Zhentao Liu

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Personal Profile

I am now a second-year master student in IMPACT Lab of ShanghaiTech University under the supervision of Prof. Zhiming Cui and Porf. Dinggang Shen. My current research interests lie in 3D/4D vision & reconstruction, neural representation and medical image reconstruction. **I've published two IEEE Transactions papers, with another two in revision/submission. I won the first prize of Ningbo Natural Science Outstanding Paper Award (*ranked first, 1/130*) of 2021-2022.**

Education

ShanghaiTech University   *Shanghai, China*
M.S. in Computer Science - GPA 3.71/4   *Sep. 2022 - Present*
- IMPACT Lab | Supervisor: Prof. Zhiming Cui, Prof. Dinggang Shen
- Research Interests: 3D/4D Vision & Reconstruction, Neural Rendering, Medical Image Reconstruction

Ningbo University   *Ningbo, China*
B.E. in Communication Engineering - GPA 3.83/4, Rank 1/100   *Sep. 2018 - July 2022*
- VIPP Lab | Supervisor: Prof. Qiuping Jiang
- Research Interests: Human Vision Modeling, Image Quality Assessment

Research Experience

Sparse-view Dynamic DSA Reconstruction   *Shanghai, China*
IMPACT Lab | ShanghaiTech University   *May 2023 - March 2024*
- **Motivation**: Reconstruct high quality 3D vessel structure from a decreased number of dynamic Digital Subtraction Angiography (DSA) images (133 to 30) to reduce radiation exposure.
- **Method**: Represent the dynamic DSA imaging as a complementary weighted combination of static and dynamic attenuation fields, with the weights derived from the time-agnostic vessel probability field. Functioning as dynamic mask, vessel probability provides proper gradients for both static and dynamic fields adaptive to different scene types, which facilitates a clear static-dynamic decomposition and significantly improves the reconstruction quality. Two training strategies are applied to further enhance reconstruction quality: coarse-to-fine progressive training and temporal perturbed rendering loss.

Sparse-view CBCT Reconstruction   *Shanghai, China*
IMPACT Lab | ShanghaiTech University   *Sep. 2022 - March 2023*
- **Motivation**: Reconstruct high quality 3D Cone-beam Computed Tomography (CBCT) image from a decreased number of X-ray images (500 to 20 or less) to reduce radiation exposure.
- **Method**: Develop a geometry-aware encoder-decoder framework to reconstruct 3D CBCT image from multi-view 2D X-rays. Leveraging CBCT scanning geometry and prior knowledge from data population, our method provides high-quality and efficient reconstructions.

JND Profile Estimation   *Ningbo, China*
VIPP Lab | Ningbo University   *April 2021 - Aug. 2021*
- **Motivation**: Develop an accurate Just Noticeable Difference (JND) estimation model aligning with human perception system.
- **Method**: Instead of traditional explicitly formulating and fusing different masking effects in a bottom-up way, the proposed JND estimation model employs a totally different top-down design philosophy. It first predicts a critical perceptual lossless (CPL) counterpart of the original image based on KLT transformation and then calculates the difference map between the original image and the predicted CPL image as the JND map.

SISR Images Quality Assessment   *Ningbo, China*
VIPP Lab | Ningbo University   *July 2020 - April 2021*
- **Motivation**: Try to fairly compare different Single Image Super-Resolution (SISR) algorithms performance in real-world scenarios.
- **Method**: First, we construct a real-world SISR quality dataset and conduct human subjective studies to compare the performance of the representative SISR algorithms. Second, we propose a new objective metric based on KLT transformation to evaluate the quality of SISR images in a no-reference manner.

Publications

Journal Articles

3D Vessel Reconstruction from Sparse-View Dynamic DSA Images via Vessel Probability Guided Attenuation Learning
Zhentao Liu, Huangxuan Zhao, Wenhui Qin, Zhenghong Zhou, Xinggang Wang, Wenping Wang, Xiaochun Lai, Chuansheng Zheng, Dinggang Shen, Zhiming Cui.
IEEE Transactions on Pattern Analysis and Machine Intelligence, 2024. (In Submission)

Geometry-Aware Attenuation Field Learning for Sparse-View CBCT Reconstruction
Zhentao Liu, Yu Fang, Changjian Li, Han Wu, Yuan Liu, Dinggang Shen, Zhiming Cui.
IEEE Transactions on Medical Imaging, 2023. (Major Revision)

Towards Top-Down Just Noticeable Difference Estimation of Natural Images
Qiuping Jiang[†], **Zhentao Liu**[†], Shiqi Wang, Feng Shao, Weisi Lin. ([†]equal contribution)
IEEE Transactions on Image Processing, 2022.

Single Image Super-Resolution Quality Assessment: A Real-World Dataset, Subjective Studies, and An Objective Metric
Qiuping Jiang, **Zhentao Liu***, Ke Gu, Feng Shao, Xinfeng Zhang, Hantao Liu, Weisi Lin. (*corresponding author)
IEEE Transactions on Image Processing, 2022.

CONFERENCE PROCEEDINGS

TeethDreamer: 3D Teeth Reconstruction from Five Intra-oral Photographs.
Chenfan Xu[†], **Zhentao Liu**[†], Yuan Liu, Yulong Dou, Jiamin Wu, Jiepeng Wang, Minjiao Wang, Dinggang Shen, Zhiming Cui.
International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2024. (In Submission)

Performance Analysis of Implicit Neural Representation for Clinical CT Imaging.
Wenhui Qin, **Zhentao Liu**, Xiaopeng Yu, Mengqing Su, Yang Yang, Yikun Zhang, Yuyao Zhang, Zhiming Cui, Yang Chen, Xiaochun Lai.
International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2024. (In Submission)

Multi-View Vertebra Localization and Identification from CT Images.
Han Wu, Jiadong Zhang, Yu Fang, **Zhentao Liu**, Nizhuan Wang, Zhiming Cui, Dinggang Shen.
International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2023.

Patents

A Top-Down method for Just Noticeable Difference Estimation of Natural Images
Zhentao Liu, Qiuping Jiang.
China Invention Patent.

A Super-Resolution Image Quality Assessment Method based on KLT Transformation
Qiuping Jiang, **Zhentao Liu**.
China Invention Patent.

Awards

2021-2022	**Ningbo Natural Science Outstanding Paper Award**, *First Prize, Ranked First, 1/130*	*Ningbo, China*
2019-2020	**Scholarship of Zhejiang Province**	*Ningbo, China*
2018-2019	**Scholarship of Zhejiang Province**	*Ningbo, China*

Skills

Programming	Python, Matlab
Research Tools	PyTorch, MeshLab, ITK-SNAP, 3D Slicer, Notion, LaTeX, CUDA
Languages	Chinese (native), English (fluent)