Hamza Tahboub

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EDUCATION

- **Northeastern University, Khoury College of Computer Sciences** Boston, United States
  Bachelor of Science — Computer Science and Mathematics; GPA: 3.96, Dean's List *2021 – 2025*
  Relevant Courses: Practical Neural Networks, Adv. Linear Algebra, Statistics and Stochastic Processes, Data Management and Processing, Number Theory, C++ Programming, Matrix Methods in Machine Learning, Object-Oriented Programming, Group Theory

SKILLS

- **Languages**: Python, Java, C++, SQL, LaTeX, Lisp, MATLAB, C#
- **Tools**: PyTorch, Git, LangChain, Hadoop, Spark, NumPy, Pandas, Sklearn, Matplotlib, Mongo, Azure, GCP, AWS

EXPERIENCE

- **Professor Huaizu Jiang's Visual Intelligence Lab — Northeastern University** Boston, MA
  Research Assistant *Dec 2024 – Present*
  - Formulated the novel problem of unifying diverse multimodal social interaction understanding tasks.
  - Designed and implemented a visual language model (VLM) architecture that can leverage the synergies between different social tasks to attain positive transfer between them.
  - Beat two popular open-source VLMs of similar parameter capacity to our model on four of five tasks; our model was the only one able to consistently leverage task synergy in joint training.
  - Preparing a submission to top conferences this year presenting our competitive method.

  Full-Time Undergraduate Research Fellowship *Aug 2024 – Dec 2024*
  - Led a computer vision project on social interaction modeling from an egocentric/first-person perspective.
  - Designed and tested transformer-based architectures to leverage advantages of egocentric data (*e.g.*, what and who each agent is looking at) while mitigating disadvantages (*e.g.*, the shakiness of the viewpoint).
  - Tackled the problem of strategy understanding in social games, achieving a joint accuracy of 78.2% compared to the 66.5% reported in the paper that introduced this task.
  - Devised and formulated new loss functions that pull together the embeddings of utterances that should have the same strategies.

  Research Assistant *Aug 2022 – Aug 2024*
  - Was awarded the Summit undergraduate research award in support of my work, including funding.
  - Researched the reasoning capacity of language models (LMs) and general long-form video understanding.
  - Demonstrated how, contrary to common belief at the time, medium-sized LMs cannot benefit from chain-of-thought prompting in the same way that LLMs do.
  - Carried out a comprehensive analysis of state-of-the-art methods, implementing papers such as "Towards Long Form Audio-visual Video Understanding" from scratch in PyTorch.
  - Conducted root-cause analysis on the weaknesses of long-form video models, finding that their training strategies do not allow for out-of-domain generalization.

- **Genentech, Subsidiary of Roche** San Francisco, CA
  Natural Language Processing Research Co-op *July 2023 – Dec 2023*
  - Contributed to experimental medical NLP research, designing experiments and reviewing new methods.
  - Distilled capabilities from attention-based language models to smaller ones while maintaining accuracy, reducing long-term computation costs by over 95% and reducing reliance on closed-source models.
  - Curated a synthetic dataset of over 100k samples for training deep transformers for specialized medical QA.
  - Implemented models from papers for the computer vision team for cellular semantic segmentation.
  - Developed an embedding-based semantic search engine to retrieve from big data medical corpora of over 150k documents using methods in retrieval-augmented generation.

PROJECTS

- **MarkovPatch: Random Image Masks for Interpretable AI** *May 2022*
  - Applied image masks to a pre-trained DNN during inference to identify spatial features of significance.
  - Developed a stochastic mask generator by sampling a second-order Markov chain. The distribution parameters were adjusted to alter the size and spatial correlation of the masks' patches.
  - Demonstrated that the model attends more to contour features and attributes unique to each class.

- **Assigning TAs to Labs Using Evolutionary Computing** *Jan 2022*
  - Formulated matching teaching assistants to lab sessions with constraints as a cost optimization problem.
  - Developed a program that applies evolutionary computing principles to search for the minimum-cost solution.
  - Wrote scoring functions to quantify progress and agents that "mutated" solutions to search for better ones.