# Ge Shi

Davis, CA (413) 425-3452 geshi@ucdavis.edu
**Linkedin** **Github** **Personal Page**

## Education

**University of California, Davis** Davis, CA
*Ph.D. candidate in Computer Science; GPA: 3.8/4.0* *Expected: June. 2025*

**University of Massachusetts, Amherst** Amherst, MA
*Master of Science in Computer Science; GPA: 3.9/4.0* *May. 2019*

**Zhejiang University** Hangzhou, China
*Bachelor of Engineering in Automation; GPA: 3.7/4.0* *July. 2017*

## Programming Skills

**Coding**: Python, C/C++, Java, Matlab, SQL, Javascript, R, D3.js, Node.js, Object Oriented Programming.
**Courses**: Advanced Algorithm, Machine Learning, Computer Vision, Neural Networks, Database, Distributed System.
**Tools**: TensorFlow, Pytorch, Image Processing, Robotics(ROS), AWS, Latex, Git, DataGrip, Matlab.

## Publications

**In Preparation**: Explainer Guided Localized Deep Counterfactual Generator for Multi-class Classification.
**In Preparation**: Can machines learn human interpretable policies? A rubiks cube example of learning combo actions.
**In Preparation**: CRF-transplant: post-hoc processing module transplant guarantees improvements.
**KDD (1st)**: HALE: Hierarchical Aggregation of Local Explanations.
**IJCAI (1st)**: Unraveling Neural Networks' Insights in Scientific Knowledge Discovery through Bivariate Optimization.
**TVCG (4th)**: LossLens: Diagnostics for Machine Learning Models through Loss Landscape Visual Analytics.
**AAAI (2nd)**: Rethink Baseline of Integrated Gradients from the Perspective of Shapley Value.
**KDD (1st)**: Deep Learning for Prognosis Using Task-fMRI: A Novel Architecture and Training Scheme.
**NeuroImage (1st)**: Data augmentation with Mixup: Enhancing performance of a functional neuroimaging-based prognostic deep learning classifier in recent onset psychosis.
**Frontiers in Psychiatry (2nd)**: Deep learning in neuroimaging: Overcoming challenges with emerging approaches.

## Internship Experiences

**Lawrence Berkeley National Laboratory** Berkeley, USA
*Graduate Student Researcher Assistant* *Apr. 2023 - present*

- **Loss Landscape on Image Segmentation with CRF**: Extended the loss landscape to segmentation task and study – model architecture: the impact of adding a trainable CRF module; loss functions: generalizability w.r.t. CrossEntropy, Dice, IOU; hyperparameter: data volume, batch size, learning rate, layer width. Inspired by the extensive empirical studies, a CRF transplant algorithm is proposed to stably improve backbone network.
- **Loss Lens**: Created a general debugging tool that aids practitioners in explaining, diagnosing, and validating deep learning models. Mainly took charge of implementing class oriented loss landscape, running statistics correction, and mode connectivity of Vit model.

**NetEase Huyu Incorporation, Limited** Hangzhou, China
*Game AI Software Engineer* *Nov. 2016 - Sept. 2023*

- **Behavior Trees**: Took part in the design of game AI behavior trees of a 'guardian' by optimizing a min-max objective; fixed bugs to make AI robot behave normally, based on the habits of player to patrol and track enemies.
- **Web Crawling**: Created and exerted web scraping from the public online game forums like Baidu Post Bar, Weibo etc. to get the information of interested potential customers, which facilitated the propagation and market department.

