KUMAIL ALHAMOUD

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Current Research Summary

Currently working on evaluation and post-training for multimodal reasoning models. I built NegBench, which reveals why vision-language models (e.g. CLIP, LLaVA, AIMv2) misinterpret negation, and it provides synthetic datasets that measurably improve negation understanding after finetuning. I also worked on applications like FedMedICL, which stress-tests medical AI under realistic shifts (e.g. pandemics). My first-authored work has been published at diverse venues (e.g., CVPR, TMLR, MICCAI, Computers & ChemE) and featured by MIT News, MIT CSAIL, and New Scientist. I've collaborated with research teams at Google, Samsung, and Foxconn, and I've consulted for PwC.

Education

Massachusetts Institute of Technology (MIT)   **September 2023 – Present**
PhD, Computer Science and Artificial Intelligence Lab (CSAIL); GPA: 5.0/5.0 (A)   *Cambridge, MA*
- PhD Supervisor: Prof. Marzyeh Ghassemi
- **Relevant Courses:** Large Language Models, Hardware Architecture of Deep Learning
- **Main Programming Language and Framework:** Python and PyTorch

King Abdullah University for Science and Technology (KAUST)   **September 2021 – July 2023**
M.S, Computer Science; GPA:3.96/4.00 (A)   *Thuwal, Saudi Arabia*
- Thesis Advisor: Prof. Bernard Ghanem
- **Relevant Courses:** Deep Generative Modeling, Low-resource Deep Learning, Algorithms in Bioinformatics

Cornell University   **May 2021**
B.S, Electrical and Computer Engineering; GPA: 4.13/4.30 (A+)   *Ithaca, NY*
- *Summa Cum Laude*
- Dean's List, all semesters
- **Relevant Courses:** Computer Vision, Natural Language Processing, Digital Signal Processing, Deep Learning

Publications

(* indicates equal contribution; clicking on paper title links to paper)

- ***Kumail Alhamoud****, Sepehr Ranjbar*, Marzyeh Ghassemi. "SpaceVLM: Sub-Space Modeling of Negation in Vision-Language Models", *Preprint 2025*.

- Hasan Hammoud, ***Kumail Alhamoud***, Elie Bou-Zeid, Marzyeh Ghassemi, Bernard Ghanem. "Train long, think short: Curriculum learning for efficient reasoning", *Preprint 2025*.

- Olawale Salaudeen, Haoran Zhang, ***Kumail Alhamoud***, Sara Beery, Marzyeh Ghassemi. "Aggregation Hides OOD Generalization Failures from Spurious Correlations", *NeurIPS 2025*. [**Spotlight Paper**]

- ***Kumail Alhamoud***, Shaden Alshammari, Yonglong Tian, Guohao Li, Philip Torr, Yoon Kim, Marzyeh Ghassemi. "Vision-Language Models Do *Not* Understand Negation", *CVPR 2025*.

- ***Kumail Alhamoud****, Yasir Ghunaim*, Motasem Alfarra, Thomas Hartvigsen, Philip Torr, Bernard Ghanem, Adel Bibi, Marzyeh Ghassemi. "FedMedICL: Towards Holistic Evaluation of Distribution Shifts in Federated Medical Imaging", *MICCAI 2024*.

- ***Kumail Alhamoud****, Yasir Ghunaim*, Abdulelah Alshehri, Guohao Li, Bernard Ghanem, Fengqi You. "Leveraging 2D Molecular Graph Pretraining for Improved 3D Conformer Generation with Graph Neural Networks", *Computers and Chemical Engineering 2024*.

- ***Kumail Alhamoud****, Hasan Abed Al Kader Hammoud*, Motasem Alfarra, Bernard Ghanem. "Generalizability of Adversarial Robustness Under Distribution Shifts", *Transactions on Machine Learning Research (TMLR) 2023*. [**awarded a Featured Certification → presented in ICLR 2024**]

- Yasir Ghunaim*, Adel Bibi*, **Kumail Alhamoud**, Motasem Alfarra, Hasan Abed Al Kader Hammoud, Ameya Prabhu, Philip Torr, Bernard Ghanem. "Real-Time Evaluation in Online Continual Learning: A New Hope", *CVPR* 2023. [**Highlight Paper,** *top 2.5%*]

- Andrés Villa, Juan C. Alcazar, Motasem Alfarra, **Kumail Alhamoud**, Julio Hurtado, Fabian Caba, Alvaro Soto, Bernard Ghanem. "PIVOT: Prompting for Video Continual Learning", *CVPR* 2023.

