Ge Shi

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Education

University of California, Davis Davis, CA
Ph.D. student in Computer Science; GPA: 3.80/4.00 *Expected: June. 2024*

University of Massachusetts, Amherst Amherst, MA
Master of Science in Computer Science; GPA: 3.91/4.00 *May. 2019*

Zhejiang University Hangzhou, China
Bachelor of Engineering in Automation; GPA: 3.65/4.00 *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, Google Cloud.

Academic Projects

explainable artificial intelligence (XAI) in image domain Davis, CA
Supervisor: Prof. Ian Davidson *Jan. 2022 - present*

- **Exemplar-based XAI**: In comparison with current methods focusing on data distribution or adversarial examples, creating a XAI method to give critical examples of subgroups as intersections of binary concepts.
- **Concept-based XAI**: Bridging the local XAI method and global XAI method by dissecting the nodes of deep learner layer by layer hierarchically. It is able to provide explanations on what concepts the learner detected for each instance, and how does the concept affect the predictions of a class.

Long-term study of deep learning on constrained data settings Davis, CA
Supervisor: Prof. Ian Davidson *Jan. 2021 - June. 2022*

- **Multi-view multi-instance learning (accepted by KDD)**: 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 (accepted by Frontiers in Psychiatry)**: 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, using an entropy minimization procedure. I implemented the algorithm in python based on negative log-likelihoods minimization and gradient descent to tweak optimal camera rotations, translations and depths parameters.

Multi-tier Online Book Store Amherst, MA
Supervisor: Prof. Prashant Shenoy *Feb. 2019 - May. 2019*

- **Multi-tier Full Stack Development**: Designed a two-tier online book store 'Pygmy' with both a front-end and a back-end. Using the lightweight web frameworks Flask in Python to build up the three servers structure, including FrontEnd server, Order server and Catalog server.
- **Distributed concurrency**: Achieved concurrency of allowing multiple users to access the same database and buy books leveraging Python threads. Each component is bound with a HTTP REST interface.

- **Supporting large workloads**: Added replication and in-memory caching to improve request processing latency and organize them with round-robin load balancing algorithm. Consolidated the fault tolerant functionality for the front-end node to detect and recover from back end node failures.

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.

Semantic Image Segmentation Amherst, MA
Supervisor: Prof. Subhransu Maji *Oct. 2017 - Jan. 2018*

- **Convolutional Neural Network**: Applied Deep FCNs methods in semantic image segmentation tasks. Adopted proposed pyramid scene parsing network (PSPNet) to learn features and working on PASCAL VOC 2012 and Cityscapes datasets.
- **Conditional Random Field**: Utilized CRF (conditional random field) algorithm to refine the segmentation of boundary. Adopted the fully-connected CRF model with heuristic pairwise potential following Deeplab V2 to overcome the limitations of losing detailed local structures by short-range CRFs.

Model Inference Processes Amherst, MA
Supervisor: Prof. Yuriy Brun *Oct. 2017 - Jan. 2018*

- **Model Inference Techniques**: Collected log files with multiple traces of human-driven process descriptions for the same process, then managed them into Node.js network type using JavaScript and customized model inference techniques (Synoptic) to infer an FSM (finite state machine) model that captures all the variations in the process.
- **High Level Goal**: Evaluated the generative properties of the model with JAVA code snippets. Performed sensitivity analysis on the inclusion of more or fewer traces. The high level goal is to build self-monitor system which is conducive to the stability of self-adaptive systems in dynamic environments. The result is visualized with Data-Driven Documents (D3) based on JavaScript online.

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).

Humanoid RoboCup Soccer Competetion Hangzhou, China
Supervisor: Prof. Rong Xiong *Sept. 2015 - Jul. 2016*

- **Court Recognition with OpenCV**: With the aid of OpenCV toolboxes, mended the codes for soccer court features recognition such as the goal, rivals, soccer ball, sideline from single camera vision.
- **Robot Pace Motion**: Simulated robot pace motion on matlab rvctools and developed real time direction self-correction system with the help of IMU (Inertial Measurement Unit) using C++; final robot linear walking correction deviation is about 15cm/3m.

Internship Experiences

NetEase Huyu Incorporation, Limited Hangzhou, China
Game AI Software Engineer *Nov. 2016 - Feb. 2017*

- **Behavior Trees**: Took part in the design of game AI behavior trees of a 'guardian', which based on the habits of player to patrol and track enemies; fixed bugs to make AI robot behave normally.
- **Web Scraping**: Created and exerted web scraper on the online interest sharing communities like Baidu Post Bar, Weibo etc. to get the information of interested potential customers, which facilitated the propagation and market department.