# Atharva Kulkarni

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## Education

**Carnegie Mellon University, School of Computer Science** — **Pittsburgh, PA**
*Master of Language Technologies (GPA: 4.06/4.0)* — *August 2024*
*Advisors: Prof. Barnabás Póczos*

## Pre-prints/ Under Review Papers

1. **Atharva Kulkarni***, Lucio M. Dery*, Amrith Setlur, Aditi Raghunathan, Ameet Talwalkar, Graham Neubig . **Multitask Learning Can Improve Worst-Group Outcomes** (*Accepted at NeurIPS 2023 SSLTheoryPractice Workshop & Under Review at TMLR 2024*)
2. **Atharva Kulkarni***, Amey Hengle*, Shantanu Patankar, Rashmi Gupta. **You Might be More Than Just Depressed: Exploring Social Media Discourse Surrounding Comorbid Mental Health Disorders** (*To be submitted to ACL 2024*)

## Selected Publications (*Google Scholar*) (* denotes equal contribution)

1. **Atharva Kulkarni**, Bo-Hsiang Tseng, Joel Moniz, Dhivya Piraviperumal, Hong Yu, Shruti Bhargava. **Towards Few-Shot Dialog State Tracking with Synthetic Data** (*EACL 2024*)
2. Dhananjay Ashok, **Atharva Kulkarni**, Hai Pham, Barnabás Póczos. **The student becomes the master: Matching GPT3 on Scientific Factual Error Correction** (*EMNLP 2023 Findings & NeurIPS 2023 SyntheticData4ML Workshop*)
3. **Atharva Kulkarni***, Sarah Masud*, Vikram Goyal, Tanmoy Chakraborty. **Revisiting Hate Speech Benchmarks: From Data Curation to System Deployment** (*SIGKDD 2023*)
4. **Atharva Kulkarni**, Raya Das, Ravi Srivastava, Tanmoy Chakraborty. **Learning & Reasoning Multifaceted Longitudinal Data for Poverty Estimates and Livelihood Capabilities of Lagged Regions in Rural India** (*IJCAI 2023*) (*AI for Social Good Award!*)
5. **Atharva Kulkarni***, Shivam Sharma*, Tharun Suresh, Himanshi Mathur, Preslav Nakov, Md. Shad Akhtar, Tanmoy Chakraborty. **Characterizing Entities in Harmful Memes: Who is Hero, Villain, Victim?** (*EACL 2023*)
6. **Atharva Kulkarni***, Megha Sundriyal*, Vaibhav Pulastya, Md. Shad Akhtar, Tanmoy Chakraborty. **Empowering the Fact-checkers! Automatic Identification of Claim Spans on Twitter.** (*EMNLP 2022*)
7. **Atharva Kulkarni***, Shivani Kumar*, Md Shad Akhtar, Tanmoy Chakraborty. **When did you become so smart, oh wise one?! Sarcasm Explanation in Multi-modal Multi-party Dialogues** (*ACL 2022*)
8. Leonie Weissweiler, Valentin Hofmann, Anjali Kantharuban, Anna Cai, Ritam Dutt, Amey Hengle, Anubha Kabra, **Atharva Kulkarni**, Abhishek Vijayakumar, Haofei Yu, Hinrich Schuetze, Kemal Oflazer, David R Mortensen. **Counting the Bugs in ChatGPT's Wugs: A Multilingual Investigation into the Morphological Capabilities of a Large Language Model** (*EMNLP 2023*)

## Research Experience

**Apple Inc** — **Seattle, WA**
*Research Intern | Manager: Dr. Hong Yu* — *May 2023 – Aug 2023*
- Worked with the **Siri Conversation Understanding team** on few and zero-shot dialog state tracking using LLMs. (*EACL 2024*)

**Carnegie Mellon University** — **Pittsburgh, PA**
*Research Assistant | Advisor: Prof. Barnabás Póczos* — *Jan 2023 – Present*
- Working on improving **worst group-generalization** using $\mathcal{V}$-Usable Information and trust-regions based regularization.
- Worked on **factual error correction** using modular LLMs and constrained decoding. (*NeurIPS 2023 SyntheticData4ML Workshop & EMNLP 2023 Findings*)

*Research Assistant | Advisor: Prof. Graham Neubig* — *August 2022 – Aug 2023*
- Explored the impact of **constrained multi-task learning** for improving worst-group generalization. (*Accepted at NeurIPS 2023 SSLTheoryPractice Workshop & Under review at TMLR 2024*)

