in educational, scientific, and social-media domains.

EDUCATION

University of Massachusetts (UMass), Amherst — **Sept 2022 - Present**
Doctor of Philosophy (MS-PhD), Computer Science — ***GPA: 4.0/4.0***

Indian Institute of Technology (IIT), Patna — **July 2018 - May 2022**
Bachelor of Technology (B.Tech), Computer Science and Engineering — ***CGPA: 9.38/10***, *Institute Rank: 3/265*

EXPERIENCE

Applied Scientist II Intern, Amazon Web Services — **New York City, USA**
Mentors: • Marvin Dong • Jiarong Jiang — *June 2023 - Sept 2023*

- **Project: Building helpful Text-to-SQL systems**
- Identified 5 ambiguous and 4 unanswerable categories of user questions in Text-to-SQL systems. Prompted LLMs to construct a conversational dataset containing over 50k samples spread across 50 databases.
- Proposed three tasks and benchmarked the dataset using state-of-the-art LLM prompting and fine-tuning approaches.

Research Assistant, CICS UMass — **Amherst, MA, USA**
Advisor: • Prof. Andrew Lan — *Sept 2022 - Present*

- **Project: ML and NLP for Educational Applications**
- Designed a causal RNN model for predicting the relationship between skills in student observational data. [Among the top performers in the Task-3 of the NeurIPS 2022 CausalML for Education Challenge]
- Proposed a method to generate human expert-aligned questions for reading comprehensions using data augmentation and over-generate-and-rank which shows a 5% absolute increase in the ROUGE-L score on a popular dataset.
- Proposed an LLM-based compiler-in-the-loop iterative refinement system to generate test cases for buggy student codes that accurately measure their ability. Using RL techniques for generating personalized test cases for students.

Research Scientist Intern, SciSpace — **Bangalore, India**
Advisor: • Dr. Tirthankar Ghosal — *May 2022 - August 2022*

- **Project: Multimedia (Slides and Poster) Generation from Scientific Articles**
- Built an end-to-end service for creating long, medium, and elevator-pitch slides with posters for over 2M scientific articles
- Proposed a pipeline consisting of multi-modal information extraction using clustering-based extractive summarizer, sentence-transformer-based image ranker, and multi-tasking SciBERT-based contribution statements retriever

Undergraduate Researcher, AI-NLP-ML Lab — **IIT-Patna, India**
Advisor: • Prof. Asif Ekbal — *July 2019 - May 2022*

- **Undergraduate Thesis: Explainable Multi-Modal Novelty and Emotion based Fake News Detection**
- Proposed a novel pipeline for natural language based explanaiblity for multimodal fake news using evidence from the web
- Proposed a novel contrastive learning approach using novelty and emotion for multimodal fake news with self-procured background knowledge which gives 7% improvement over the previous state-of-the-art (SOTA).
- Proposed a novel multi-tasking neural network architecture giving SOTA results on 4 datasets (ByteDance, FNC, Covid-Stance and FNID with 7.73%, 3.69%, 7.95% and 13.38% improvement) which has been integrated with Wipro Research

Summer Research Intern, IBM Research AI — **Bangalore, India**
Research Managers: • Nitin Gupta • Hima Patel — *May 2021-Aug-2021*

- **Project: Detecting Ambiguity in Input-Output Annotations for Programming By Example (PBE) Systems**
- Identified five ambiguous properties that hinder the generalization of data transformation programs.
- Proposed an interpretable multi-task neural network architecture for detecting ambiguity. The architecture improves the performance of PBE modules by pointing regions of ambiguity hence generating programs as per user's intent.

Undergraduate Researcher, DKE Group — **University of Wuppertal, Germany**
Advisors: • Dr. Terry Ruas • Prof. Dr. Bela Gipp — *Dec 2020-May 2021*

- **Project: Analysis of Transfer Learning Approaches for detecting Covid-19 Fake News**
- Performed masked-language-modeling (MLM) based pre-training of general neural language models (BERT, RoBERTa, DeBERTa etc.) on Covid-19 corpus, CORD-19. Showed empirically that tokenizers and models tailored to the CORD-19 corpus do not provide a significant advantage over general-purpose ones.

AI Research Intern, Video Analytics Laboratory — **Indian Institute of Science, Bangalore, India**
Advisor: • Prof. Venkatesh Babu — *May 2020-Aug 2020*

- **Project: Unlabeled Data from Different Distribution for Adversarial Robustness**
- Constructed new loss functions combining Cross-Entropy and KL Divergence. Performed domain adaptation using Data-Enriching GANs between Cifar-100 and Cifar-10 datasets. Showed that unlabeled data from a different distribution is as competitive as the fully-supervised setting (within 2% error margin) against iterative FGSM and PGD-20 attacks.

