Andy Zhang

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Education

University of California, Los Angeles (UCLA) — B.S, Computer Science

GPA: **4.0**/4.0 — Expected June 2025

Experience

- **ByteDance Inc.** Software Engineer Intern (06/2024-09/2024)
  - Develop highly scalable recommendation models to improve advertisement recommendation accuracy
  - A/B test new iterations of TensorFlow models with added features and a transformer architecture
  - Increased TikTok's advertiser revenue in the US by 8% and Tiktok's revenue by 4%, due to model modifications
- **Lawrence Berkeley National Laboratory** *Student Assistant(Link)* (06/2023-09/2023)
  - Developed a web tool to display power usage time series information for Perlmutter, a supercomputer at LBNL.
  - Wrote Python scripts to process data queried from VictoriaMetrics time series database, and output to JS and PHP frontend
  - Display time vs power usage graph and enable users to see which applications were taking up the most power and why.
- **Computational Diagnostics Lab** *Student Researcher* (04/2023-present)
  - Helping develop a transformer model to predict hospital readmission based on adherence and fitness data.
  - Predict whether patients would be readmitted within the next seven days based on steps, heart rate, and more.
  - Integrate model with a mobile health app with the goal of providing patients with better care from home.
- **Predictive Science Inc.** *Computing/Solar Physics Intern (link)* (04/2022-09/2022)
  - Implemented a redesign of the PSI website used to model data from NASA on the Solar Corona and Heliosphere.
  - Used React to build a new interface for displaying plots and inputting data into form fields.
  - Migrated backend from legacy PHP system to Django, and deployed new website intended to be used by researchers.

Projects

- **Grounded**: (link)
  - Developed a mobile app in 10 weeks designed to promote mindfulness and get away from social media.
  - Utilized React Native to help create a navigation bar, take photos, and add friends through QR codes.
  - Implemented backend through Firebase to store photos and login information.
  - Tested app through Expo CLI, deployed app intended to be available on iOS and Android.
- **BruinYelp**: (link)
  - Worked with team members to create a web application to allow students to voice their opinions on UCLA food.
  - Built dynamic display of food reviews and images, navigation menu, and search/sort functionalities through React.
  - Created Firebase backend that allowed for Google Authentication and storing user reviews.
- **PsiPy:** (link)
  - Created new features and fixed bugs in PsiPy, a tool for visualizing MHD models from Predictive Science Inc.
  - Added the ability for users to specify file type and font size when reading in hdf files through Python.
  - Developed a pipeline to call Fortran functions in Python using Numpy's f2py tool.

Publications:

- **Zhang A**, Bhalachandra S, Deng S, Zhao Z, NPAT - A Power Analysis Tool at NERSC, August 2023; Lawrence Berkeley National Laboratory. *https://doi.org/10.1145/3624062.3624149*

Extracurriculars

- Upsilon Pi Epsilon: CS Honor Society. Tutored students, attended professional events, and practiced mock interviews.
- Bruin Sports Analytics: Wrote sports articles backed up with self-created graphs and data. (link)

Relevant Coursework

Data Structures and Algorithms, Software Construction, Operating Systems, Artificial Intelligence, Statistics for Engineering, Programming Languages, Computer Architecture, Computer Vision, Databases, Machine Learning, Web Applications, Computer Networks.

Technical Skills

- Coding: C++, C, Python, Java, Django, JavaScript, React, HTML, TensorFlow, Keras, SQL, Haskell, Pytorch, Fortran, PHP, MongoDB.
- Technologies/Environments: Github, Gitlab, Linux, Visual Studio Code, Docker, Kubernetes, Jupyter Notebook, PostgreSQL.

“How can a computer tell the difference between cats and dogs?” I remember asking myself this question countless times when my mom first told me about AlexNet in middle school. I was fascinated by the idea that a computer could differentiate between objects in the real world—a task that I had thought of as distinctly human given that it required the use of our senses. This ignited my interest in computer vision, and my desire to discover what novel tasks computers could do. I further explored that idea through independent research under Dr. Boussard at Stanford, and as a participant in programs such as the Summer STEM Institute, the Bioinformatics AI Research Lab at UCLA, and Lawrence Berkeley National Laboratory. Doing serious research has affirmed my passion for technical and challenging projects. My objective is to pursue a PhD program in Computer Science with a focus on artificial intelligence, specifically computer vision and its applications at Columbia University.

