# Nikhil Madaan

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## EDUCATION

**Carnegie Mellon University**                                                                     Pittsburgh, PA
*Master of Science in Computer Engineering (GPA: 4.0/4.0) with AI-ML Systems Concentration*          Dec 2022
• **Coursework:** Adv. NLP, Visual Learning and Recog, Intro. to ML, ML for Signal Proc., Speech Recognition and Understanding, Intro. to DL, ML for Large Data.

**Birla Institute of Technology and Science (BITS), Pilani**                                    Hyderabad, India
*B.E. (Hons.) in Electrical and Electronics Engineering (GPA: 9.63/10; Dept Valedictorian)*          May 2019

## WORK EXPERIENCE

**Bloomberg - AI Group**                                                                              NYC, NY
*Senior AI Researcher*                                                                     Jan 2023 - Present

• Working on leveraging ML models for multi-variate time-series modeling to build real-time pricing models for Fixed-Income securities. Contributed in the launch of the pricing model, for USD and EUR markets.

**Amazon - Media & Ads Team**                                                                    Seattle, WA
*Applied Scientist Intern - Advised by Dr. Manisha Verma*                                 May 2022 - Aug 2022

• Worked on generating headlines for products by factoring in **multiple modalities**; using SOTA multimodal fusion networks such as **Flava, Mantis**. Employed **contrastive learning** to improve the diversity of the generated headlines and **rouge, bleu score** by 53.5% and 145% respectively, w.r.t unimodal models.[Accepted at **KDD,23**.]

**Walmart Grp (Flipkart) - Catalog Team**                                                       Bangalore, India
*Software Development Engineer - Machine Learning*                                         Jul 2019 - Aug 2021

• Leveraged **Image encoders** such as **ViT, ResNets**, to generate embeddings of the product images. Indexed the generated embeddings, added **multi-cluster support** for reads and writes, and used the embeddings to support **Product Deduplication**.
• Developed a **prioritized distributed message processing extension** to the **camel-Kafka** component in **Java**, to support priority consumption of records and implemented various consumption strategies to support different use cases.

## RESEARCH EXPERIENCE

*Independent Researcher - SLED Lab - Advised by Prof. Joyce Y. Chai*                       Jun 2023 - Present
• *LLM Grounder*: Worked on leveraging **LLMs (GPT-4)** and visual-grounding tools (**Openscene**) to attain state-of-the-art **zero-shot 3D visual-grounding accuracy**. [Accepted at **ICRA, 2024**]
• *3D-LLM*: Working on injecting the 3D-world into large language models.

*Graduate Research Assistant - Multicomp Lab - Advised by Prof. L.P. Morency*               Jan 2022 - Dec 2022
• Worked on analyzing QA bias in **Multi-modal QA Systems** using fine-tuned language models such as **RoBERTa**.

*Graduate Research Assistant - Lions Research Lab - Advised by Prof. Carlee Joe-Wong*       Jan 2022 - Dec 2022
• Worked on the transferability of **adversarial attacks** in Personalized Federated Learning setup and trying to make the learnt model more robust to such attacks. [Accepted at **CrossFL, MLSys 2022, AISTATS 2023**]

*Robust SAD/ASR Systems using Learnable Frontends - Advised by Prof. Richard Stern*        Sep 2021 - Feb 2022
• Used **learnable modulation spectrogram** to replace fixed components in ASR feature extraction pipelines, to **build representations** that are **robust to noise/reverb** so as to build **robust ASR systems**.[Accepted at **SLT, 2022**].

## SELECTED PUBLICATIONS

Yang, J., Chen, X., Qian, S., **Madaan, N**., Iyengar, M., Fouhey, D. F., & Chai, J. (2023). LLM-Grounder: Open-Vocabulary 3D Visual Grounding with Large Language Model as an Agent. **ICRA, 2024**.

**N.Madaan**, K.Kesari, M. Verma, S. Mishra, T.Steiner Contrastive Multimodal Text Generation for E-Commerce Brand Advertising, **KDD, 2023**

T.Kim, S.Singh, **N.Madaan**, C.Joe-Wong,Characterizing Internal Evasion Attacks in Federated Learning, **AISTATS 2023**

T Vuong, **N Madaan**, R Panda, RM Stern, Investigating the Important Temporal Modulations for Deep-learning-based Speech Activity Detection, **SLT 2022**

## PROJECTS

*Hierarchical Knowledge Distillation*                                                      Sept 2022 - Dec 2022
• Worked on reducing the knowledge distillation training time using **Hierarchical contrastive loss** and **adapters**. Attained a 2x speedup without any performance degradation.

*WEBQA*                                                                                    Jan 2022 - May 2022
• Developed a **multimodal multihop reasoning unified model**, capable of generating answers by combining information from multiple modalities with reasoning to answer a query. Improved Source-retrieval F1 score by 12% using **CLIP transformer**.

*Neural Network Pruning*                                                                    Mar 2022 - Apr 2022
• Employed **iterative threshold based pruning strategy and incremental dropout** to prune Resnet-18 for CIFAR-10 classification; Attained (97.24%) sparsity at the cost of 0.8% drop in classification accuracy. [Best model in class]

## SKILLS

**Programming:** Python(Numpy, Pandas, Matplotlib), Java, C, C++, SQL.
**Additional Technologies:** Pytorch, HuggingFace, TensorFlow, Apache Kafka, Apache Pulsar, GIT, Elastic Search, Hbase

## HONORS AND AWARDS

• Qualified for **ACM ICPC, Amritapuri regionals**. (Ranked among **top 300** out of 3282 participating          Dec 2018 - Jan 2019
teams all over India).