

Zhong Li

CONTACT INFORMATION	Sunnyvale, CA, USA lizhong@udel.edu	Personal website Google scholar
RESEARCH INTERESTS	Computer Vision and Graphics, Computational Photography, Artificial Intelligence, Image-based Rendering and Relighting, Light Fields, Neural Rendering, 3D Reconstruction, 3D Human Digitization.	
EDUCATION	University of Delaware , Newark, Delaware Ph.D, Computer Science, Winter 2019 <ul style="list-style-type: none">• Advisors: Jingyi Yu, Ph.D University of Missouri , Columbia, Missouri M.S, Computer Science, Summer 2015 <ul style="list-style-type: none">• Advisor: Ye Duan, Ph.D	
INDUSTRIAL EXPERIENCE	Innopeak Technology(A.K.A. OPPO Research USA) , Palo Alto, CA, USA <i>Staff Research Scientist/Technical Lead:</i> March 2021 - Present <ul style="list-style-type: none">• 3D Photo and Video: Currently leading a team in the development and delivery of an immersive six-degrees-of-freedom (6DoF) video and imaging experience for OPPO MR device.<ul style="list-style-type: none">– Spatio video/Live photo: Development in progress on a high-resolution, real-time immersive video solution utilizing Gaussian Splatting and Neural Radiance Fields (NeRF). This project focuses on iterative refinements to enhance the user experience.– Spatio photo: Ongoing development of a high-resolution, real-time solution for 6 Degrees of Freedom (6DoF) photography and panoramas. This initiative employs Gaussian Splatting and Neural Radiance Fields (NeRF) to achieve its objectives.– Light-Field and Photometric Data Capture : Features synchronized LED lights and triggered cameras, adaptable to both outside-in and inside-out scenarios.<ul style="list-style-type: none">* Hardware Setup: Responsible for designing the LED light circuit, triggering DSLR cameras, and controlling Arduino.* Post-Processing Pipeline: Includes geometry reconstruction, light direction calibration, photometric stereo, and other steps. <p>Senior Research Scientist/Technical Lead March 2019 - August 2021</p> <ul style="list-style-type: none">• TOF/RGB human motion capture: Lead a team to successfully deliver an on-device real-time TOF/RGB human motion capture function for OPPO future AR wearable device and virtual human project. Showcased:OPPO official twitts<ul style="list-style-type: none">– Dataset Generation: Design and implemented several fully automatic TOF/RGB/Fisheye 2D/3D human motion capture GT joint data collection pipelines using VICON/Kinect sensor/3D render.– Algorithm development: Robust on-device real-time 2D/3D human pose estimation, 3D avatar driven, 3D parametric human recovery.	

– **Algorithm Deployment:** Deploy deep learned models using on-device SDK(SNPE,ONNX) running on DSP/ARM/GPU in modern SOC.

- **One Shot Human 3D Digitization:** Served as the lead on a project to digitize humans from a single image. My responsibilities included the design and implementation of the core algorithm.

DGene US Research, Santa Clara, CA, USA

Graphics & Vision Research Intern

Feb 2017 - Aug 2017

- Develop an algorithm combine Poisson Reconstruction and Visual Hull to improve multiple-view stereo reconstruction.
- Participate to build a multi-camera dome for dynamic object capturing for AR/VR Applications. The applied algorithms including Camera Calibration, Structure from Motion, Multiple-View Stereo Reconstruction.