My research journey in deep learning started under Dr. Boussard at Stanford’s Biomedical Informatics Research Lab, where I investigated a computer vision method in parsing patient-reported medical surveys. With over 20,000 International Prostate Symptom Score (IPSS) multiple choice surveys, it was important to develop an efficient way of detecting patient responses. We developed a machine learning pipeline that could detect patient marks. The Hough Line Transform was used to preprocess the surveys, and analyze only the portion with the marks. Then, the images were passed to Google’s CNN MobileNet to detect which cell was marked. I was responsible for developing, debugging, and optimizing the algorithm. This process of developing a state-of-the-art tool, experimenting, and writing about our findings was an incredible introduction to machine learning and the research world. Although our work didn’t end up being published, I learned to reflect on feedback and grew as a researcher. This introduction to research piqued my interest in the capabilities of large-scale deep learning.

At the Summer STEM Institute, I worked alongside a graduate student to perform an independent research project. There, I developed a transfer learning approach to classifying CT-scans of non-small-cell lung cancer. Lung cancer is often hard to detect and classify, and even if detected, can already be in the advanced stages. In an effort to help detect signs of lung cancer earlier, I utilized Google’s InceptionV3 CNN, pre-trained on the ImageNet dataset. The training and test data was obtained

from the NSCLC-Radiomics dataset, with CT-scans from over 400 patients. The model was fine-tuned on lung cancer scans, and classified between adenocarcinoma, squamous cell carcinoma, and large cell carcinoma. It obtained an accuracy of 78%, comparable to state-of-the-art lung cancer image classification methods at the time. As the first project where I was responsible for every step from start to finish, I grew as an independent and autonomous researcher. This process also taught me the process of writing an engaging paper, something I ended up doing in my next research experience.

My most memorable research experience at Lawrence Berkeley National Laboratory led to me publishing my first paper. In an investigation of power usage and efficiency under the National Energy Scientific Research Computing Center, I developed the NERSC Power Analysis Tool (NPAT), a tool to provide quick and accurate power analysis of their newest supercomputer, Perlmutter. Perlmutter collects a vast amount of data every second, but, being a time-consuming and difficult process, getting the desired data can be challenging. We developed NPAT to help improve power efficiency in future systems and better understand the power signature of current supercomputing workloads. It provides a quick and accessible way to view the power usage data of NERSC systems, jobs, and applications. I was responsible for development and deployment of NPAT, as well as the writing and editing of the paper. I published this first-author paper[1] in SC23, and presented it at the HUST workshop at SC23. Publishing a paper was an incredible thrill, and I was delighted to present and explain our contributions to others. I especially valued this project due to the immediate and tangible impact it had on NERSC users.

In order to deepen my skills, I pursued opportunities through lab and classwork. As a member of UCLA's Biomedical Artificial Intelligence Research Lab, I'm developing a transformer-based approach to predict a patient's symptom severity based on their activity and adherence data. This data includes steps, heart rate, time asleep, calories burned, as well as adherence data like whether they synced their Fitbit or took their medication. The eventual goal is to integrate this prediction into a mobile health app that can provide patients with care from home. Additionally, as part of a Computer Vision for Deep Learning class, I created a research presentation on depth estimation and the state-of-the-art methodology. It included CNN-based approaches, as well as DepthAnything, which utilizes both labeled and unlabeled data, as

well as an encoder-decoder architecture. I gained skills in working closely alongside graduate students, and collaborating on larger scale projects where communication is crucial.

My experiences have collectively shaped my research interests and motivated me to pursue graduate studies. Today, computer vision is incredibly important in a variety of fields. I hope to develop new methods to enhance athletic performance, improve the safety and reliability of self-driving cars, and detect and classify diseases like cancer. Watching the NBA change because of analytics as I grew up, and hearing about the millions who pass away due to car accidents and cancer each year, I'm motivated to develop applicable and practical solutions that can further the field of computer vision. How can athletes train more effectively? How can self-driving cars learn to navigate difficult situations in real time? How can we detect lung cancer early and accurately? With a deep understanding of the problem space, and with skills gained through solving problems in this space, I hope to solve these problems by applying AI in computer vision to help people live their best lives.

Columbia's AI program's recent work shows its unique strengths in my topics of interest. Specifically, I would be excited to work with Dr. Peter Belhumeur and Dr. Shih-Fu Chang. Dr. Belhumeur's work on computer vision and machine learning, especially Dogsnap and Birdsnap, are related to my exploration of computer vision, especially in the recognition field. Extending my work under his supervision would deepen my understanding of the practical and everyday applications of computer vision. My research interests also greatly overlap with Dr. Chang's work, such as his research on R-CNNs and Few-Shot Object Detection. Having explored these concepts in class, I would be excited to bring my skills and experience in computer vision and neural networks to my work with Dr. Chang.

The combination of my previous research experience and interests has thoroughly prepared me for the academic rigor of a PhD. I see an immediate fit for my skills and interests at Columbia University .

[1] Zhang A, Bhalachandra S, Deng S, Zhao Z, NPAT - A Power Analysis Tool at NERSC, August 2023; Lawrence Berkeley National Laboratory. https://doi.org/10.1145/3624062.3624149