Zihan Zhou

CONTACT INFORMATION

Manycore Tech Inc.
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APPOINTMENTS

Manycore Tech Inc. 05/2021 - present
- Chief Scientist

The Pennsylvania State University 07/2017 - 04/2021
- Assistant Professor

The Pennsylvania State University 01/2013 - 06/2017
- Research Associate

ShanghaiTech University 05/2016 - 07/2016
- Visiting Faculty

EDUCATION

University of Illinois at Urbana-Champaign 08/2007 - 12/2012
- **Ph.D., ECE**, Degree conferred in May, 2013
  Thesis: *Exploring Structural Regularities for Robust 3D Reconstruction of Urban Scenes*
- **Master of Science, ECE**, Degree conferred in May, 2010
  Thesis: *Face Recognition under Varying Illumination, Pose and Contiguous Occlusion*
- Advisor: Prof. Yi Ma

Tsinghua University 08/2003 - 07/2007
- **Bachelor of Engineering, Automation**

The Chinese University of Hong Kong 09/2005 - 12/2005
- Exchange Student, Mechanical and Automation Engineering

RESEARCH INTERESTS

I am interested in computer vision, machine learning, signal processing, and applied data sciences. My research focuses on **developing novel computational tools to model and analyze the 3D environments from big visual data**, with applications in VR/AR, vision-based navigation, architectural design and engineering, social media, and more.

PUBLICATIONS AND PREPRINTS (REVERSE CHRONOLOGICAL)

- *End-to-end Graph-constrained Vectorized Floorplan Generation with Panoptic Refinement*
  Jiachen Liu, Yuan Xue, Jose Duarte, Krishnendra Shekhawat, **Zihan Zhou**, and Xiaolei Huang. European Conference on Computer Vision (**ECCV**), 2022.
- *Neural Face Identification in a 2D Wireframe Projection of a Manifold Object*
  Kehan Wang, Jia Zheng, and **Zihan Zhou**. IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2022.
- *Deep Depth from Focus with Differential Focus Volume*
  Fengting Yang, Xiaolei Huang, and **Zihan Zhou**. IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2022.
- *Iterative Design and Prototyping of Computer Vision Mediated Remote Sighted Assistance*
  Jingyi Xie, Madison Reddie, Sooyeon Lee, Syed M. Billah, **Zihan Zhou**, Chun-Hua Tsai, and John M. Carroll. ACM Transaction on Computer-Human Interaction (**ToCHI**), 2022.

- *Towards Robust Human Trajectory Prediction in Raw Videos*
  Rui Yu, and **Zihan Zhou**. IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), 2021.

- *Neural Wireframe Renderer: Learning Wireframe to Image Translations*
  Yuan Xue, **Zihan Zhou**, and Xiaolei Huang. European Conference on Computer Vision (**ECCV**), 2020.

- *Structured3D: A Large Photo-realistic Dataset for Structured 3D Modeling*
  Jia Zheng*, Junfei Zhang*, Jing Li, Rui Tang, Shenghua Gao, and **Zihan Zhou**. European Conference on Computer Vision (**ECCV**), 2020.

- *Data-driven Distributed State Estimation and Behavior Modeling in Sensor Networks*
  Rui Yu, Zhenyuan Yuan, Minghui Zhu, and **Zihan Zhou**. IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), 2020.

- *Superpixel Segmentation with Fully Convolutional Networks*
  Fengting Yang, Qian Sun, Hailin Jin, and **Zihan Zhou**. IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2020.

- *Single-Image Piece-Wise Planar 3D Reconstruction via Associative Embedding*
  Zehao Yu*, Jia Zheng*, Dongze Lian, **Zihan Zhou**, and Shenghua Gao. IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2019.

- *Recovering 3D Planes from a Single Image via Convolutional Neural Networks*
  Fengting Yang and **Zihan Zhou**. European Conference on Computer Vision (**ECCV**), 2018.

- *Learning to Parse Wireframes in Images of Man-Made Environments*
  Kun Huang, Yifan Wang, **Zihan Zhou**, Tianjiao Ding, Shenghua Gao, and Yi Ma. IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2018.

- *Discovering Triangles in Portraits for Supporting Photographic Creation*
  Siqiong He, **Zihan Zhou**, Farshid Farhat, and James Z. Wang. IEEE Transactions on Multimedia (**TMM**), vol. 20, no. 2, 2018.

