Ao Xu

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EDUCATION

- **University of Southern California**   CA, U.S.
  Bachelor of Science - Computer Science;   *Aug 2017 - May 2021*
  Courses: *Operating Systems, Data Structures, Analysis Of Algorithms, Artificial Intelligence, Machine Learning, Networking, Probability Theory, Multi-variable Calculus, Linear Algebra*

- **University of Southern California**   CA, U.S.
  Master of Science - Data Science;   *Aug 2021 - May 2023*
  Courses: *Artificial Intelligence, Data Mining, Databases and data management*

PUBLICATIONS

- **Invariant Structure Learning for Better Generalization and Causal Explainability**:
  https://arxiv.org/abs/2206.06469   Yunhao Ge, Sercan O Arik, Jinsung Yoon, **Ao Xu**, Laurent Itti, Tomas Pfister

- **Shared Knowledge Lifelong Learning (just submitted to ICLR, preprints not available yet)**: Yunhao Ge, Yuecheng Li, Di Wu, **Ao Xu**, Adam M Jones, Amanda Sofie Rios, Iordanis Fostiropoulos, shixian wen, Po-Hsuan Huang, Zachary William Murdock, Kiran Lekkala, Gozde Sahin, Sumedh Anand Sontakke, Laurent Itti

RESEARCH EXPERIENCE

- **Lifelong Learning Project (ShELL) initiated by DAPPA:**
  USC iLab Research Assistant supervised by Prof.Itti   *May 2021 - Now*
  - **Project outline**: A total of 102 challenging image classification tasks built for the lifelong learning setting
  - **Literature Review and Experiments**: Reviewing lifelong learning literature from multiple perspectives, the regularization-base, the rehearsal/replay-based, and the parameter-expansion approaches, and implementing the some of those as baseline models
  - **Extending Continual Learning on Object Detection Task**: Collected 34 object detection task under different settings and testing the backbone model performance by freezing optimal intermediate layers to reduce the number of shared parameters and currently approaching the problem by open-vocabulary object detector

- **NeuroIoT: Visuasl Scene Understanding**
  Research Assistant directed by Luis Garcia at USC ISI   *Sep 2022 - Now*
  - **Project Descriptions**: Decoding how humans encode memories by working with epileptic participants with memory loss issues and synchronizing the IoT-sensed "Human Experience" relative to neuronal events
  - **video scene understanding**: Automatic Concept Extraction for complex labels from natural language annotations (currently experimenting with videoCLIP and VLM) on video stream data to align with other IoT signals (audio annotation, object detection) and neuro signals to discover patterns

- **Image Analysis and Sequence Analysis**
  Research Assistant at USC Rong Lu's lab   *May 2022 - Aug 2022*
  - **Cell Segmentation** : Conducted cell segmentation and quantification on microscopy images of bone marrow sections with U-net and cellProfiler
  - **Sequence Analysis**: Trajectory inference for hematopoiesis process by analyzing the scRNA data on HSCs
  - **ML Practice**: Applied random forest, partial linear regression, and principal component regression to identity a pattern of HSCs differential process

- **Building Novel Causal Discovery Model**
  USC iLab Research Assistant directed by Yunhao Ge   *Dec 2021 - May 2022*
  - **Literature Review**: Familiarized with the literature in causal structure learning
  - **Coding**: Devoted to developing the Invariant Structure Learning model with Yunhao Ge
  - **Design and Experiment**: Synthesizing datasets following certain causal structure and comparing experimental results from multiple baseline models NOTEAR, CASTLE, and DARING.

- **USC Directed Research Program**
  USC deep learning group directed by Iordanis Fostriopoulos   *Aug 2021 - Dec 2021*
  - **Implmenting**: Implemented a VQ-VAE model for generative tasks and tested on CIFAR10 dataset
  - **Image Lossless Compression Challenge**: Achieving a lossless compression of image data by learning the residuals of its reconstructions from various lossy compression algorithms (e.g., BGP, VQ-VAE)

PROJECTS

- **Recommendation System: H&M Personalized Fashion Recommendation**: Built an item-based collaborative filtering system combined with clustering to make personalized recommendation for H&M customers and won a bronze for the Kaggle H&M personalized fashion recommendation. Built a similar hybrid recommendation system for Yelp Restaurant review prediction by item-based approach and content-based modeling with sentiment analysis and feature engineering. (Aug. 2021 – Dec.2021)

- **Intelligent small-Go Player: An intelligent go player that learns to play**: Implemented the Q-learning algorithm to learn the utilities of moves under different configurations of a 5*5 board by playing against a random player, a greedy player, and a minimax player. After learning and fine-tuning of the learning rate, the Q-learner achieved over 90%-win rate against the minimax players with search-depth of 3 on a 5 by 5 board.(Sep. 2021 – Oct. 2021)