SAVYA KHOSLA

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EDUCATION

University of Illinois Urbana-Champaign — **Urbana, IL**
MS in Computer Science (CGPA: 4.0 / 4.0) — *Aug 2022 - May 2024*
- Thesis advisor: Prof. Derek Hoiem
- Activities: Graduate Teaching Assistant

Delhi Technological University — **New Delhi, DL**
B.Tech. in Computer Engineering (CGPA: 9.40 / 10.0) — *Aug 2017 - July 2021*
- Awards: Received Commendable Research Award and INR 50,000 for noteworthy contributions to machine learning research

RESEARCH EXPERIENCE

Allen Institute for AI — **Seattle, WA**
Research Intern — *Oct 2022 - Present*
- Working on a memory-augmented multimodal encoder for understanding videos ranging from a few seconds to tens of minutes
- Contributed to Unified-IO 2, an instruction-following model that can parse and generate multimodal data and perform 120+ tasks

National University of Singapore — **Remote**
Research Assistant (Guide: Prof. Kenji Kawaguchi) — *Apr 2022 - Aug 2022*
- Developed robust active learning algorithm for handling heteroskedastic noise, resulting in 10% accuracy boost over baselines
- Demonstrated 15% accuracy improvement in other state-of-the-art algorithms by incorporating a simple self-supervised approach

Mila - Quebec AI Institute — **Montreal, QC**
Research Intern (Guide: Prof. Yoshua Bengio) — *Apr 2021 - Nov 2021*
- Demonstrated catastrophic failure of uncertainty-based active learning algorithms by proposing 3 heteroskedastic data distributions
- Proposed adversarial training method that gives 48% reduction in error rate on clean data while preserving adversarial robustness

Delhi Technological University — **New Delhi, DL**
Undergraduate Researcher (Guide: Prof. Anil Singh Parihar) — *Apr 2021 - Nov 2021*
- Worked on improving object recognition systems in the presence of adversaries like occlusion and blurriness
- Used image-based representation of malware binaries and leveraged ensembling to develop SOTA model for malware classification

INDUSTRY EXPERIENCE

Google — **Bangalore, KA**
Software Engineer — *Aug 2021 - Mar 2022*
- Improved Google Search's web ranking infrastructure using deep learning for better multimodal document understanding
- Enhanced precision and recall in salient entity extraction from webpages by transitioning from traditional ML methods to LLMs

Google — **Bangalore, KA**
Software Engineering Intern — *May 2020 - Jul 2020*
- Initiated the development of MuRIL, a BERT-based multilingual language model for 17 Indian dialects
- Achieved 10.42% F1 improvement in sentiment analysis and 9.87% in named entity recognition for Indian languages

Cadence Design Systems — **Noida, UP**
Python Developer Intern — *Dec 2018 - Jan 2019*
- Streamlined complex multi-step process of fetching file revisions from 2 version control systems to a single bash command

TEACHING EXPERIENCE

CS 445: Computational Photography — **Urbana, IL**
Teaching Assistant (Instructor: Prof. Derek Hoiem) — *Aug 2023 - Dec 2023*
- Responsibilities encompass conducting office hours, grading projects, and resolving students' doubts

CS 225: Data Structures and Algorithms with C++ — **Urbana, IL**
Teaching Assistant (Instructor: Prof. Carl Evans and Prof. Brad Solomon) — *Aug 2022 - May 2023*
- Taught a lab of 150+ students in Fall 2022 and 80+ students in Spring 2023
- Additional responsibilities encompassed conducting office hours, grading projects, and mentoring students in their final projects

PUBLICATIONS & PREPRINTS

(† denotes alphabetical order, * denotes equal contribution)

