Ruqi Huang

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Research Interests

My research interest lies in the area of Geometry Processing and 3D Computer Vision, with a strong focus on developing 3D reconstruction techniques for both static and dynamic scenes. In particular, I am interested in developing learning approaches towards 3D computer vision tasks without heavy dependency on supervision, via incorporating structural priors (especially the geometric ones) into neural networks. Beyond that, I am also interested in applying geometric/topological analysis on interdisciplinary data, e.g., biological, medical and high-dimensional imaging data.

Working Experience

2020–Present **SIGS, Tsinghua University**.
Assistant Professor

2017–2019 **Stream group, LIX, Ecole Polytenique**.
Post-doc Researcher

Education

2013-2016 **University of Paris-Saclay, Paris, France**.
Ph.D., Computer Science, December 2016.
Thesis:*Two contributions to geometric data analysis: filamentary structures approximations, and stability properties of functional approaches for shape comparison.*
Advisor: Frédéric Chazal

2011–2013 **Tsinghua University, Beijing, China**.
M.S., Computational Mathematics, December 2013.
Thesis: *Non-negative matrix factorization in network data dimension reduction.*
Advisor: Fengshan Bai

2007–2011 **Tsinghua University, Beijing, China**.
B.S., Mathematics and Applied Mathematics, July 2011.

Selected Publications [* indicates me being (co-) first/corresponding author]

1 "SRIF: Semantic Shape Registration Empowered by Diffusion-based Image Morphing and Flow Estimation", M. Sun, C. Guo, P. Jiang, S. Mao, Y. Chen, **R. Huang***, *Siggraph Asia*, 2024

2 "Nano-watt all-optical 3D perception for mobile robotics", T. Yan, T. Zhou, Y. Guo, Y. Zhao, G. Shao, J. Wu, **R. Huang***, Q Dai*, L Fang*, *Science Advances*, 2024

3 "XScale-NVS: Cross-Scale Novel View Synthesis with Hash Featurized Manifold, G. Wang, J. Zhang, F. Wang, **R. Huang***, L. Fang*, *IEEE CVPR*, 2024

4 "OmniSeg3D: Omniversal 3D Segmentation via Hierarchical Contrastive Learning", H. Ying, Y. Yin, J. Zhang, F. Wang, **R. Huang**, L. Fang, *IEEE CVPR*, 2024

5 "Non-Rigid Shape Registration via Deep Functional Maps Prior", P. Jiang, M. Sun, **R. Huang***, *NeurIPS*, 2023

6 "GiganticNVS: Gigapixel Large-scale Neural Rendering with Implicit Meta-deformed Manifold", G. Wang, J. Zhang, K. Zhang, **R. Huang**, L. Fang, *IEEE Trans. PAMI*, 2023

7 "Spatially and Spectrally Consistent Deep Functional Maps", M. Sun, S. Mao, P. Jiang, M. Ovsjanikov, **R. Huang***, *ICCV*, 2023

8 "RealGraph: A Multiview Dataset for 4D Real-world Context Graph Generation", H. Lin, Z. Chen, J. Zhang, B. Bai, Y. Wang, **R. Huang**, L. Fang, *ICCV*, 2023

9 "The Group Interaction Field for Learning and Explaining Pedestrian Anticipation", X. Wang, X. Chen, P. Jiang, H. Lin, X. Yuan, M. Ji, Y. Guo, **R. Huang**, L. Fang, *Engineering*, 2023

10 "Neural Intrinsic Embedding for Non-rigid Point Cloud Matching", P. Jiang, M. Sun, **R. Huang***, *IEEE CVPR*, 2023.

11 "Optical Neural Ordinary Differential Equations", Y. Zhao, H. Chen, M. Lin, H. Zhang, T. Yan, **R. Huang**, X. Lin, Q. Dai, *Optics Letters*, 48(3), 628-631, 2023.

12 "ElasticMVS: Learning Elastic Part Representation for Self-supervised Multi-view Stereopsis", J. Zhang, R. Tang, Z. Cao, J. Xiao, **R. Huang***, L. Fang*, *NeurIPS, 2022. (Spotlight)*

13 "ParseMVS: Learning Primitive-aware Surface Representations for Sparse Multi-view Stereopsis", H. Ying, J. Zhang, Y. Chen, Z. Cao, J. Xiao, **R. Huang***, L. Fang*, *ACM Int. Conf. on Multimedia 2022.*

14 "Consistent ZoomOut: Efficient Spectral Map Synchronization", **R. Huang***, J. Ren, P. Wonka, M. Ovsjanikov. *Symposium on Geometry Processing, 2020.*

15 "OperatorNet: Recovering 3D Shapes From Difference Operators", **R. Huang***, M. Rakotosaona*, P. Achlioptas, L. Guibas, M. Ovsjanikov. *International Conference on Computer Vision, 2019.*

16 "Limit Shape – A Tool for Understanding Shape Differences and Variability in 3D Model Collections", **R. Huang***, P. Achlioptas, L. Guibas, M. Ovsjanikov. *Symposium on Geometry Processing, 2019.*

17 "Adjoint Map Representation for Shape Analysis and Matching.", **R. Huang***, M. Ovsjanikov. *Symposium on Geometry Processing, 2017.*

18 "On the Stability of Functional Maps and Shape Difference Operators.", **R. Huang***, F. Chazal, M. Ovsjanikov. *Computer Graphics Forum, 2017.*

19 "Gromov-Hausdorff Approximation of Filamentary Structures Using Reeb-Type Graphs.", F. Chazal, **R. Huang**, J. Sun. *Discrete Computational Geometry, 2015.*

Teaching

1 Computational Photography, graduate level course in TBSI.

2 Digital Image and Video Processing, graduate level course in TBSI.

Research Funding

1 "Theory and Technique of Dynamic Scene 3D Reconstruction via Spectral Methods", General Program supported by National Natural Science Foundation of China, (Grant No. 62171256), 560k CNY, from 2022 to 2025, PI.

2 "High-precision Computational Photography for All-time and All-region Lunar Exploration", Key Program of the National Natural Science Foundation of China(Grant No. 62331006), 700K CNY (out of 2.36M CNY), from 2024-2028, Co-PI.

3 "Depth Image Enhancement and 3D Reconstruction", Commerical Research Fund from Berxel Photonics Co., 450k CNY, from 2022 to 2023, PI.

4 "Noninvasive Dynamic Biomechanics Study of Organoids Based on Muller Microscopy Imaging", Cross-disciplinary Research and Innovation Fund from SIGS, 125K CNY (out of 250K CNY), Co-PI.

Services

1 I have been a reviewer for top conferences and journals in Computer Vision and Graphics, including International Journal of Computer Vision (J), ACM Transactions on Graphics (J), IEEE Transactions on Image Processing (J), IEEE Transactions on Multi-Media (J), Graphics Models (J), ACM SIGGRAPH&Asia(C), EuroGraphics (C), Pacific Graphics (C), CICAI (C), etc.

2 I am a member of Expert Committee on Metaverse Techniques, Chinese Association for Artificial Intelligence (CAAI).