

Haozhe (Hank) Si

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EDUCATION

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Ph.D. in Electrical and Computer Engineering

FALL 2022-SPRING 2027

GPA: 4.0

Bachelor of Science in Computer Engineering

FALL 2018-FALL 2021

GPA: 3.97

HONORS: James Scholar; Dean's List of College of Engineering (All Semester); the O. Thomas and Martha S. Purl Scholarship

RELATED COURSEWORK: Artificial Intelligence; Transfer Learning; Pattern Recognition; Trustworthy Machine Learning; Algorithms; Data Structure; Computer Vision; Linear Algebra and Diff. Eq.; Probability; Signal Processing; Natural Language Processing; Machine Learning for Signal Processing; Robotics.

RESEARCH INTERESTS: Computer Vision and Machine Learning, especially trustworthy machine learning and foundation models.

PUBLICATIONS

- [1] Provable Domain Generalization via Invariant-Feature Subspace Recovery.
H. Wang, **H. Si**, B. Li, H. Zhao.
In *Proceedings of the International Conference on Machine Learning (ICML)*, 2022.
- [2] Fully Self-Supervised Depth Estimation from Defocus Clue
H. Si, B. Zhao, D. Wang, M. Chen, Y. Gao, Z. Wang, X. Li.
In *Proceedings of the Computer Vision and Pattern Recognition (CVPR)*, 2023.

EXPERIENCE

SHANGHAI ARTIFICIAL INTELLIGENCE LAB

MARCH 2022-AUGUST 2022

- Researched on depth estimation from defocus clue; Proposed a self-learning framework that estimate depth from sparse focal stack; Design the hardware that can capture the focal stack; Address the problems exist in previous works.
- Tested the framework on NYUv2 dataset and MobileDFD dataset; Proved the method to be SOTA on depth estimation from defocus clues tasks; Verified the ability of the model to be applied in industry.
- Researched on surface reconstruction from defocus clue; Proposed a framework that incorporates defocus rendering, NeRF and surface estimation to achieve self-supervised surface reconstruction; Designed the benchmark dataset for this task.

VOKATECH

MAY 2021-OCTOBER 2021

- Researched on 3D reconstruction from few-shot image; Reproduced SOTA works including pixelNeRF, DeepSDF and PIFu and performed ablation studies on them; Analyzed the effectiveness of position encoding, transformer, and diet loss in improving reconstruction quality.
- Proposed a network architect with a novel global feature extractor that can make use of the semantic information of input images to improve the consistency of output 3D mesh; Tested on the NMR and the DTU datasets.

XIAOMI CORPORATION

JULY 2020-AUGUST 2020

- Worked in Camera Department, Software Group; Researched on the principle of CMOS image sensor and the mainstream products; Compared image sensors from three suppliers and generated a report highlighting each one's feature;
- Performed daily camera tests on the phones under development about all the camera functions; Recorded the abnormal software performances; Reported the issues and possible causes to the manager;
- Researched the mechanism of OIS and wrote an 8-page essay about it; Researched image quality (IQ) evaluation and prepared slides introducing the IQ attributes and evaluation criteria. Held presentations to share the research with the colleagues.

ERICSSON(CHINA) COMMUNICATION COMPANY LTD.

MAY 2019-JULY 2019

- Worked for Wireless Innovation Lab and Demonstration Center (WILD-C) at Shanghai Branch; Researched on controlling the remote driving car through Bluetooth; Designed and coded the GUI for the remote driving car to simplify the controlling;
- Provided technique supports for Ericsson's and China Telecom's Booths during MWC Shanghai; Set up and introduced 4 demos including 5G Remote Engraving Machine and 5G Remote Driving Car;

- Edited promotion videos for 5G Unmanned Boat and 5G Intelligent Fire Extinguishing System; Made slides of 5G Unmanned Boat for the demonstration in MWC Shanghai.

RESEARCH PROJECTS

LEARNING OPTIMAL REPRESENTATIONS FOR INVARIANT-FEATURE SUBSPACE RECOVERY SPRING 2023

- Designed a *Finetuning with Multi-label Classification* paradigm that encourage the feature extractors learning the representations that satisfy the data model of ISR. Adopted the proposed paradigm to CLIP and boosted its performance on various o.o.d. dataset.
- Developing a CLIP-Finetune package that aims helping users finetune CLIP models easily and efficiently, e.g., finetune a CLIP ViT-G/14 model (1.8B parameters, needs 512 A100s in pre-training) on a single GPU.

BYZANTINE-ROBUST FEDERATED DOMAIN GENERALIZATION FALL 2022

- Designed a scenario in federated learning where both o.o.d data and poisoned data exist in the clients; Showed the SOTA byzantine-robust federated learning algorithm will fail to generalize in such scenario by being too conservative.
- Proposed a novel federated learning algorithm that encourages the features to align across the domains; the proposed method makes trade-off between domain generalization and byzantine robustness.

ISR: INVARIANT SUBSPACE RECOVERING SUMMER 2021

- Worked with Professor Han Zhao and Professor Bo Li on domain generalization; Purposed a novel post-processing method to recover the invariant subspace of features and improve the robustness of models; The work is published on ICML 2022.
- Tested the algorithm on both synthetic and real-world image datasets for domain generalization; Outperformed the algorithms including IRM and Group-DRO;

PACB: PROBLEM AGNOSTIC CLUSTER-BASED AUDIO PRETRAINING FALL 2021

- Proposed a novel self-supervised training scheme to better leverage the large corpus of unlabeled audio data; Designed a problem-agnostic cluster-based pretext task to pretrain the feature extractor;
- Tested the scheme on source separation and speaker classification datasets; the models converge faster and result in higher accuracy in both tasks.

FEDERATED DOMAIN GENERALIZATION FALL 2021

- Proposed a novel federated learning scheme making use of the data distribution of public and private data and can handle the out of distribution data on the clients;
- Designed the training framework for the proposed scheme; Designed a problem setting on CelebA and constructed the dataset for federated learning that requires domain generalization; Outperformed the FedAvg optimizer on both i.d. and o.o.d accuracy.

HAODE-NET: OBJECT DETECTION IN HAZY ENVIRONMENT SPRING 2021

- Utilized continual learning, multitask learning and knowledge distillation to propose a novel network architecture targeting object detection in a hazy environment; Tested on the SSD and the RTTS datasets;
- Performed extensive experiments and ablation studies verifying the superiority of the proposed framework.

ACDEMICRANK SPRING 2021

- Worked in the FORWARD Data Lab with professor Kevin Chang; Conducted research on calculating the rank of academic works about a given keyword according to their importance;
- Formalized the task into a weighted Personalized PageRank problem with multiple nodes values; Re-processed 3 datasets for the task to shrink the data size and speed up calculation;
- Designed a fast-ranking algorithm that works on citation relation graphs that can calculate the ranking of a graph with more than 10 billion edges in about 1 hour; Generated convincing results.

SKILLS

DEEP LEARNING FRAMEWORKS

- PyTorch; Scikit-learn; Jax; TensorFlow;

PROGRAMMING LANGUAGE

- Python; C/C++; LaTeX; SQL; System Verilog; x86 Assembly; Clojure; HTML; MATLAB;

APPLICATIONS

- Microsoft Office; Photoshop; Premiere Pro; Autodesk; V-REP; ROS.