# Nicholas Mesa-Cucalon

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## Experience

- **Carnegie Mellon University** — Pittsburgh, PA
  *Teaching Assistant* — *August 2024 – Present*
  - **17-200 Ethics and Policy Issues in Computing**: Moderated recitation discussions of over 70 undergraduate students to further discuss lecture material. Provided constructive feedback and revision strategies for groups of 10 students for each assignment.
  - **Content**: Discussed AI Ethics and Safety, Big Data Ethics, GDPR and Predictive Privacy in class and recitation.
- **InfiniAI Lab CMU** — Pittsburgh, PA
  *Student Researcher* — *August 2024 – December 2024*
  - **Research Topics**: Investigated and read state of the art papers regarding token merging algorithms for Vision Models and KV-Caches for Language Models.
  - **Contributions and Results**: Implemented the Heavy Hitter Oracle KV-Cache for the LLaVA Vision-Language Model by directly modifying the LLaMA backbone. Replicated vanilla LLaVA performance on TextVQA of 61.24% using a KV-Cache 0.25× the size of LLaMA's context window.
- **Voaige** — Pittsburgh, PA
  *Robotics and Perception Intern* — *May 2023 – August 2023*
  - **Robot Calibration**: Led development of and deployed production code for Delta Robot calibration with a team size of 8. Produced a program and documentation for Hand-Eye-Calibration for xArm7 Robot Arms, Intel RealSense Cameras and Zivid Cameras using OpenCV.
  - **Point Cloud Registration Research**: Researched and documented 23 papers on various Point Cloud Registration for future work with the core product.

## Projects

- **Multimodal Meme Caption Generation**: Developed and implemented a model to use text and image data to generate captions for memes on the MemeCap dataset. Model achieved a BLEU-4 F1 Score of 9.0 and ROUGE-L F1 Score of 25.9, comparable to state of the art models.
- **"Denoising Diffusion Probabilistic Models" Implementation**: Wrote code implementing the forward process, reverse process and forward sampling for DDPM. Trained on cat images of the AFHQ dataset with a fixed compute of a single A100 GPU. Model was able to generate realistic cat images after training for 10,000 steps in 20 minutes.
- **"You need to Pay Better Attention" Paper Reimplementation**: Reimplemented "Optimized", "Efficient" and "Super" Attention Layers in both PyTorch and Keras. Collaborated with original authors to replicate 78% test accuracy with the Super Layer on the IMDb Dataset.

## Education

- **Carnegie Mellon University** — Pittsburgh, PA
  *Master of Science in Electrical and Computer Engineering* — *Expected: May 2026*
- **Carnegie Mellon University** — Pittsburgh, PA
  *Bachelor of Science in Electrical and Computer Engineering; GPA: 3.76* — *Aug 2021 – May 2025*
  - **Relevant Courses**: Computer Systems & Hardware-Software Interface, Distributed Systems, Machine Learning Systems, Convex Optimization, Computer Vision, Generative AI, Multimodal Machine Learning

## Skills

- **Programming Languages**: Python, C/C++, Golang
- **Programming Frameworks**: PyTorch, OpenCV, Huggingface, Pandas, NumPy, Keras, Jupyter
- **Technologies**: Deep Learning, Computer Vision, Natural Language Processing, Ranking Methods, Weights and Biases, Git, Linux, AWS
- **Languages**: English (Native), Spanish (Native)