SELECTED
PUBLICATIONS

[†]Corresponding Author

1. Zhan Li, Zhang Chen[†], **Zhong Li[†]**, Yi Xu. "Spacetime Gaussian Feature Splatting for Real-Time Dynamic View Synthesis." To appear at IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2024.
2. Tianyu Luan, **Zhong Li**, Lele Chen, Xuan Gong, Lichang Chen, Yi Xu, Junsong Yuan. "Spectrum AUC Difference (SAUCD): Human Aligned 3D Shape Evaluation." To appear at IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2024.
3. **Zhong Li**, Liangchen Song, Zhang Chen, Xiangyu Du, Lele Chen, Junsong Yuan, Yi Xu "Relit-NeuLF: Efficient Relighting and Novel View Synthesis via Neural 4D Light Field." In Proceedings of the 31th ACM International Conference on Multimedia, (**ACM MM**), 2023.
4. Zhang Chen[†], **Zhong Li[†]**, Liangchen Song, Lele Chen, Jingyi Yu, Junsong Yuan, Yi Xu. "NeuRBF: A Neural Fields Representation with Adaptive Radial Basis Functions" To appear at IEEE/CVF International Conference on Computer Vision. (**ICCV**), 2023. (github star>250)
5. Wentao Ba, Lele Chen, Libing Zeng, **Zhong Li**, Yi Xu, Junsong Yuan, Yu Kong. "Uncertainty-aware State Space Transformer for Egocentric 3D Trajectory Forecasting." To appear at IEEE/CVF International Conference on Computer Vision. (**ICCV**), 2023.
6. Yuqi Ding, **Zhong Li**, Zhang Chen, Yu Ji, Jingyi Yu, Jinwei Ye. Full-Vome 3D Fluid Flow Reconstruction with Light Field PIV. IEEE Transactions on Pattern Analysis and Machine Intelligence, (**TPAMI**), 2023.
7. Liangchen Song, Anpei Chen, **Zhong Li[†]**, Zhang Chen, Lele Chen, Junsong Yuan, Yi Xu, and Andreas Geiger. "NeRFPlayer: A Streamable Dynamic Scene Representation with Decomposed Neural Radiance Fields." IEEE Transactions on Visualization & Computer Graphics, (**TVCG**), Special Issue on 2023 IEEE Conference on Virtual Reality and 3D User Interfaces (**VR**)
8. Libing Zeng, Lele Chen, Wentao Bao, **Zhong Li**, Yi Xu, Junsong Yuan, Nima Kalantari. "3D-aware Facial Landmark Detection via Multiview Consistent Training on Synthetic Data." To appear at IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2023.

9. Isabella Liu, Linghao Chen, Ziyang Fu, Liwen Wu, Haiyan Jin, **Zhong Li**, Chin Ming Ryan Wong, Yi Xu, Ravi Ramamoorthi, Zexiang Xu, Hao Su. "OpenIllumination: A Multi-Illumination Dataset for Inverse Rendering Evaluation on Real Objects" *Advances in Neural Information Processing Systems(NeurIPS)*,2023.
10. Tianyu Luan, Yuanhao Zhai, Jingjing Meng, **Zhong Li**, Zhang Chen, Yi Xu, Junsong Yuan. "High Fidelity 3D Hand Shape Reconstruction via Scalable Graph Frequency Decomposition." To appear at IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2023.
11. **Zhong Li**, Liangchen Song, Celong Liu, Junsong Yuan and Yi Xu. *NeuLF: Efficient Novel View Synthesis with Neural 4D Light Field*. In *Proceedings of the Eurographics Symposium on Rendering*, (**EGSR**), 2022.
12. Yuliang Guo, **Zhong Li**[†], Zekun Li, Xiangyu Du, Shuxue Quan, and Yi Xu. "PoP-Net: Pose over Parts Network for Multi-Person 3D Pose Estimation from a Depth Image." In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision*, (**WACV**), 2022.
13. Celong Liu, Lingyu Wang, **Zhong Li**, Shuxue Quan, and Yi Xu. "Real-Time Lighting Estimation for Augmented Reality via Differentiable Screen-Space Rendering." *IEEE Transactions on Visualization & Computer Graphics* ,(TVCG),2022
14. Zhuo Su, Lan Xu, Dawei Zhong, **Zhong Li**, Fan Deng, Shuxue Quan, and Lu Fang. "Robustfusion: Robust volumetric performance reconstruction under human-object interactions from monocular rgbd stream." *IEEE Transactions on Pattern Analysis and Machine Intelligence* ,(TPAMI),2022
15. Liangchen Song, Sheng Liu, Celong Liu, **Zhong Li**, Yuqi Ding, Yi Xu, and Junsong Yuan. "Learning Kinematic Formulas from Multiple View Videos." In *Proceedings of the 29th ACM International Conference on Multimedia*, (**ACM MM**), 2021.
16. **Zhong Li**, Lele Chen, Celong Liu, Fuyao Zhang, Zekun Li, Yu Gao, Yuanzhou Ha, Chenliang Xu, Shuxue Quan, and Yi Xu. "Animated 3D Human Avatars from a Single Image with GAN-based Texture Inference." accepted by *Computers & Graphics*, (**C&G**) (2021).
17. **Zhong Li**, Yu Ji, Jingyi Yu, and Jinwei Ye. "3D Fluid Flow Reconstruction Using Compact Light Field PIV" accepted by *European Conference on Computer Vision (ECCV)*, 2020.
18. Lele Chen, Guofeng Cui, Celong Liu, **Zhong Li**, Ziyi Kou, Yi Xu, and Chenliang Xu. "Talking-head Generation with Rhythmic Head Motion" accepted by *European Conference on Computer Vision (ECCV)*, 2020.
19. Celong Liu, **Zhong Li**, Shuxue Quan, and Yi Xu. "Lighting Estimation via Differentiable Screen-Space Rendering." In *2020 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (IEEE VRW)*, pp. 575-576. *IEEE*, 2020.
20. Wei Yang, Yingliang Zhang, Jinwei Ye, Yu Ji, **Zhong Li**, Mingyuan Zhou, Jingyi Yu. "Structure from Motion on XSlit Cameras". accepted by *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2019
21. **Zhong Li**, Lele Chen, Celong Liu, Yu Gao, Yuanzhou Ha, Chenliang Xu, Shuxue Quan, Yi Xu. "3D Human Avatar Digitization from a Single Image". accepted by *ACM SIGGRAPH International Conference on Virtual Reality Continuum and*

