Zhiwen Fan

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RESEARCH INTERESTS

Implicit Neural Representation, Neural Radiance Fields, 3D Reconstruction, Panoptic Symbol Spotting & Segmentation.

SELECTED PROJECTS

Implicit Neural Representations   Sep. 2021 - Present

INR editing: In our *INS* paper, we conduct a pilot study for training stylized implicit representations (e.g., SIREN, NeRF, SDF). We obtain faithful stylizations and can interpolate between different styles to generate new mixed style. In our *INR-DSP* paper, we propose a theoretically grounded signal processing framework for Implicit Neural Representations (INR), which analytically manipulates INRs on the weight space through differential operators.

Sparse view NeRF: In our *SinNeRF* paper, we propose thoughtfully designed semantic and geometry regularizations to train neural radiance field using only a single view.

NeRF augmentations: In our *Aug-NeRF* paper, we propose to augment NeRF with worst-case perturbations in three distinct levels with physical grounds. They effectively boost NeRF in both novel view synthesis (up to 1.5dB PSNR gain) and underlying geometry reconstruction.

Efficient MVS and MTL   Jul. 2019 - Present

Efficient MVS: In our *Cas-MVSNet* paper, we propose a memory and run time efficient cost volume formulation which is built upon a standard feature pyramid encoding geometry and context at gradually finer scales. We obtain a 23.1% improvement on [DTU benchmark] **(1st place)** , with **50.6% and 74.2%** reduction in GPU memory and run-time. It ranks 1st within all learning-based methods on [Tanks and Temples benchmark]. Besides, we adapt GwcNet with our proposed cost volume design, and the accuracy ranking rises from 29th to 17th with 37.0% memory reduction on [KITTI 2015 test set].

Efficient MTL: In our M^3-*ViT* paper, we propose to activate any task of interest, by integrating mixture-of-experts (MoE) layers into a ViT backbone, along with hardware-level innovations. M^3-ViT reduce the memory by 2.4x, saving 9.23x energy, on PASCAL-Context and NYUD-v2 datasets.

CAD Drawing Perception   Oct. 2020 - Present

Project Page & Product Page

We release the first large-scale real-world dataset of over 10,000 CAD drawings with line-grained annotations. It is used for architecture, engineering and construction (AEC) industries to accelerate the efficiency of 3D modeling. A new task-**panoptic symbol spotting** is proposed for evaluation the quality of panoptic symbol spotting quality.

PanCADNet: In our *FLoorPlanCAD* paper, we first propose a CNN-GCN method for semantic and instance symbol spotting respectively.

CADTransformer: In our *CADTransformer* paper, we present a Transformer-based framework by painlessly modifying existing vision transformer (ViT) to tackle the panoptic symbol spotting task.

SELECTED PUBLICATIONS

NeurIPS 2022 [link]: **Zhiwen Fan**[*], Hanxue Liang[*], Rishov Sarkar, Ziyu Jiang, Tianlong Chen, Kai Zou, Yu Cheng, Cong Hao, Zhangyang Wang, "M³ViT: Mixture-of-Experts Vision Transformer for Efficient Multi-task Learning with Model-Accelerator Co-design"

NeurIPS 2022 [link]: Dejia Xu[*], Peihao Wang[*], Yifan Jiang, **Zhiwen Fan**, Zhangyang Wang, "Signal Processing for Implicit Neural Representations"

ECCV 2022 [link]: **Zhiwen Fan**[*], Yifan Jiang[*], Peihao Wang[*], Xinyu Gong, Dejia Xu, Zhangyang Wang, "Unified Implicit Neural Stylization"

ECCV 2022 [link]: Dejia Xu[*], Yifan Jiang[*], Peihao Wang, **Zhiwen Fan**, Humphrey Shi, Zhangyang Wang, "SinNeRF: Training Neural Radiance Fields on Complex Scenes from a Single Image"

ECCV 2022 [link]: Hanxue Liang , Hehe Fan, **Zhiwen Fan**, Yi Wang, Tianlong Chen, Yu Cheng, Zhangyang Wang, "`Point Cloud Domain Adaptation via Masked Local 3D Structure Prediction`"

ICML 2022 [link]: Peihao Wang, **Zhiwen Fan**, Tianlong Chen, Zhangyang Wang, "`Neural Implicit Dictionary Learning via Mixture-of-Expert Training`".

CVPR 2022(Oral) [link]: **Zhiwen Fan**, Tianlong Chen, Peihao Wang, Zhangyang Wang, "`CADTransformer: Panoptic Symbol Spotting Transformer for CAD Drawings`".

