Albert Jianqiao Zhai

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Education

University of Illinois at Urbana-Champaign — *Fall 2021 – Present*
Ph.D. in Computer Science

California Institute of Technology — *Fall 2017 – Spring 2021*
B.S. in Computer Science with Minor in Information and Data Sciences

Research Experience

Research Assistant (Computer Vision) — *Summer 2022 – Present*
Shenlong Lab, UIUC
Advisors: Shenlong Wang and Kaiyu Guan

- Developing methods for learning priors on indoor scene layouts to guide robot navigation
- Developing methods for 3D shape reconstruction of plants guided by physics-and-biology-informed procedural generation model
- Developed algorithm for automatic calibration of view zenith angle from smartphone sensors

Research Assistant (Computational Imaging) — *Fall 2021 – Spring 2022*
Computational Imaging Science Lab, UIUC
Advisor: Prof. Mark Anastasio

- Developed a method for learning a projection operator that extracts the components of objects that are invisible to an arbitrary linear imaging system
- Evaluated the method in a medical imaging setting and showed that its low memory cost allows it to be applied to previously intractable systems

Research Intern (Robotics/Learning) — *Summer 2020 – Fall 2020*
Intelligent and Interactive Autonomous Systems Group, Stanford University
Advisor: Prof. Dorsa Sadigh

- Developed a method for learning a low-dimensional embedding space for robot movements in which dexterous manipulators can be efficiently teleoperated
- Compared various architectural options for extracting representations of the robot's environment state through vision and encoding robot actions using autoencoder networks
- Analyzed transferability of learned representations across demonstration styles and target layouts

Research Intern (Deep Learning) — *Summer 2019 – Spring 2020*
Anandkumar Lab (Tensorlab), Caltech
Advisor: Prof. Animashree Anandkumar

- Developed a new recurrent neural network architecture for aggregating structured visual features and encoding latent representations for memory-based decision making
- Implemented and evaluated convolutional models and augmentation/training procedures for object detection and showed that our architecture yields improvements in sample efficiency

Research Intern (Vision/Cognition) — *Spring 2018 – Spring 2019*
Shimojo Lab, Caltech
Advisor: Prof. Shinsuke Shimojo

- Designed and conducted behavioral experiments to study attentional mechanisms in preconscious visual processing and the influence of color-based preference
- Constructed statistical analysis tools for human perceptual task and gaze-tracker data; discovered significant visual cueing effects on diversion of spatial attention

Teaching Experience

Teaching Assistant

Department of Computer Science, UIUC

- **CS 444:** Deep Learning for Computer Vision ..... *Spring 2022*
- **CS 101:** Introduction to Computing: Engineering and Science ..... *Fall 2021*

Teaching Assistant

Department of Computing and Mathematical Sciences, Caltech

- **CS/ACM/IDS 157:** Statistical Inference ..... *Spring 2021*
- **CS/CNS/EE/IDS 165:** Foundations of ML and Statistical Inference ..... *Winter 2021*
- **CS/CNS/EE 155:** Machine Learning and Data Mining ..... *Winter 2020*
- **CS 038:** Algorithms ..... *Spring 2020*
- **CS 001:** Introduction to Computer Programming ..... *Fall 2018*

Publications

- **A. J. Zhai**, S. Wang, *PEANUT: Predicting and Navigation to Unseen Targets*, submitted to CVPR 2023
- **A. J. Zhai**, J. Kuo, M. A. Anastasio, U. Villa, *Memory-Efficient Self-Supervised Learning of Null Space Projection Operators,* SPIE Medical Imaging, 2023
- S. Karamcheti, **A. J. Zhai**, D. P. Losey, D. Sadigh, *Learning Visually Guided Latent Actions for Assistive Teleoperation,* Learning for Dynamics & Control (L4DC), 2021
- H. Su, L. Wu, J. H. Jiang, R. Pai, A. Liu, **A. J. Zhai**, P. Tavallali, M. DeMaria, *Applying Satellite Observations of Tropical Cyclone Internal Structures to RI Forecast With Machine Learning*, Geophysical Research Letters, 2020
- J. H. Jiang, **A. J. Zhai** et al., *Using Deep Space Climate Observatory Measurements to Study the Earth as An Exoplanet,* Astronomical Journal, 2018
- X. Jiang, A. Kao, A. Corbett, E. Olsen, T. Pagano, **A. J. Zhai**, S. Newman, L. Li, Y. L. Yung, *Influence of Droughts on Mid-tropospheric CO2*, Remote Sensing, 2017

Conference Presentations

- **A. J. Zhai**, S. M. Hung, S. Shimojo, *The role of color preference under interocular suppression*, Vision Sciences Society Annual Meeting, St. Pete Beach, FL, 21 May 2019, doi:10.1167/19.10.264b
- J. H. Jiang, **A. J. Zhai** et al., *Using Deep Space Climate Observatory Measurements to Study the Earth as An Exoplanet*, American Geophysical Union Fall Meeting, New Orleans, LA, 14 December 2017, https://agu.confex.com/agu/fm17/meetingapp.cgi/Paper/226600
- **A. J. Zhai**, J. H. Jiang, C. Frankenberg, Y. L. Yung, Y.S. Choi, *OCO-2 Solar-induced Fluorescence Data Portal and Applications to Crop Yield Estimation*, American Geophysical Union Fall Meeting, San Francisco, CA, 16 December 2016, https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/182043

Service

- Program Committee Member (Reviewer) for 37th AAAI Conference on Artificial Intelligence

Additional Projects

Hurricane Intensity Forecast Model *Spring 2020*

JPL Data Science Pilot Project

- Implemented loss reweighting in tree-based and linear models for prediction of hurricane wind speed
- Employed ensemble learning methods to produce a classifier that outperformed the National Hurricane Center operational models on standard forecast metrics

Ultrasound Bacterial Colony Segmentation *Fall 2018 – Winter 2019*

Caltech Shapiro Lab

- Developed a multi-stage segmentation algorithm for processing images collected through a novel ultrasound imaging paradigm
- Built the algorithm into a tool which is now heavily used by biology researchers in the lab

Selected Awards

- 2019 Google Tech Challenge 1st Place Team
- 2019 CS 155 Final Kaggle High Score
- 2018 Caltech Ph 11 Research Fellow
  (awarded for a creative solution for modeling the Tour de France cycling race)
- 2017 CS 1 Honor Roll 2nd Place Winner
- 2017 Eagle Scout
- 2016 Helen & Peter Bing Earthwatch Research Award
- 2016 NASA Earth System Science Award
- 2016 Siemens Competition Semi-Finalist
  (for building a web-based portal for OCO-2 satellite data)

Skills

- *Programming Languages:* Python, C/C++, MATLAB, x86, MySQL, OCaml, Java, HTML/CSS, Javascript
- *Frameworks/Tools:* PyTorch, OpenAI Gym, Tensorflow, Keras, ROS, MuJoCo, OpenCV, Scikit-Learn, Pandas, Docker, Flask, Git
- Familiar with Windows, Linux, LaTeX