

Aniket Vashishtha

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EDUCATION




Present Aug 2024	University of Illinois Urbana-Champaign MS in Computer Science (<i>Thesis Track</i>), Advisor - Prof. Hao Peng	Illinois, USA
Aug 2022 Aug 2018	Guru Gobind Singh Indraprastha University B.Tech., Information Technology	New Delhi, India

EXPERIENCE

Aug 2024 Apr 2023	Microsoft Research  <i>Pre-Doctoral Research Fellow - Advisor: Dr. Amit Sharma, Prof. Vineet Balasubramanian</i> › Developed methods to leverage imperfect experts (LLMs) for accurate causal discovery and effect estimation. Work accepted at ICLR'25 conference. › Designed novel training strategies using an axiomatic framework, enabling a 67M-parameter model trained from scratch to outperform models like Gemini Pro and GPT-4 on complex causal graphs.	Bangalore, India
Aug 2022	<i>AI Center Fellow Advisor: Sameer Segal</i> Led a multifaceted effort merging HCI research, software development, design, and psychology to build a workplace mental health application currently deployed at Microsoft Research India.	
Jan 2022	<i>Research Intern - Advisors: Prof. Monojit Choudhury, Dr. Sunayana Sitaram</i> › Led a Responsible AI project to assess biases in LLMs for text prediction models used in production. Created custom checklists to analyse social biases and the effect of using harm mitigation strategies on performance. › Proposed bias evaluation metrics for Multilingual LMs, addressing embedding-based limitations. Introduced evaluation and debiasing methods focusing on Indian languages for broader inclusivity. › Work accepted in EACL'23 and ACL'23	
Jan 2022 Mar 2021	Inria <i>Research Intern - Advisors: Dr. Adrien Coulet, Dr. Joel Legrand</i> Worked on the identification of discontinuous entities using segmental hypergraph and dependency graphs on Pharmacogenomics corpora.	Remote/Paris, France
Apr 2021 Sep 2020	IIIT Delhi - TavLab Research Group  <i>Research Intern - Advisor: Prof. Tavpritesh Sethi</i> Optimized vaccine allocation for Indian states via Reinforcement Learning and compartmental models. Also conducted a spacio-temporal analysis of the vaccine infodemic using NLP.	New Delhi, India
Mar 2021 Aug 2020	Umgraumeio (formerly Sintecs)  <i>Data Science Intern - Advisor: Antonio Leblanc</i> Enhanced fire detection in Brazilian forests using computer vision, satellite imagery and live on ground image analysis, surveilling over 8 million hectares.	Remote/Sao Paulo, Brazil

PUBLICATIONS

W = WORKSHOP, C=CONFERENCE, J=JOURNAL (* = EQUAL CONTRIBUTION)

- [W.1] **Teaching Transformers Causal Reasoning through Axiomatic Training** 
[Aniket Vashishtha](#), Abhinav Kumar, Abbavaram Gowtham Reddy, Vineeth N. Balasubramanian, Amit Sharma
“Reasoning and Planning for LLMs” @ ICLR’25 [Reasoning and Planning for LLMs@ICLR’25]
- [C.3] **Causal Order: The Key to Leveraging Imperfect Experts in Causal Inference** 
[Aniket Vashishtha](#), Abbavaram Gowtham Reddy, Abhinav Kumar, Saketh Bachu, Vineeth N. Balasubramanian, Amit Sharma
The Thirteenth International Conference on Learning Representations [ICLR’25]
- [C.2] **On Evaluating and Mitigating Gender Biases in Multilingual Settings** 
[Aniket Vashishtha](#)*, Kabir Ahuja*, Sunayana Sitaram
Annual Conference of the Association for Computational Linguistics [ACL’23 Findings]