- *Detecting Dominant Vanishing Points in Natural Scenes with Application to Composition-Sensitive Image Retrieval*
  Zihan Zhou, Farshid Farhat, and James Z. Wang. IEEE Transactions on Multimedia (**TMM**), vol. 19, no. 12, 2017.

- *Beyond Saliency: Assessing Visual Balance with High-Level Cues*
  Baris Kandemir, **Zihan Zhou**, Jia Li, and James Z. Wang. Engagement Workshop, ACM Multimedia Conference (**ACM MM**), 2017.

- *Improving Offline Handwritten Chinese Character Recognition by Iterative Refinement*
  Xiao Yang, Dafang He, **Zihan Zhou**, Daniel Kifer, and C. Lee Giles. International Conference on Document Analysis and Recognition (**ICDAR**), 2017.

- *Learning to Read Irregular Text with Attention Mechanisms*
  Xiao Yang, Dafang He, **Zihan Zhou**, Daniel Kifer, and C. Lee Giles. International Joint Conference on Artificial Intelligence (**IJCAI**), 2017.

- *Label Information Guided Graph Construction for Semi-Supervised Learning*
  Liansheng Zhuang, **Zihan Zhou**, Shenghua Gao, Jingwen Yin, Zhouchen Lin, and Yi Ma. IEEE Transactions on Image Processing (**TIP**), vol. 26, no. 9, 2017.

- *Smart Library: Identifying Books in a Library using Richly Supervised Deep Scene Text Reading*
  Xiao Yang, Dafang He, Wenyi Huang, Alexander Ororbia, **Zihan Zhou**, Daniel Kifer, and C. Lee Giles. ACM/IEEE-CS Joint Conference on Digital Libraries (**JCDL**, short paper), 2017.

- *Multi-scale FCN with Instance Aware Segmentation for Arbitrary Oriented Word Spotting In The Wild*
  Dafang He, Chen Liang, Xiao Yang, **Zihan Zhou**, Alexander Ororbia, Daniel Kifer, and C. Lee Giles. IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2017.

- *Robust Plane-based Calibration of Multiple Non-Overlapping Cameras*
  Chen Zhu, **Zihan Zhou**, Ziran Xing, Yanbing Dong, Yi Ma, and Jingyi Yu. International Conference on 3D Vision (**3DV**), 2016.

- *Aggregating Local Context for Accurate Scene Text Detection*
  Dafang He, Xiao Yang, Wenyi Huang, **Zihan Zhou**, Daniel Kifer, and C. Lee Giles. Asian Conference on Computer Vision (**ACCV**), 2016.

- *Detecting Arbitrary Oriented Text in the Wild with a Visual Attention Model*
  Wenyi Huang, Dafeng He, Xiao Yang, **Zihan Zhou**, Daniel Kifer, and C. Lee Giles. ACM Conference on Multimedia (**ACM MM**, short paper), 2016.

- *Modeling Photographic Composition via Triangles*
  Zihan Zhou*, Siqiong He*, Jia Li, and James Z. Wang. arXiv:1605.09559, 2016.

- *Modeling Perspective Effects in Photographic Composition*
  Zihan Zhou, Siqiong He, Jia Li, and James Z. Wang. ACM Conference on Multimedia (**ACM MM**), Oct. 2015.

- *Fast ℓ_1-Minimization Algorithms for Robust Face Recognition*
  Allen Yang, **Zihan Zhou**, Arvind Ganesh, Shankar Sastry, and Yi Ma. IEEE Transactions on Image Processing (**TIP**), vol. 22, no. 8, 2013.

- *Plane-Based Content Preserving Warps for Video Stabilization*
  Zihan Zhou, Hailin Jin, and Yi Ma. IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), June 2013.

- *Single-Sample Face Recognition with Image Corruption and Misalignment via Sparse Illumination Transfer*
  Liansheng Zhuang, Allen Yang, **Zihan Zhou**, Shankar Sastry, and Yi Ma. IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), June 2013.

- *Towards a Practical Face Recognition System: Robust Alignment and Illumination by Sparse Representation*
  Andrew Wagner, John Wright, Arvind Ganesh, **Zihan Zhou**, Hossein Mobahi, and Yi Ma. IEEE Transactions on Pattern Analysis and Machine Intelligence (**PAMI**), vol. 34, no. 2, 2012.

