# Yu Fang

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## Education

**University of North Carolina at Chapel Hill** **Fall 2023 - Present**
*Ph.D. in Computer Science* *Chapel Hill, NC, US*
Advisors: Marc Niethammer, Roni Sengupta

**ShanghaiTech University** **Fall 2020 - Spring 2023**
*M.S. in Computer Science* *Shanghai, China*
IDEA Lab | Advisors: Dinggang Shen, Zhiming Cui

**Donghua University** **Fall 2016 - Spring 2020**
*B.E. in Software Engineering* *Shanghai, China*

## Research Interests

I'm broadly interested in **3D computer vision**, including applications of neural rendering, generative AI for 3D content creation, and intersection with perception tasks in embodied AI and robotics.

## Research Experience

**CBCT Reconstruction with Neural Rendering** **Mar 2022 - Present**

- Motivation: **Decrease the number of 2D projections** (500 $\rightarrow$ 20) for 3D CBCT image reconstruction, to lower x-ray radiation dose while maintaining high reconstruction quality.
- Method: Extend neural radiance fields to **neural attenuation fields**, learning X-ray absorption through different materials for clinical CBCT. To tackle sparse-view inputs, propose a **novel view augmentation strategy** to fine-tune the trained field, providing strong regularization to constrain in-between novel views to be sharper and more clear.
- Future: **Explore potential applications of neural rendering in CBCT images**, including: reconstruction with fewer views (10 views) for surgical navigation, dynamic image reconstruction, and applications of surface reconstruction.

**High-quality Tooth Model Generation from CBCT Images** **Jun 2021 - Feb 2022**
*IDEA Lab, ShanghaiTech University*

- Motivation: Generate high-quality tooth model with **fine-grained surface details on tooth crown** only from CBCT images, without the need of another modality, i.e., intra-oral scanning model.
- Method: **Combine two modalities of data** to build high-quality tooth model for network training, i.e., tooth model from CBCT images and crown model from intra-oral scanning model. **Implicit function learning** for 3D shape reconstruction of high-quality tooth model, improving the predicted surface details by a novel module to **enhance the learning of curvature on the surface**.
- Extend the application of model fusion to 3D measurement for diagnosing periodontal disease.

## Publications

**DTR-Net: Dual-space 3D Tooth Reconstruction from Panoramic X-ray Image**
Lanzhuju Mei, **Yu Fang**, Yue Zhao, Min Zhu, Xuming He, Xiang Zhou, Zhiming Cui, Dinggang Shen.
*IEEE Transactions on Medical Imaging, 2023.*

**HC-Net: Hybrid Classification Network for Automatic Periodontal Disease Diagnosis**
Lanzhuju Mei, **Yu Fang**, Zhiming Cui, Ke Deng, Nizhuan Wang, Xuming He, Yiqiang Zhan, Xiang Zhou, Maurizio Tonetti, Dinggang Shen.
*International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2023.*

**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.*

**Dental Anatomy Segmentation from Cone Beam CT Images**
Minhui Tan, **Yu Fang**, Yu Zhang, Zhiming Cui, Dinggang Shen.
*IEEE International Symposium on Biomedical Imaging (ISBI), 2023.*

**Geometry-Aware Attenuation Field Learning for Sparse-View CBCT Reconstruction**
Zhentao Liu, **Yu Fang**, Changjian Li, Han Wu, Yuan Liu, Zhiming Cui, Dinggang Shen.
*ArXiv Preprint arXiv:2303.14739.*

**SNAF: Sparse-view CBCT Reconstruction with Neural Attenuation Fields**
**Yu Fang**, Lanzhuju Mei, Changjian Li, Yuan Liu, Wenping Wang, Zhiming Cui, Dinggang Shen.
*Arxiv Preprint arXiv:2211.17048.*

**Curvature-enhanced Implicit Function Network for High-quality Tooth Model Generation from CBCT Images**
**Yu Fang**, Zhiming Cui, Lei Ma, Lanzhuju Mei, Bojun Zhang, Yue Zhao, Zhihao Jiang, Yiqiang Zhan, Yongsheng Pan, Min Zhu, Dinggang Shen.
*International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2022.*

**A Fully Automatic AI System for Tooth and Alveolar Bone Segmentation from Cone-beam CT Images**
Zhiming Cui*,**Yu Fang***, Lanzhuju Mei*, Bojun Zhang*, Bo Yu, Jiameng Liu, Caiwen Jiang, Yuhang Sun, Lei Ma, Jiawei Huang, Yang Liu, Yue Zhao, Chunfeng Lian, Zhongxiang Ding, Min Zhu, Dinggang Shen.
*Nature Communications, 2022.*

## Patents

**Curvature-enhanced Implicit Function Network for High-quality Tooth Model Generation from CBCT Images**
*China Invention Patent.*

## Services

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| **Teaching Assistant** | CS240: Algorithm Design [Spring 2022, ShanghaiTech University]<br>BME2113: Algorithm Design and Analysis [Fall 2022, ShanghaiTech University] |
| **Reviewer** | MICCAI 2024<br>SIGGRAPH 2024 (Poster)<br>SIGGRAPH 2023 (Poster) |

## Skills

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| **Programming Languages** | Python, C/C++, Java, SQL, HTML/CSS/JavaScript |
| **Research Tools** | PyTorch, MeshLab, VR/AR (Meta Quest 3), Unity, ITK-SNAP, 3D Slicer, Git, NAS, Notion, LaTeX |
| **Communication** | Chinese (native), English (fluent) |
| **Hobbies** | Photography, Movies, Music, Games |