

Ange Lou

(202) 517-3096 | ange.lou@vanderbilt.edu

Website: <https://angeloucn.github.io/> | Goole Scholar: [zUwelkUAAAAJ](https://scholar.google.com/citations?user=zUwelkUAAAAJ)

EDUCATION

Vanderbilt University

Doctor of Philosophy in Electrical Engineering

Nashville, TN.

August 2021 – Present

The George Washington University

Master of Science in Electrical Engineering

Washington, D.C.

August 2017 – May 2019

Wuhan University of Technology

Bachelor of Engineering in Energy and Power Systems

Wuhan, Hubei, China

September 2013 – June 2017

RESEARCH EXPERIENCE

Biomedical Image Analysis for Image Guided Interventions Laboratory—Vanderbilt University

Nashville, TN

Research Assistant

August 2021 – Present

3D Surgical Scene Understanding (*An end-to-end 3D navigation system for real-world surgery*)

- Designed a self-supervised segmentation network for surgical tool segmentation, achieving state-of-the-art performance using only 20% labeled data.
- Developed a self-supervised 3D reconstruction method for surgical tools, achieving high-fidelity texture recovery.
- Created a self-supervised network for surgical scene depth estimation with unknown camera parameters, achieving superior performance in intrinsic, pose, and depth estimation.
- Proposed frequency-based representation, online pruning, and post quantization methods for efficient dynamic and static scene reconstruction using Neural Radiance Fields (NeRF), resulting in a 5% performance (PSNR) improvement.
- Finetuned a Vision Transformer (ViT)-based foundation model for depth estimation in surgical scenes.
- Applied a diffusion model and 3D Gaussian Splatting for image-to-3D generation of surgical tools.
- Zero-shot surgical video segmentation by Segment Anything Model 2.

EEG-to-fMRI Translation

- Proposed a multi-scale spectral representation for fMRI synthesis from EEG, achieving SOTA correlation.

Medical Imaging & Image Analysis Laboratory – The George Washington University

Washington, DC

Research Associate

July 2019 – May 2021

Efficient Biomedical Image Segmentation

- Developed an efficient CNN-based segmentation network for real-time medical image segmentation.

INDUSTRY EXPERIENCE

United Imaging Intelligence

Cambridge, Massachusetts, USA

Research Intern

May 2023 – August 2023

Efficient 4D Neural Radiance Field and Gaussian Splatting

- Proposed sparse directional-aware representation based neural radiance field (NeRF) to improve the quality of both static and dynamic scene reconstruction.

Human Body Reconstruction

Developed a bottom-up approach for reconstructing human body meshes from partially visible data.

Video Phase Recognition

- Proposed the neural finite-state machine (NFSM) module to improve surgical phase recognition in lengthy surgical videos.

SKILLS

Programming Languages: Python, MATLAB, C++

Packages and Frameworks: PyTorch, Tensorflow, Keras, OpenCV, scikit-learn

Research Area: Perception (SfM, pose estimation, NeRF and Gaussian Splatting), Segmentation, Deep Learning, Semi/Self-supervised learning, Time-Series Analysis, Multi-Modality, Transformer, Diffusion, Image-to-3D Generation, Foundation Model, 3D Scene Understanding

PUBLICATIONS

[C1] Ange Lou, Yamin Li, Yike Zhang, Jack Noble. “Zero-Shot Surgical Tool Segmentation in Monocular Video Using Segment Anything Model 2”. *Submitted to SPIE 2025*

[C2] Yamin Li*, Ange Lou*, Dario Englot, Soheil Kolouri, Daniel Moyer, Catie Chang. “NeuroBOLD: Resting-state EEG-to-fMRI Synthesis with Multi-dimensional Feature Mapping”. *Submitted to NeurIPS 2024*

