Zhentao Liu

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Personal Profile

I am Zhentao Liu, currently a second-year master student of BME School in ShanghaiTech University. I belong to IMPACT Lab under the supervision of Prof. Zhiming Cui and Porf. Dinggang Shen. My current research interests lie in 3D/4D vision & reconstruction, implicit neural representation and medical image reconstruction. **I've published two IEEE TIP papers, with another two IEEE TPAMI/TMI papers under review/revision. I once won the first prize of Ningbo Natural Science Outstanding Paper Award (1/130). I also won the Scholarship of Zhejiang Province twice.**

Education

ShanghaiTech University Shanghai, China

M.S. in Computer Science - GPA 3.71/4 2022.09 - Present

- IMPACT Lab | Supervisor: Prof. Zhiming Cui, Prof. Dinggang Shen
- Research Interests: 3D/4D Vision & Reconstruction, Implicit Neural Representation, Medical Image Reconstruction

Ningbo University Ningbo, China

B.E. in Communication Engineering - GPA 3.83/4, Rank 1/100 2018.09 - 2022.07

- 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 2023.05 - 2024.03

- **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** Propose to use time-agnostic vessel probability field to model dynamic DSA imaging effectively. Represent the dynamic DSA imaging as a complementary weighted combination of static and dynamic attenuation fields, with the weights derived from the 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 self-supervised 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 2022.09 - 2023.03

- **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 high quality 3D CBCT image from sparse 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 2021.04 - 2021.08

- **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 2020.07 - 2021.04

- **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 (**IEEE TPAMI**). (**Under Review**)*

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 (**IEEE TMI**). (**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 (**IEEE TIP**), 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 (**IEEE TIP**), 2022. (**TOP50 Popular Articles**)*

CONFERENCE PROCEEDINGS

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. (**Under Review**)*

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. (**Under Review**)*

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

2023.10	**First Prize of Ningbo Natural Science Outstanding Paper Award (1/130)**	Ningbo, China
2022.06	**Nomination of Best Student in Ningbo University**	Ningbo, China
2021.12	**First Scholarship of Ningbo University**	Ningbo, China
2020.12	**Scholarship of Zhejiang Province**	Ningbo, China
2019.12	**Scholarship of Zhejiang Province**	Ningbo, China