Ge Jin

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PhD graduate with 5 years of experience in developing and implementing deep learning solutions for computer graphics, visualization, and image processing. Proven expertise in generative models, 3D reconstruction, and rendering optimization from hospital applications to top journals.

Personal Project Experiences

MISNER-X: MEDICAL IMPLICIT SHAPE NEURAL REPRESENTATION FROM X-RAY IMAGES BY CONTRASTIVE GENERATIVE LEARNING **2022-2024**

- A **contrastive learning** framework for **single image 3D reconstruction** task. It is an **encoder-decoder neural network**. It reconstructs 3D organs from a single 2D X-Ray image.
- It is built using **PyTorch, OpenGL, OpenCV,** and adjacent packages, e.g. **Numpy, SciKit**.
- It achieved **comparable shape accuracy** while using only **1/256th** of the data required for the 3D input.

MISNER: MEDICAL IMPLICIT SHAPE NEURAL REPRESENTATION FOR 3D PELVIS VISUALISATION **2021-2023**

- An **implicit** shape representation **neural network** for **3D shape segmentation and reconstruction** task. It used a **multi-layer-perceptron (MLP)** for implicit shape representation that visualize the organ shape from a CT volume, inspired by the Neural Radiance Field (**NeRF**).
- It is built using **PyTorch, PyRender, OpenGL,** and adjacent packages, e.g. **Numpy, SciKit**.
- It allows **watertight surface** for enhanced **visualization** while maintaining the shape accuracy.

A GENERATIVE ADVERSARIAL NETWORK FOR UP-SAMPLING OF DIRECT VOLUME RENDERING IMAGES **2020-2023**

- A conditional **generative adversarial network** (conditional **GAN**) for accelerating **3D volumetric rendering** in the GPU pipeline. Inspired by **style transfer** task, it up-samples low-quality renderings to higher quality, similar to **super-resolution**, while using less computation power.
- It is built using **PyTorch, OpenGL, HLSL, C++,** and adjacent packages, e.g. **Numpy, SciKit**.
- The 3D volumetric visualization process renders at **4 times faster.**

SHIC/3SVR Viewer **2022-2024**

- A **Python** and **C++** based 3D medical image **visualization software** for professional cancer diagnosis and analysis which is capable of rendering **3D visualization** of medical images.
- The visualization algorithm is built using **python** and adjacent packages, the software package (based on 3D Slicer) is built using **C++** and **QT.**
- It is now distributed in **Royal Prince Alfred Hospital** as a standard, serving over **30,000 patients**
- Integrated an **LLM** for **visualization parameter optimization** from natural language (function under internal review)

RibMR – A Mixed Reality Visualization System for Rib Fracture Localization **2019-2023**

- A **C++/CX, C#** and **Python** based **Mixed Reality** solution for surgery aid. It superimposes processed renderings of the fractured ribs onto the patient for accurate incision during surgery.
- It consists of a **deep learning**-based **segmentation** and **data preprocessing** pipeline using **PyTorch,** a **Unity & C#** based desktop app, and a **C++/CX** HoloLens app.
- During the clinical trial in **Westmead Hospital,** it achieved **32% higher localization rate** and **78% faster** per rib fracture comparing to the standard method.

HOLOLENS DVR **2019**

- A **Microsoft HoloLens visualization** app that is developed using **C++/CX**, **OpenGL, and HLSL,** it supports native real-time **direct volume rendering (DVR)** on a mobile device.
- It achieved **11% higher avg frame rate** comparing to generic Unity app (on HoloLens Gen1).

Other Experiences

PRESIDENT OF IEEE USYD STUDENT BRANCH **2022-2024**

- In a leadership role to coordinate a small team to promote IEEE (Institute of Electrical and Electronics Engineers) in the campus, regularly host events with guest speakers
- The number of student members increased by 40% from previous terms

HDR Officer of Sydney University Postgraduate Representative Association **2024**

- Advocate for HDR students in USYD in matters such as the HDR policy reform, the Grad School, chairing the HDR committee and representing student interest in the university board meetings.
- In a leadership role to organize and host activities and events such as the Supervisor of the Year Award, HDR Wine & Cheese, etc.

Skills & Abilities

- **Language**: Native in Mandarin; Fluent in English (IELTS band 8)
- **Machine Learning / Deep Learning Topics:** Generative AI, Computer Graphics, Computer Vision, Image Processing, Implicit Representation, Contrastive Learning, Foundation Models, Large Language Models, 3D Reconstruction, Mesh Modelling, Virtual/Augmented/Mixed Reality
- **Visualization Tools:** OpenGL, GLSL, HLSL, Unity, Microsoft HoloLens
- **Technical Skills**: Python, PyTorch and adjacent DL packages, OpenCV, Java, C, C++, C#, HLSL, OpenGL, SQL, AWS, Azure and general MLOps/DevOps

Education

The University of Sydney, Bachelor of Information Technology *(Honours)* **2016-2019**

- Major: Computer Science, **First Class Honours**

The University of Sydney, Doctor of Philosophy (Engineering and IT) **2020-2024**

- Thesis Title: Medical Volume Visualization Enhancement Using Deep Neural Networks
- Supervisors: Prof. Jinman Kim, Prof. Dagan Feng, and A/Prof. Lei Bi

Publications

- **G. Jin**, Y. Jung, M. Fulham, D. Feng, and J. Kim, “A Generative Adversarial Network for Upsampling of Direct Volume Rendering Images,” Computer Graphics Forum, e15198, 2024. DOI: https://doi.org/10.1111/cgf.15198
- **G. Jin**, Y. Jung, L. Bi, and J. Kim, “MISNeR: Medical Implicit Shape Neural Representation for Image Volume Visualisation,”, Computer Graphics Forum, 43: e15222, 2024. DOI: https://doi.org/10.1111/cgf.15222
- **G. Jin**, Y. Jung, and J. Kim, "Challenges and Constraints in Deformation-Based Medical Mesh Representation." Computer Graphics International, pp. 146-156. Cham: Springer Nature Switzerland, 2023
- **G. Jin**, Y. Jung, and J. Kim, “Medical Implicit Shape Neural Representation from a Single X-Ray,” **submitted** to Medical Image Analysis

Links

- **Webpage: http://theattackingeyebrows.github.io**
- **LinkedIn: https://www.linkedin.com/in/ge-jin-050a1a148/**