- [C.1] **Performance and Risk Trade-offs for Multi-word Text Prediction at Scale** [🔗]
 Aniket Vashishtha, S Sai Krishna Prasad, Payal Bajaj, Vishrav Chaudhary, Kate Cook, Sandipan Dandapat, Sunayana Sitaram, Monojit Choudhury
European Chapter of the Association for Computational Linguistics [EACL'23 Findings]
- [J.2] **Mining Trends of COVID-19 Vaccine Beliefs on Twitter With Lexical Embeddings: Longitudinal Observational Study** [🔗]
 Harshita Chopra*, Aniket Vashishtha*, Ridam Pal, Ashima, Ananya Tyagi, Tavpritesh Sethi
Journal of Medical Internet Research Infodemiology [JMIR Infodemiology'23]
- [J.1] **VacSIM: Learning effective strategies for COVID-19 vaccine distribution using reinforcement learning** [🔗]
 Raghav Awasthi, Keerat Kaur Guliani, Saif Ahmad Khan, Aniket Vashishtha, Mehrab Singh Gill, Arshita Bhatt, Aditya Nagori, Aniket Gupta, Ponnurangam Kumaraguru, Tavpritesh Sethi
Intelligence Based Medicine Journal [IBM'22]

SELECT RESEARCH PROJECTS

Teaching Transformers Causal Reasoning through Axiomatic Training FEB'24 - PRESENT
Advisors: Dr. Amit Sharma, Prof. Vineeth Balasubramanian

- Introduced *Axiomatic Framework*, a new training paradigm for language models. Our 67M-parameter model, trained on simple causal chains, outperforms billion-scale LLMs and rivals GPT-4 in inferring cause-effect relations in complex graphs.
- Our approach uses structured perturbations in training data to train transformers for robust understanding of causal transitivity axiom and d-separation rule for identifying conditional independence.
- Architectural adjustments in transformers are explored to improve their generalization to unseen causal structures, also extending to complex tasks like inferring causality from correlational statements.
- Work accepted at *Reasoning and Planning workshop* at **ICLR'25**, and also covered by multiple outlets [1],[2]

Causal Inference using LLM-Guided Discovery APR'23 - PRESENT
Advisors: Dr. Amit Sharma, Prof. Vineeth Balasubramanian

- Evaluated LLMs as pseudo domain experts for identifying real-world causal relationships, emphasizing causal order's role in downstream tasks and showing LLMs' potential in accurate order prediction.
- Incorporated innovative probing strategies for precise causal order estimation, surpassing limitations of prior pairwise methods. Integrated In-Context Learning and Chain-of-Thought to optimize LLMs for causal reasoning.
- Leveraged LLM outputs as priors to enhance discovery algorithms like constraint-based and score-based methods. Our LLM pipelines yielded substantial improvements in causal order inference compared to baselines.
- Work accepted at **ICLR 2025**, presented at the *CaLM Workshop* as an **oral presentation** at **CaLM@Neurips 2024**, and will also be integrated with **DoWhy** & **PyWhy** package for causal inference.

On Evaluating and Mitigating Gender Biases in Multilingual Settings AUG'22 - JAN'23
Advisor: Dr. Sunayana Sitaram

- Examined bias evaluation and mitigation in multilingual models, focusing on non-western languages. Addressed social bias challenges in diverse languages, offering resources and techniques for improved scalability.
- Developed a benchmark to assess gender biases in pre-trained masked language models across various Indian languages, to address limitations of existing embedding-based metrics.
- Observed that debiasing methods designed for English do not apply well to other languages, especially non-western ones and often exacerbates bias in multilingual settings.
- Work accepted at **ACL'23 Findings**

Performance and Risk Trade-offs for Multi-word Text Prediction at Scale JAN'22 - OCT'22
Advisor: Prof. Monojit Choudhury, Dr. Sunayana Sitaram

- Assessed toxicity detection methods using our proposed checkList based dataset for improving fairness of text prediction systems, targeting various harm levels across different demographic groups.
- Created a benchmark dataset encompassing various social facets (sexual orientation, nationality, etc.) to evaluate LLM's performance in predicting toxic content, and assessing prediction severity based on context.
- Our work uncovers bias in LLM-based predictors towards certain groups, which can be mitigated with hate classifiers to improve fairness, though resulting in reducing system's effectiveness.
- Work accepted at **EACL'23 Findings**