- [C3] Hao Ding, Zhongpai Gao, Tianyu Luan, Benjamin Planche, Abhishek Sharma, **Ange Lou**, Terrence Chen, Mathias Unberath, Ziyang Wu, “Neural Finite-State Machines for Video Phase Recognition”. *Submitted to NeurIPS 2024*
- [C4] Tianyu Luan, Zhongpai Gao, Abhishek Sharma, Hao Ding, Benjamin Planche, **Ange Lou**, Terrence Chen, Junsong Yuan, Ziyang Wu, “Divide and Fuse: Body Part Mesh Recovery from Partially Visible Human Images”. **Accepted by ECCV 2024**
- [C5] **Ange Lou**, Benjamin Planche, Zhongpai Gao, Yamin Li, Tianyu Luan, Hao Ding, Terrence Chen, Jack Noble, Ziyang Wu, “DaReNeRF: Direction-aware Representation for Dynamic Scenes”. *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2024*.
- [C6] **Ange Lou**, Yamin Li, Xing Yao, Yike Zhang, Jack Noble, “SAMSNeRF: Segment Anything Model (SAM) Guides Dynamic Surgical Scene Reconstruction by Neural Radiance Field (NeRF)”. *Medical Imaging 2024: Image-Guided Procedures, Robotic Interventions, and Modeling*, vol. 12928, pp. 19-23. SPIE, 2024. **(Oral)**
- [C7] Xing Yao, Han Liu, Dewei Hu, Daiwei Lu, **Ange Lou**, Hao Li, Ruining Deng, Gabriel Arenas, Baris Oguz, Nadav Schwartz, Brett C Byram, Ipek Oguz, “False Negative/Positive Control for SAM on Noisy Medical Image”. *Medical Imaging 2024: Image Processing*, vol. 12926, p. 1292602. SPIE, 2024. **(Oral)**
- [C8] Yamin Li, **Ange Lou**, Ziyuan Xu, Catie Chang, “Leveraging sinusoidal representation networks to predict fMRI signals from EEG”. *Medical Imaging 2024: Image Processing*, vol. 12926, pp. 795-800. SPIE, 2024.
- [C9] Yike Zhang, Eduardo Davalos, **Ange Lou**, Jack Noble, “Monocular Microscope to CT Registration using Pose Estimation of the Incus for Augmented Reality Cochlear Implant Surgery”. *Medical Imaging 2024: Image-Guided Procedures, Robotic Interventions, and Modeling*, vol. 12928, pp. 556-562. SPIE, 2024.
- [C10] **Ange Lou**, Jack Noble, “WS-SfMLearner: Self-supervised Monocular Depth and Ego-motion Estimation on Surgical Videos with Unknown Camera Parameters”. *Medical Imaging 2024: Image-Guided Procedures, Robotic Interventions, and Modeling*, vol. 12928, pp. 119-127. SPIE, 2024. **(Oral)**
- [C11] Ziteng Liu, Yubo Fan, **Ange Lou**, Jack Noble, “SRSegN: Super-resolution Segmentation network for inner-ear tissue segmentation”. In *International Workshop on Simulation and Synthesis in Medical Imaging* (pp. 11-20).
- [C12] **Ange Lou**, Xing Yao, Ziteng Liu, Jintong Han, Jack Noble, “Self-Supervised Surgical Instrument 3D Reconstruction from a Single Camera Image”. *Medical Imaging 2023: Image-Guided Procedures, Robotic Interventions, and Modeling*. Vol. 12466. SPIE, 2023 **(Oral)**
- [C13] Xing Yao, **Ange Lou**, Hao Li, Dewei Hu, Han Liu, Jiacheng Wang, Zachary Stoebner, Hans Johnson, Jeff D. Long, Jane S. Paulsen, Ipek Oguz, “Novel application of the attention mechanism on medical image harmonization”. *Medical Imaging 2023: Image Processing*. Vol. 12464. SPIE, 2023 **(Oral)**
- [C14] **Ange Lou**, Shuyue Guan, Hanseok Ko, Murray Loew, “CaraNet: Context Axial Reverse Attention Network for Segmentation of Small Medical Objects”. *SPIE Medical Imaging 2022: Image Processing*. **(Oral)**
- [C15] **Ange Lou**, Shuyue Guan, Murray Loew, “CFPNet: Channel-wise Feature Pyramid Network for Real-Time Semantic Segmentation”. *International Conference on Image Processing (ICIP) 2021*
- [C16] **Ange Lou**, Shuyue Guan, Murray Loew, “DC-UNet: Rethinking the U-Net Architecture with Dual Channel Efficient CNN for Multimodal Biomedical Image Segmentation”. *SPIE Medical Imaging 2021: Image Processing*.
- [C17] **Ange Lou**, Shuyue Guan, Nada Kamona, Murray Loew, “Segmentation of Infrared Images Using MultiResUnet Neural Networks”, *IEEE Applied Imagery Pattern Recognition Workshop (AIPR), Washington, D.C, USA, 2019*. **(Oral)**
- [J1] **Ange Lou**, Benjamin Planche, Zhongpai Gao, Yamin Li, Tianyu Luan, Hao Ding, Meng Zheng, Terrence Chen, Ziyang Wu, Jack Noble, “DaRePlane: Direction-aware Representation for Dynamic Scenes”. **In preparation for IEEE Transactions on Pattern Analysis and Machine Intelligence**.
- [J2] **Ange Lou**, Kareem Tawfik, Xing Yao, Ziteng Liu, Jack Noble, “Min-Max Similarity: A Contrastive Semi-Supervised Deep Learning Network for Surgical Tools Segmentation”. *IEEE Transactions on Medical Imaging (2023)* **(IF=11.037)**
- [J3] **Ange Lou**, Shuyue Guan, Murray Loew, “CFPNet-M: A Light-weight Encoder-Decoder Based Network for Multimodal Biomedical Image Segmentation”. *Computers in Biology and Medicine (2023)*: 106579 **(IF=7.7)**
- [J4] **Ange Lou**, Shuyue Guan, Murray Loew, “CaraNet: context axial reverse attention network for segmentation of small medical objects”. *Journal of Medical Imaging, 10(1)*, 014005. **(IF=2.4)**

ACADEMIC SERVICE

- iScience, Cell Press
- Journal of Medical Imaging (JMI)
- Imaging Science Journal
- Neural Regeneration Research (NRR)
- IEEE Journal of Biomedical and Health Informatics (JBHI)
- Image and Vision Computing
- Automatika
- Image and Vision Computing
- Cluster Computing
- Computer Methods and Programs in Biomedicine
- Artificial Intelligence in Medicine
- IEEE Robotics and Automation Letters
- IEEE Transactions on Circuits and Systems for Video Technology
- The Visual Computer
- Multimedia Systems
- Scientific Reports
- Signal, Image and Video Processing
- Neurocomputing
- IEEE Transactions on Radiation and Plasma Medical Sciences

Reviewer for Conferences

Reviews: 25

- 2023 International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)
- 2024 International Conference on Medical Image Computing and Computing Assisted Intervention (MICCAI)
- 2024 Conference on Neural Information Processing Systems (NeurIPS)

EDUCATIONAL ACTIVITIES

2023 **Guest lecturer** for the course “Intelligent Systems and Robotics” at *Vanderbilt University Department of Electrical Engineering* (Spring)

2023 **Invited Speaker** for *George Washington University* and *Children’s National Hospital* Joint Informatics Seminar, “CFPNet-M: A Lightweight Encoder-Decoder Based Network for Multimodal Biomedical Image Real-Time Segmentation”

2023 **Guest lecturer** for the course “Special Topics – Engineering for Surgery” at *Vanderbilt University Department of Electrical Engineering* (Fall)