## Academic Projects

**Explainable Artificial Intelligence (XAI)** Davis, CA
*Supervisor: Prof. Ian Davidson* *Jan. 2022 - present*

- **Learning Combos from Rubik's Cube**: The learned strategies of RL methods are usually incomprehensible to human. We study the problem of learning combo actions to discover human interpretable Rubik's Cube formula by increasing the action space and pruning the depth of decision tree.
- **CAM Guided GenAI**: Using the class activation map from a classifier to guide the localized image-to-image translation without changing the features at other task unrelated regions by adapting the cycle-consistent deep generative models.
- **Hierarchical Aggregation of Local Explanations**: Studied the problem of aggregating post-hoc local XAI of black-box ML models. Proposed a hierarchical aggregation of local explanations frameword that provides various levels of explanations, from local to global, to strike a balance between fidelity and interpretability

**Long-term Study of Deep Learning on Constrained Data Settings** Davis, CA
*Supervisor: Prof. Ian Davidson* *Jan. 2021 - present*

- **Chronic Multi-source Domain Adaptation**: Single-source domain adaptation suffers from data scalability while multi-source domain adaptation doesn't support online learning. We try to improve multi-source domain adaptation on chronic tasks where data are collected as streams with concept drifts.
- **Multi-view multi-instance learning**: Built a novel deep architecture with MLP ensemble model to encode multi-task multi-trial brain activities in task-fMRI domain, which lies in a novel multi-view multi-instance setting. The model reaches state-of-the-art performance at 75.6%.
- **Study in neuralimaging on brain task fMRI data**: Long-term study on brain task fMRI data collected for schizophrenia prognosis. A bunch of downstream machine learning tasks are validated on the data and an elaborate survey on the deep learning methods was conducted.
- **Weighted data augmentation with GAN**: Proposed a weighting strategy over the GANs generated synthetic data that has a high probability to improve the agnostic learning accuracy through empirical risk minimization.

**Super Congealing** Amherst, MA
*Supervisor: Prof. Erik Learned-Miller* *March. 2018 - March. 2019*

- **Primary Goal**: The inspiration is the effect of camera rotation on the photograph is invariant to the depth of scene while the effect of camera translation is proportional to the inverse of depth. The purpose of the project is to get the estimations of camera motion, relative depth map of the scene and stitching video frames to form a panorama.
- **Pixel Congealing**: Congealing is a way of aligning a set of images simultaneously and create a panorama by minimizing the entropy. I implemented the algorithm in python including on negative log-likelihoods minimization, coordinate descent and gradient descent to tweak optimal camera rotations, translations and depths parameters.

**Moving Object Segmentation** Amherst, MA
*Supervisor: Prof. Erik Learned-Miller* *March. 2018 - May. 2018*

- **Deep Neural Network**: Adopted encoder-decoder model to preserve spatial information of pooled deep features. Based on the initialization of optical flow net to transfer learning segmentation boundaries. Implementation by Tensorflow.
- **Unsupervised Learning**: Leveraged well designed loss function penalizing both image gradients and motion smoothness to train Neural Networks with unsupervised learning. Based on UnFlow, Fine-tuned the pre-trained optical flow model on the DAVIS Dataset.

**Multi Source Information Based SLAM Design** Hangzhou, China
*Supervisor: Prof. Yu Zhang* *Oct. 2016 - May. 2017*

- **Optical Flow**: Applied optical flow theory to establish a fully direct probabilistic model minimizing photometric error. Generated dense 3D points cloud by utilizing lie group algebra in computer vision to estimate the pose of camera and position of features
- **Robot Operating System**: Using ROS (Robot Operating System), Linux and toolbox/library (OpenSLAM & OpenCV), developed an offline SLAM (simultaneous localization and mapping) system.
- **Improvement of DSO**: Used stereo camera and infrared filter to fit in the Direct Sparse Odometry algorithm; Improved the performance of DSO of long term tasks with Kalman filter and IMU (Inertial Measurement Unit).

## Awards

UC Davis academic traveling award 2023
UC Davis academic traveling award 2022
Meritorious Winner in The International Mathematical Contest in Modeling 2017
2nd Place in Robocup Kidsize Humanoid League 2016
Zhejiang University Excellent Academic Scholarship 15/100
Zhejiang University Outstanding Student Leadership Award 2/100