SELECTED PUBLICATIONS

* denotes equal contribution

- **N Ashok Kumar**, N Fernandez, Z Wang, A Lan, **"Improving Reading Comprehension Question Generation with Data Augmentation and Over-generate-and-rank"**, 18th Workshop on Innovative Use of NLP for Building Educational Applications (BEA) co-located with the Association for Computational Linguistics (ACL-2023) [***Outstanding Paper Award***][Paper] [Code]
- **N Ashok Kumar**, W Feng, J Lee, H McNichols, A Ghosh, A Lan, **"A Conceptual Model for End-to-End Causal Discovery in Knowledge Tracing"**, 16th International Conference on Educational Data Mining [Paper] [Code]
- **N Ashok***, R Kumari*, T Ghosal and A Ekbal, **"A Multi-task Learning Approach for Fake News Detection: Novelty, Emotion, and Sentiment Lend a Helping Hand"**, International Joint Conference on Neural Networks, [Paper] [Code]
- **N Ashok***, R Kumari*, T Ghosal and A Ekbal, **"Misinformation detection using multitask learning with mutual learning for novelty detection and emotion recognition"**, Journal of Information Processing and Management, Elsevier, **IPM-2021**, (Impact Factor: 6.222) [Paper] [Code] [WHO Website]
- **N Ashok***, JP Wahle*, T Ruas, N Meuschke, T Ghosal and B Gipp, **"Testing the Generalization of Neural Language Models for Covid-19 Misinformation Detection"**, International Conference on Information, iConference 2022, Springer [Paper] [Code]
- V Gupta, R Kumari, **N Ashok**, T Ghosal and A Ekbal , **"MMM: An Emotion and Novelty-aware Approach for Multilingual Multimodal Misinformation Detection"**, Findings of the Association for Computational Linguistics: AACL-IJCNLP 2022 [Paper] [Code]

Pre-prints

- **N Ashok Kumar**, N Gupta, S Guttula, H Patel, **"Multi-Intent Detection in User Provided Annotations for Programming by Examples Systems"** [Paper]

AWARDS and HONORS

- **Victor Lesser Graduate Scholarship in Artificial Intelligence** - Awarded to a top PhD student specializing in AI at UMass.
- **UMass Common Good Fellowship** - for Spring 2023 for working on computing problems for the common good.
- **UMass CICS Doctoral Scholarship** - Received an entry scholarship of 4000$ among the Fall-2022 admits.
- **IIT-Patna Merit List** - 3rd Rank for the institute in the IIT-Patna B.Tech Class of 2022 among 265 students.
- **Best CSE Undergraduate Thesis Nomination IIT-Patna** - for my work on fake news detection.
- **Summer Research Fellow 2020** - (Indian Academy of Sciences) for pursuing a research internship in AI at IISc Bangalore.
- **Fellowship (KVPY'2016)** - Young Scientist Incentive Plan Govt. of India - Stood among top 0.2% among 200,000 students.
- **Academic Excellence Award** - Ranked 2nd among 100,000 students in 10th Standard public exam (ICSE'2016).

SERVICE and LEADERSHIP

- **Conference Volunteer** - NAACL-2021, ICML-2021, ACL-IJCNLP-2021
- **Volunteer** - Ph.D. application support committee (PASP UMass), New Student Committee UMass CICS.
- **Head of ML and AI** - NJACK - CS Club (IIT-Patna) - Introduced NJACK ML Workshop Series.
- **Departmental Lead** - DSC IIT-P - Facilitator of Explore-ML Workshop IIT-P powered by Google-AI.
- **Mentor** - Institute Student Mentorship Program (IIT-Patna) (2020-2022).
- **Project Mentor** - NJACK Winter of Code Open Source Programme'2019 - [ML Project Link].
- **Facilitator** - Delivered four (one-hour) talks in the Reinforcement Learning Seminar Series - IBM Research AI.
- **Teaching** [Link] and **writing blogs** [Link] on ML and AI
- **Lead** - Entrepreneurship-Cell IIT-Patna - Introduced Entrepreneur-101 series and organized 4 sessions on entrepreneurship.
- **Social Worker** - National Service Scheme IIT-Patna - Led the rural entrepreneurship division.

SKILLS

- **Programming Languages:** • Python • C/C++ • Java • Bash • Verilog • Assembly
- **Deep Learning Tools:** • PyTorch • HuggingFace • AllenNLP • Tensorflow • Keras
- **Other tools:** • SQL • Docker • LaTeX • Git/GitHub