**IIIT Delhi** **Delhi, India**

*Predoctoral Researcher / Research Associate | Advisor: Dr. Tanmoy Chakraborty* *March 2021 – July 2022*

- Devised an adapter-based RoBERTa model with quasi-attention to **incorporate structural constraints** through domain-specific descriptions for claim span identification. Improved the SOTA by **1.5% in F1-score**. (*EMNLP'22*)
- Developed a mixture-of-experts based multilingual BERT, utilizing user ego network, user history, and semantic exemplars for **robust hate speech classification amidst subpopulation and covariate shifts**. Improved over baseline by **5% F1 on worst-performing class**. (*SIGKDD'23*)
- Developed an **audio-visual BART** with multimodal context aware attention for **sarcasm explanation generation**, improving over the best baseline by **3 rouge** and **7 bleu points**. (*ACL'22*)
- Curated a **meme dataset** for semantic role labeling of meme entities. Benchmarked it with **optimal transport** based **multimodal DeBERTa** with **visual** and **commonsense knowledge**. (*EACL'23*)
- Organized the shared task at **CONSTRAINT-2022 Workshop, ACL 2022**. (*CONSTRAINT ACL'22*)

**IIT Bombay** **Bombay, India (Remote)**

*Research Collaborator | Advisor: Dr. Rashmi Gupta* *July 2021 – July 2022*

- Curated a novel Reddit dataset for **depression-anxiety comorbidity** classification. Developed mental health diagnosis scales based prompting strategies for comorbidity classification. (*To be submitted to ACL 2024*)

## Other Selected Projects

**$\mathcal{V}$-Usable Information based LLM Pruning** **Jan 2023 - May 2023**

- Designed a $\mathcal{V}$-usable information based iterative magnitude pruning (ITM) technique that takes into account example difficulty for LLM compression. The pruning method effectively mitigates bias, enhances worst-group robustness, and preserves top-line performance compared to naive ITM. (*Report*)

**Continual Learning via Winning Subnetwork Selection** **Jan 2023 - May 2023**

- Proposed a Winning SubNetworks (WSN) based technique for worst-group generalization that identifies the most effective subnetworks for each sub-group while preserving previously chosen weights. Achieved competitive performance with group-DRO on CIFAR100. (*Report*)

**Training Dyamics and Entropy-Aware Mixup for Robust Text Classification** **August 2022 - Dec 2022**

- Developed a robust mixup technique that generates synthetic samples by interpolating pairs of high and low entropy datapoints of easy-to-learn and ambiguous examples in a label aware fashion. Reported an improvement of about **2% in f1-score** on the 2 benchmarks datasets. (*Report*)

**Concept Grounding in Multimodal Models** **August 2022 - Dec 2022**

- Proposed a conceptually robust data augmentation approach using prompt engineering and diffusion models to generate conceptually grounded synthetic VQA examples. Evaluated performance of multimodal models on concept-invariant and concept-equivariant augmentations and highlighted the shortcomings. (*Report*)

## Academic Service

- **Teaching Assistant:** 11-711 Advanced NLP (Fall 2023), 11-611 NLP (Spring 2023)
- **Reviewer:** ARR 2024, EMNLP 2022-23, ACL 2023, NeurIPS 2023 Workshop (SSLTheoryPractice23, R0-FoMo), ICON 2022
- **Conference Volunteer:** EACL 2023, ACL 2021-22', EACL 2021
- **Workshop Organizer:** CONSTRAINT Workshop co-located with ACL 2022

## Achievements and awards

- **CMU LTI Research Fellowship** (monthly stipend of $3330 USD and coverage of tuition fees for academic year 2023-24)
- **Best AI for Social Good Project - IJCAI 2023**, for research on poverty estimation using ML techniques.(*Award link*)
- Winner of the **EACL WASSA 2021 Shared Task**.
- Winner of the ICON 2020 **TechDoFication Shared Task**.
- **Bachelor's thesis awards**: $2^{nd}$ place amongst 33,000 teams and cash prize of **2,00,000 INR** at the **ZS Prize Competition**. $2^{nd}$ place at **ASPIRE 2020**, a national project competition organized by Computer Society of India (CSI).

## Technical Skills

- **Languages:** Python, C++ | **Libraries & Frameworks:** Pytorch, Huggingface, Tensorflow, Keras, Scikit-learn, NLTK, spCay, Gensim, OpenCV | **Tools:** Git, Latex