CVPR 2022 [link]: Tianlong Chen, Peihao Wang, **Zhiwen Fan**, Zhangyang Wang, "`Aug-NeRF: Training Stronger Neural Radiance Fields with Triple-Level Physically-Grounded Augmentations`".

3DV 2021 [link]: Rakesh Shrestha, **Zhiwen Fan**, Qingkun Su, Zuozhuo Dai, Siyu Zhu, Ping Tan, "`MeshMVS: Multi-View Stereo Guided Mesh Reconstruction`".

ICCV 2021 [link]: **Zhiwen Fan***, Lingjie Zhu*, Honghua Li, Xiaohao Chen, Siyu Zhu, Ping Tan, "`FloorPlanCAD: A Large-Scale CAD Drawing Dataset for Panoptic Symbol Spotting`".

CVPR 2020(Oral) [link]: **Zhiwen Fan***, Xiaodong Gu*, Siyu Zhu, Zuozhuo Dai, Feitong Tan, Ping Tan "`Cascade Cost Volume for High-Resolution Multi-View Stereo and Stereo Matching`".

IPMI 2019 [link]: **Zhiwen Fan***, Liyan Sun*, Xinghao Ding, Yue Huang, John Paisley "`Joint CS-MRI reconstruction and segmentation with a unified deep network`".

ACM MM 2019 [link]: **Zhiwen Fan***, Huafeng Wu*, Xueyang Fu, Yue Huang, Xinghao Ding "`Residual-guide network for single image deraining`".

ECCV 2018 [link]: **Zhiwen Fan***, Liyan Sun*, Xinghao Ding, Yue Huang, Congbo Cai, John Paisley, "`A Segmentation-aware Deep Fusion Network for Compressed Sensing MRI`".

AAAI 2018 [link]: **Zhiwen Fan***[1], Liyan Sun*, Yue Huang, Xinghao Ding, John Paisley "`Compressed Sensing MRI Using a Recursive Dilated Network`".

TIP 2019 [link]: Liyan Sun, **Zhiwen Fan**, Xueyang Fu, Yue Huang, Xinghao Ding, John Paisley, "`A deep information sharing network for multi-contrast compressed sensing MRI reconstruction`", Transactions on Image Processing.

MRI 2019 [link]: Liyan Sun, **Zhiwen Fan***, Xinghao Ding, Yue Huang, John Paisley, "`Region-of-interest undersampled MRI reconstruction:  A deep convolutional neural network approach`", Magnetic resonance imaging.

MRI 2019 [link]: Liyan Sun, **Zhiwen Fan**, Xinghao Ding, Congbo Cai, Yue Huang, John Paisley "`A divide-and-conquer approach to compressed sensing MRI`", Magnetic resonance imaging.

PROFESSIONAL EXPERIENCE

Google	May. 2022 - Present
Research Intern, Supervisor: Sergio Orts Escolano and Alexander Koumis	
The University of Texas at Austin	Aug. 2021 - Present
Research Assistant, Supervisor: Prof. Zhangyang (Atlas) Wang	
Alibaba Cloud	Jul. 2019 - Aug. 2021
Senior Algorithm Engineer, Supervisor: Prof. Ping Tan, Dr. Siyu Zhu	
Xiamen University	Aug. 2016 - Jun. 2019
Research Assistant, Supervisor: Prof. Xinghao Ding	

EDUCATION

The University of Texas at Austin (UT Austin)	Aug. 2021 - Present
Ph.D. Student, Electrical and Computer Engineering	Advisor: Prof. Zhangyang (Atlas) Wang
Xiamen University (XMU)	Sep. 2016 - Jun. 2019
Master, Electronic and Communication Engineering	Advisor: Prof. Xinghao Ding
Shandong Agriculture University (SDAU)	Sep. 2012 - Jun. 2016
Bachelor, Electronic Information Science and Technology	

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[1]A marker * denotes equal-contribution first authorship.

HONORS

Scholarship & Awards

- Winner of Qualcomm Innovation Fellowship (North America) 2022 Aug. 2022
- Professional Development Award of UT Austin   Jul. 2022
- 3rd place of University Demo Best Demonstration at 59th Design Automation Conference   Jul. 2022
- Outstanding Graduates of Xiamen University   Jun. 2019
- The First Prize Scholarship of Xiamen University   2016-2018
- AAAI 2018 Travel Award   Jan. 2018
- Outstanding Graduates of Shandong Province   Jun. 2016

INVITED TALKS

- Unified Implicit Neural Stylization" at Xiamen University and Kungfu.ai.   Jul. 2022

SERVICES

Journal Reviewer: TPAMI, TIP, IJCV, Neurocomputing

Conference Reviewer: NeurIPS'22, ECCV'22, ICML'22, CVPR'22, ICCV'21, AAAI'21, ICME'19