TALKS

- “Teaching Transformers Causal Reasoning through Axiomatic Training ”** [📍] November 2024
‣ Gave a talk at the Causal Data Science Workshop, a prestigious event by Maastricht University and Copenhagen Business School for academics and industry professionals focused on causal applications.
- “Causal Inference using LLM-Guided Discovery”** [📍] November 2024
‣ Gave a talk at *LLM-CP workshop* for our work accepted as an **Oral** presentation at **AAAI’24**.
- “Unlocking the Potential of Language Models: Empowering Education, Enhancing Experiences and Beyond”** [📍] September 2023
‣ Led a 2-day workshop in Kerala on the potential of LLMs and practical strategies for rural education, tailored for non-technical participants, including professors and students from fields like Botany and Physics.
- “On Evaluating and Mitigating Gender Biases in Multilingual Settings”** June 2023
‣ Delivered a talk on our ACL’23 paper in Reading group of Speech & NLP Group, MSR India
- “Performance and Risk Trade-offs for Multi-word Text Prediction at Scale”** September 2022
‣ Delivered a talk on our EACL’23 paper in Reading group of Speech & NLP group, MSR India
- “How To Break Into Data Science and AI Research”** [📍] March 2022
‣ Delivered a talk on how to pickup Data Science and research in AI to 500+ undergraduate students

HONOURS AND AWARDS

- Receipient of the JN Tata Scholarship** [📍]
Recipient of the prestigious JN Tata Scholarship, a competitive merit-based scholarship loan awarded to a select number of students across India for pursuing higher education.
- Recieved Travel Grant of 1500 USD for ICLR’25** [📍]
Recieved travel grant for 1500 USD to present my research at ICLR’25.
- Winner of Microsoft Turing’s Large Scale Models for Inclusion Hackathon Challenge, 2022** [📍]
Developed an Inclusivity Toolkit to diagnose the biases of language models across various dimensions by bringing together numerous bias detection methods in the literature
- Spotlight Presentation at MIT’s Conference ‘Vaccines for All’, 2020** [📍] [📺]
Research on building RL based framework for vaccine allocation got featured as a part of the spotlight presentation
- High Commendation Award for Trinity Challenge, 2021**
Our submission, *“Privacy-preserving Crowdsourcing for Citizen Engagement in Pandemics”*, was recognized as a Highly Commended Solution at The Trinity Challenge.

LEADERSHIP AND VOLUNTEERING ROLES

- Causal NLP Reading Group, MSR India** *Founding Member and Coordinator* APR’23 - AUG’24
Started a weekly reading group to discuss research in causal machine learning, LLMs, and related areas. Hosted speakers from University of Toronto, IIT Bombay, and other insitutions.
- PathCheck Foundation (MIT)** *Data Science Researcher* FEB’21 - MAY’21
Contributed to COVID-19 solutions at PathCheck Foundation, an MIT spinoff, by developing impactful strategies for mitigating the effects of the pandemic.
- Red Dot Foundation - Safecity** *Data Analytics Volunteer* APR’20 - DEC’20
Led data-driven initiatives to combat harassment against women and support the LGBTQ+ community in Indian cities through crowdsourced crime reporting, chatbot development, inclusive education.
- Project Sunshine** *Education Support Volunteer* JUN’19 - AUG’19
Provided academic mentorship in Math, Science, and Python to underprivileged girls, along with teaching beat-boxing as an extracurricular activity to children.

ACADEMIC SERVICE

- Reviewer** ACL’25, Re-Align Workshop @ICLR’25, Reasoning and Planning for LLMs @ICLR’25, Behaviour ML @NeurIPS’24, 4th Workshop on NLP for Indigenous Languages of the Americas’24, LREC’22