Its Applications in Industry (**ACM VRCAI**), 2019. **Oral presentation. Best Paper Award.**

22. **Zhong Li**, Xin Chen, WangYiteng Zhou, Yingliang Zhang, Jingyi Yu. "Pose2Body: Pose-Guided Human Parts Segmentation." accepted by IEEE Conference on Multimedia and Expo (**ICME**), 2019. **Oral presentation**
23. **Zhong Li**, Minye Wu, WangYiteng Zhou, Jingyi Yu. "4D Human Body Correspondences from Panoramic Depth Maps." accepted by IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2018.
24. **Zhong Li**, Yu Ji, Wei Yang, Jinwei Ye, Jingyi Yu. "Robust 3D Human Motion Reconstruction Via Dynamic Template Construction." accepted by International Conference on 3D Vision (**3DV**), 2017. **Spotlight Oral presentation**
25. Yingliang Zhang, **Zhong Li**, Wei Yang, Peihong Yu, Haiting Lin, Jingyi Yu. "The Light Field 3D Scanner." accepted by IEEE International Conference on Computational Photography (**ICCP**), 2017. **Oral presentation**

TECHNICAL SKILLS

- Programming Languages: Python, C/C++, Matlab, PHP, Mysql.
- Applications/Library platform: Pytorch, OpenCV, OpenGL, Android NDK, SNPE, ONNX, EIGEN, VCG library, CGAL, LATEX, Autodesk 3Ds Max, Autodesk Maya, Blender, Agisoft, Paraview.
- Operating Systems: Linux, Windows.

PROFESSIONAL ACTIVITIES

Conference Program Committee Member and Reviewer:

- SIGGRAPH 2024/CVPR 2021,2022,2023,2024 / NeurIPS 2023
- ICCV 2021,2023/ ECCV 2022,2024 / ICLR 2024
- AAAI 2020,2021,2024 / IJCAI 2023,2024 /ISMAR 2022 / IEEE VR 2023 / ACCV 2024

Journal Reviewer:

- IEEE Transactions on Pattern Analysis and Machine Intelligence(**TPAMI**)
- IEEE Transactions on Image Processing(**TIP**)
- IEEE Transactions on Circuits and Systems(**TCAS**)
- Computer&Graphics/Machine Vision&Applications/The Visual Computer Journal(**TVCJ**) /Image and Vision Computing/Science China

