Siddhant Garg

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Education

- **University of Massachusetts Amherst (UMass Amherst)** — Amherst, MA
  Master of Science - Computer Science; GPA: 4.0/4.0 — September 2021 - May 2023

- **Indian Institute of Technology Kanpur (IIT Kanpur)** — Kanpur, India
  Bachelor of Science - Maths and Scientific Computing; GPA: 9.2/10 — September 2015 - May 2019

Publication

- **A Simple Approach to Image Tilt Correction Using Self-Attention MobileNet (BMVC 2021)**
  - Designed and implemented **Self-Attention Modules** that were integrated with MobileNetV3 and MobileDet.
  - Proposed a novel **self-supervised, first-order multi-label training method** for Image Tilt Correction.
  - Proposed model and training method showed around **10% accuracy improvement** over MobileNetV3 model.
  - **Inference latency of the in-house model is better by 50 milliseconds** over MobileNet-V3.
  - **Model has been deployed on Samsung Galaxy Flagship models (Patent pending at USPTO)**.
  - This work was done at Samsung Research Institute, Bengaluru, India

Research Experience

- **Pruning Multi-Task Models for Computer Vision** — UMass Amherst, US
  Advisor: Prof. Hui Guan — September 2021 - Present
  - Working on structured and unstructured pruning of Multi-Task Neural Networks.
  - Implemented filter pruning using gradient based importance score of the filters.
  - Discovered that the average cosine similarity of the gradients between tasks increases as the filters are pruned.
  - Proposed a novel filter ranking algorithm based on cosine similarity score of task-loss gradients.
  - Pruning filters with **proposed method leads to greater GFLOPs reduction without performance loss**.

- **Video Understanding Using CLIP — Adobe Research** — San Jose, US
  Position: Research Scientist Intern — May 2022 - August 2022
  - Worked to curate a validation dataset, that could be legally annotated and that is similar to real-user videos.
  - Extracted CLIP features of the user videos and tagged them with 18,000 classes using zero-shot classification.
  - Used **MERLOT-Reserve YouTube dataset** as a large pool to sample validation videos.
  - Used **FAISS** to find a set of MERLOT videos that is "closest" to a user-video in CLIP visual feature space.

Academic Projects

- **Representation Learning of Transformers Using Perturbed Point Clouds (3D Deep Learning)** — UMass
  Course Project: Intelligent Visual Computing, Prof. Evangelos Kalogerakis — Spring 2022
  - Proposed a **self-supervised learning method using reconstruction from noisy point clouds**.
  - Implemented **Point Cloud Transformer** with Encoder-Decoder architecture with Chamfer distance loss.
  - The learned representations improved the accuracy by 0.62% on ModelNet40 and by 0.54% on ShapeNet.
  - Also implemented Transformer Autoencoder with Vector-Quantization for discrete representation learning.

- **Self-Labeling Refinement for Self-Supervised Learning (Computer Vision)** — UMass
  Course Project: Introduction to Neural Networks, Prof. Erik-Learned Miller — Fall 2021
  - Proposed novel loss functions for **Self-Labeling Refinement** in Self-Supervised Learning frameworks.
  - The method find semantically similar images in a batch and make them closer in embedding space.
  - Implemented Bootstrap Your Own Latent (BYOL) with new loss functions and trained it on unlabeled STL10.
  - Resulting method showed **accuracy improvement of 1.9%** on labeled STL10 dataset.

- **Constrained Optimization of Geometric-Skew Normal (GSN) Distribution** — IIT Kanpur
  UG Project, Advisor: Prof. Debasis Kundu — Fall 2018 - Spring 2019
  - GSN is a 3 parameter distribution with probability of random variable as sum of infinite normal distributions.
  - Implemented **Metropolis Hastings** (MH) algorithm for estimating parameters for GSN Distribution.
  - Extended MH algorithm with L1-regularization to identify cancer covariates on cancer prediction dataset.
  - GSN distribution outperformed standard Normal distribution with lesser test error after training.

Work Experience

- **Samsung Research Institute** — Bengaluru, India
  Position: Senior Software Engineer — June 2019 - August 2021
  - **Object Detection**: .
    - Trained Tensorflow MobileDet models on MSCOCO and MIDV (ID Cards) dataset for ID Card detection.
    - Implemented SSD-MobileNet with Self-Attention layers to improve the detection performance.
  - **Inverse Reinforcement Learning**: .
    - Implemented **Principle of Maximum Entropy** for learning Bixby (AI assistant) command usage pattern.
    - Mobile phone states and user commands were used to learn the reward function and user policy.
    - Learned user policies were used to suggest a set of "routines" as a group of commands.

Other Internships

- **Semi-Supervised Sentiment Analysis — Zomato** — Delhi, India
  Position: Software Engineer Intern — June 2019
  - Trained LSTM models on Yelp and Zomato reviews dataset as a character language model.
  - Identified a hidden state neuron as a **sentiment predictor** using L1-regularization and small labeled dataset.
  - **The value of sentiment predictor neuron indicates the sentiment of the any unseen input string**.
- **Samsung Keyboard Touch Area Correction — Samsung Research Institute** — Bengaluru, India
  Position: Software Engineer Intern — May 2018 - July 2018
  - **Worked on the Touch Area Correction module of Samsung Keyboard to reduce typing mistakes**.
  - Implemented a character LSTM model with novel pre-training method for the character embeddings.
  - **Character embeddings were encoded with the keyboard key locations** along with their context.
  - Given the character and its location, a single layer MLP was trained to predict the next character.
  - The learned embeddings were fine-tuned using character LSTM Language model on a large user corpus.
  - The trained model resulted in **99%** prediction accuracy on the test set for next character prediction.

Selected Courses

- **UMass Amherst**

Reinforcement Learning	3D Deep Learning	Introduction to Neural Networks
Probabilistic Graph Models	Systems for Data Science	Natural Language Processing

- **IIT Kanpur**

Machine Learning	Database Systems	Probabilistic Modelling and Inference (Bayesian ML)

Technical Skills

- **Languages**: Python, C++, JAVA, SQL
- **Frameworks**: PyTorch, TensorFlow, Spark

Honors and Awards

- Samsung Spot Award for excellent project work, Samsung, India - 2020
- Certificate of Merit for Academic Excellence, B.S. Maths and Computing, IIT Kanpur - 2018

Volunteer Experience

- **Notebook Donation Drive** — Bengaluru, India
  Samsung Research Institute — August 2019
  - Distributed free notebooks and pens to many schools in poor areas of the city.
- **Academic Mentor, Computer Programming Course** — IIT Kanpur, India
  Counselling Service — Sept 2016 - May 2017
  - Mentored freshmen students on 1-to-1 sessions who were faced difficulties in the subject.
  - Developed practice exams and solutions for student's preparation.