- Andrés Villa, **Kumail Alhamoud**, Juan C. Alcazar, Fabian Caba, Victor Escorcia, Bernard Ghanem. "vCLIMB: A Novel Video Class Incremental Learning Benchmark", *CVPR* 2022. [**Oral Paper,** *top 2.5%*]

- Akshay Ajagekar, **Kumail Alhamoud**, Fengqi You. "Hybrid Classical-Quantum Optimization Techniques for Solving Mixed-Integer Programming Problems in Production Scheduling", *IEEE Transactions on Quantum Engineering* 2022.

- Sherry Liang, Khalid Alanazi, **Kumail Alhamoud**. "Set covering problem", *Cornell University Computational Optimization Open Textbook Chapter* 2020.

Recent Work Experience

Foxconn   July 2025 – Present
AI Research Intern   *Taipei, Taiwan*

Enhancing Reasoning in Large Language Models (LLMs)
- Designed and implemented post-training strategies to strengthen the reasoning capabilities of FoxBrain, Foxconn's proprietary LLM, leveraging reinforcement learning methods such as DPO, PPO, GRPO, and Dr. GRPO.

MIT, Healthy ML Group   August 2023 – Present
PhD Student Researcher   *Cambridge, MA*

Enhancing Negation Understanding of Vision-Language Models with Synthetic Data
- Proposed a benchmark to evaluate negation understanding in VLMs, which involves recognizing what is *not* present in an image; highlighted a severe limitation in current models and innovated a synthetic data approach to mitigate this issue.

PwC   July 2024 – July 2025
AI Research Consultant (Part-Time)   *Remote*

Strategic AI Advisory for Government Transformation
- Authored strategic studies on Human-Centered AI, Enterprise RAG, and AI Agents as Government Partners, providing clear explanations and actionable recommendations tailored to decision makers.
- Designed roadmaps for implementing these technologies by benchmarking 20 global case studies across 7 sectors and embedding best practices such as UNESCO AI Ethics Guidelines.

University of Oxford, Torr Vision Group   May 2024 – September 2024
Visiting PhD Student Researcher   *Oxford, UK*

Advancing Reliable Decision-Making with Large Language Models (LLMs)
- Developed innovative uncertainty quantification techniques to guide decision-makers on when to trust LLM outputs, improving decision-making processes under conditions of uncertainty.

Awards & Recognition

CVPR Outstanding Reviewer Award   **2025**

SACM Fellowship for PhD Studies (up to four years of PhD Funding)   **2023-2027**

MIT Jameel Clinic PhD Fellowship for ML and Health ($100,000 **award for one year**)   **2023**

KAUST Fellowship for MSc Studies   **2021**

The MISK Fellowship   **2021**

Outstanding Teaching Assistant Award at Cornell University   **2021**
- Awarded by the Information Science Department; nominated by professor for taking lead of all in-class activities

2021 Rhodes Scholarship Finalist (only 8 finalists from my constituency)   **2021**

Academic and Teaching Experience

Academic Reviewer for Top-Tier Research Publication Venues *2022 – Present*
- Including CVPR, ECCV, NeurIPS, ICLR, MICCAI, ML4H, JAMIA, and TPAMI

Teaching Assistant *2019 – 2022*
- CS 323 Deep Learning for Visual Computing, Prof. Bernard Ghanem, KAUST
- CS 4300 Language and Information, Prof. Cristian Danescu-Niculescu-Mizil, Cornell (Received the Best TA Award)
- CS 2800 Discrete Structures, Prof. Anke van Zuylen, Cornell
- ECE 3250 Mathematics of Signals and System Analysis, Prof. David Delchamps, Cornell

Research Presentations

ECCV24 Workshop on Emergent Visual Abilities and Limits of Foundation Models *September 2024*
- **Vision-Language Models Do *Not* Understand Negation**
  Kumail Alhamoud, Shaden Alshammari, Yonglong Tian, Guohao Li, Philip Torr, Yoon Kim, Marzyeh Ghassemi

*KAUST Conference on Scientific Computing and Machine Learning [**Best Poster Award**]* *November 2022*
- **Chemistry-informed Graph Representation Learning for Molecular Conformation Generation and Beyond**
  Kumail Alhamoud, Yasir Ghunaim, Guohao Li, Bernard Ghanem

Cornell Engineering Learning Initiatives Summer Presentation *August 2020*
- **Harnessing Quantum Computing to Improve the SOTA in Solving Industrial-Scale Scheduling Problems**
  Kumail Alhamoud, Akshay Ajagekar, Fengqi You

Boston University 22nd Annual UROP Undergraduate Research Symposium *October 2019*
- **DNA Sequence Alignment Framework for Sequence Pathogenicity Screening**
  Kumail Alhamoud, Samuel M.D. Oliveira, Douglas Densmore