HONORS AND AWARDS

Outstanding Team Award, OPPO Research Institute, 2019/2020/2021
Breakthrough Innovation Award, OPPO Research Institute, 2020
Professional Development Award, University of Delaware, 2018.
Best Paper Award, ACM VRCAI 2019(ACM SIGGRAPH International Conference on Virtual Reality Continuum and Its Applications in Industry.)
Best Poster Award, SSIST 2018(ShanghaiTech Symposium on Information Science and Technology)
Excellent Undergraduate Thesis Award, Hunan University of Sci and Tech, 2012

PATENT

- **Zhong Li**, and Jason Chieh-sheng Yang. "Dynamic local temporal-consistent textured mesh compression." U.S. Patent No. 10,417,806. 17 Sep. 2019.
- **Zhong Li**, Yi Xu, and Shuxue Quan. "Human body model reconstruction method and reconstruction system, and storage medium." U.S. Patent No. 2022/0222895 A1. July 14. 2022
- Celong Liu, Yi Xu, **Zhong Li**, and Shuxue Quan. "Method for rendering virtual object based on illumination estimation, method for training neural network, and related products." WO Patent No. 2,021,151,380 A1. 05 August. 2021
- **Zhong Li**, Yi Xu, and Shuxue Quan. "System and method for virtual fitting." WO Patent No. 2,021,179,936 A1. 09 Sep. 2022
- **Zhong Li**, Yi Xu, and Shuxue Quan. "System and method for visualizing light rays in a scene." WO Patent No. 2,021,169,766 A. 02 Sep. 2021
- Yuliang Guo, **Zhong Li**, Xiangyu Du, Yi Xu, and Shuxue Quan. "Pose-over-parts network for multi-person pose estimation." WO Patent No. 2,021,092,600 A2. 21 Oct. 2021

ACADEMIC EXPERIENCE

Graphics & Imaging Laboratory, University of Delaware, Newark, USA
Graduate Research Assistant **Sep 2015 - Dec 2018**
Working on several projects related to 3D Computer Vision and Graphics

- **3D Human Body Non-Rigid Reconstruction**

In multi-view human body capture systems, the recovered 3D geometry or even the acquired imagery data can be heavily corrupted due to occlusions, noise, limited field-of-view, etc. We present a graph-based non-rigid shape registration framework that can simultaneously recover 3D human body geometry and estimate pose/motion at high fidelity.

- **4D Dynamic Human Mesh Compression**

The availability of affordable 3D full body reconstruction systems has given rise to free-viewpoint video (FVV) of human shapes. Most existing solutions produce temporally uncorrelated point clouds or meshes with unknown vertex correspondences. Individually compressing each frame is ineffective and still yields to ultra-large data sizes. We present an end-to-end deep learning scheme to establish dense shape correspondences and subsequently compress the data.

- **Human Body Semantic Segmentation.**

We developed a novel technique that we call Pose2Body that robustly conducts human parts segmentation based on the pose estimation results. We partition an image into superpixels and set out to assign a segment label to each superpixel most consistent with the pose. We design special feature vectors for every superpixel-label assignment as well as superpixel-superpixel pairs and model optimal labeling as to solve for a conditional random field (CRF).

- **Light Field 3D Scanner**

We present a novel light field structure-from-motion (SfM) framework for reliable 3D object reconstruction. Specifically, we use the light field (LF) camera such as Lytro and Raytrix as a virtual 3D scanner.

CG & Image Understanding Lab, University of Missouri, Columbia, USA
Completed the Master Thesis **Feb 2013 - June 2015**

- **3D Face Reconstruction and Tracking Using SIFT Iterative Closest Points By Consumer Depth Camera**

Develop an automatic 3D face reconstruction and pose estimation framework using consumer depth camera

TEACHING
EXPERIENCE

- 15 fall: CISC 106 GEN COMPUTER SCIEN FOR ENGR
- 16 spring: CISC 220 DATA STRUCTURE