1. **Unified-IO 2: Scaling Autoregressive Multimodal Models with Vision, Language, Audio, and Action**
   Jiasen Lu*, Christopher Clark*, Sangho Lee*, Zichen Zhang*, Savya Khosla, Ryan Marten, Derek Hoiem, Aniruddha Kembhavi
   Under review, 2023
2. **Survey on Memory-Augmented Neural Networks: Cognitive Insights to AI Applications** Link
   Savya Khosla*, Zhen Zhu*, Yifie He*
   arXiv [cs.AI], 2023
3. **Understanding and Improving Neural Active Learning on Heteroskedastic Distributions** Link
   Savya Khosla, Chew Kin Whye, Jordan T. Ash, Cyril Zhang, Kenji Kawaguchi, Alex Lamb
   European Conference on Artificial Intelligence (ECAI), 372:1248-1255, 2023
4. **Interpolated Adversarial Training: Achieving Robust Neural Networks Without Sacrificing Too Much Accuracy** Link
   Alex Lamb, Vikas Verma, Kenji Kawaguchi, Alexander Matyasko, Savya Khosla, Juho Kannala, Yoshua Bengio
   Neural Networks, 154:218–233, 2022
5. **S-DCNN: Stacked Deep Convolutional Neural Networks for Malware Classification** Link
   Anil Singh Parihar*, Shashank Kumar*, Savya Khosla*
   Multimedia Tools and Applications, 81:30997–31015, 2022
6. **Catastrophic Failures of Neural Active Learning on Heteroskedastic Distributions** Link
   Savya Khosla, Alex Lamb, Jordan Ash, Cyril Zhang, Kenji Kawaguchi
   NeurIPS 2021 Workshop on Distribution Shifts: Connecting Methods and Applications, 2021
7. **AE-DCNN: Autoencoder Enhanced Deep Convolutional Neural Network For Malware Classification** Link
   Shashank Kumar*, Savya Khosla*, Shivangi Meena, Anil Singh Parihar
   2021 International Conference on Intelligent Technologies (CONIT), 2021
8. **MuRIL: Multilingual Representations for Indian Languages** Link
   Simran Khanuja, Diksha Bansal†, Sarvesh Mehtani†, Savya Khosla†, Atreyee Dey, Balaji Gopalan, Dilip Kumar Margam, Pooja Aggarwal, Rajiv Teja Nagipogu, Shachi Dave, Shruti Gupta, Subhash Chandra Bose Gali, Vish Subramanian, Partha Talukdar
   arXiv:2103.10730 [cs.CL], 2021
   Media Coverage: Economic Times, Indian Express, Google AI Blog

PROJECTS

Occluded Facial Expression Recognition Link

- An occluded facial expression recognition framework that leverages non-occluded images as privileged information
- The technique rendered an average gain of 3.90% over the baseline for 3 standard benchmarking datasets
- Technical stack used: Learning Using Privileged Information, Convolutional Neural Networks, TensorFlow

Image Captioning Link

- A CNN and RNN-based model for generating a textual description of an image based on the objects and actions in it
- Technical stack used: Convolutional Neural Networks, Recurrent Neural Networks, Beam Search Algorithm, Keras, Python

Text to Image Link

- A conditional GAN for synthesizing 256x256 dimensional photo-realistic images given textual descriptions
- Technical stack used: Conditional Generative Adversarial Networks (used the StackGAN architecture), TensorFlow, Python

AgroAI Link

- A group project to build an unbiased platform for farmers to predict the quality and price of the crops
- Presented this project in Google's Explore ML Bootcamp
- Technical stack used: React, NodeJS, Mongo, Flask (Python)

SKILLS

Languages: Python, C++, C, JavaScript, Bash

Frameworks: PyTorch, TensorFlow, JAX, Flax, OpenCV, GradIO

Tools: Git, Visual Studio, Google Cloud Platform

Others: Data Structures, Algorithms, Machine Learning, Computer Vision, NLP, Multimodal Learning, Data Handling

COURSES & CERTIFICATIONS

Graduate Courses

- CS 598: Vision by Prof. Svetlana Lazebnik
- CS 588: Autonomous Vehicle System Engineering by Prof. David Alexander Forsyth
- CS 543: Computer Vision by Prof. Svetlana Lazebnik
- CS 445: Computational Photography by Prof. Derek Hoiem
- CS 444: Deep Learning for Computer Vision by Prof. Svetlana Lazebnik
- CS 410: Text Information System by Prof. ChengXiang Zhai

Relevant Undergraduate Courses

- CO 201: Data Structures
- CO 202: Database Management System
- CO 203: Object-Oriented Programming
- CO 206: Algorithm Design and Analysis
- CO 304: Artificial Intelligence
- CO 404: Data Warehousing and Data Mining
- CO 407: Distributed Systems
- CO 414: Big Data Analytics
- CO 423: Swarm and Evolutionary Computing
- IT 420: Computer Vision

Online Courses & Certifications

- Deep Learning Specialization by Andrew Ng
  - Neural Networks and Deep Learning
  - Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization
  - Structuring Machine Learning Projects
  - Convolutional Neural Networks
  - Sequence Models
- Machine Learning by Stanford University (CS229 Lectures by Andrew Ng)
- Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning by deeplearning.ai
- C++ Bootcamp by Coding Blocks
- Competitive Programming Bootcamp by Coding Blocks
- Machine Learning Master Course by Coding Blocks