- *Face Recognition by Sparse Representation*
  John Wright, Allen Yang, Arvind Ganesh, Andrew Wagner, **Zihan Zhou**, and Yi Ma. In *Compressed Sensing: Theory and Applications*, Cambridge University Press, 2012.

- *Robust Plane-Based Structure From Motion*
  Zihan Zhou, Hailin Jin, and Yi Ma. IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), June 2012.

- *Holistic Reconstruction of Urban Structures from Low-rank Textures*
  Hossein Mobahi, **Zihan Zhou**, Allen Yang, and Yi Ma. Workshop on 3D Representation and Reconstruction, International Conference on Computer Vision (**ICCV-3dRR**), Sept. 2011.

- *Towards a Robust Face Recognition System using Compressive Sensing*
  Allen Yang, **Zihan Zhou**, Yi Ma, and Shankar Sastry. **InterSpeech**, Sept. 2010.

- *Stable Principal Component Pursuit*
  Zihan Zhou, Xiaodong Li, John Wright, Emmanuel Candès, and Yi Ma. IEEE International Symposium on Information Theory (**ISIT**), June 2010.

- *Face Recognition with Contiguous Occlusion using Markov Random Fields*
  Zihan Zhou, Andrew Wagner, Hossein Mobahi, John Wright, and Yi Ma. IEEE International Conference on Computer Vision (**ICCV**), Sept. 2009.

- *Towards a Practical Face Recognition System: Robust Registration and Illumination via Sparse Representation*
  Andrew Wagner, John Wright, Arvind Ganesh, **Zihan Zhou**, and Yi Ma. IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), June 2009.

- *Separation of A Subspace-Sparse Signal: Algorithms and Conditions*
  Arvind Ganesh, **Zihan Zhou**, and Yi Ma. IEEE International Conference on Acoustics, Speech and Signal Processing (**ICASSP**), April 2009.

- *Nearest-Subspace Patch Matching for Face Recognition Under Varying Pose and Illumination*
  Zihan Zhou, Arvind Ganesh, John Wright, Shen-Fu Tsai, and Yi Ma. IEEE International Conference on Automatic Face and Gesture Recognition (**FG**), Sept. 2008.

External Grants

- *SCH: INT: Conversations for Vision: Human-Computer Synergies in Prosthetic Interactions*
  Jack Carroll, Mary Beth Rosson, and **Zihan Zhou (co-PI)**. National Institutes of Health (Award #R01LM013330), $712,897, 2019 - 2021.

- *RI: SMALL: Learning to Discover Structure for 3D Vision*
  Zihan Zhou (Single PI). National Science Foundation (Award #1815491), $449,223, 2018 - 2021.

- *Unrestricted Gift*
  Zihan Zhou (Single PI). Adobe Systems, Incorporated, $15,000, 2018 - 2019.

Internal Grants

- *Learning to Generate Floorplans for Mass Customization of Housing*
  Zihan Zhou (PI), Xiaolei Huang, Jose Duarte, and Mahyar Hadighi. IST Seed Grant, $51,000, 2020 - 2021.

- *Distributed Visual Perception for Urban Autonomous Driving*
  Zihan Zhou (PI), and Minghui Zhu. ICS Seed Grant, $52,500, 2018 - 2019.

- *Developing 3-D Image Analysis Methods for Maize Root Structures*
  James Z. Wang, and **Zihan Zhou (co-PI)**. IST Seed Grant, $41,000, 2016 - 2017.

- *Bringing Penn State Mobile Photography Technologies to Market*
  James Z. Wang, **Zihan Zhou (Faculty sponsor)**, *et al.* The Fund for Innovation, Penn State, $75,000, 2015 - 2016.

- *Innovating the Teaching of Connective Media at the 400-level using Mobile Platforms*
  James Z. Wang, and **Zihan Zhou (co-PI)**. IST Teaching Innovation Grant, $6,000, 2014.

- *Recognizing Visual Composition from Photographs*
  James Z. Wang, and **Zihan Zhou (co-PI)**. IST Seed Grant, $9,000, 2013 - 2014.

Patents

- *Composition Modeling for Photo Retrieval through Geometric Image Segmentation*
  Zihan Zhou, Siqiong He, Jia Li, and James Z. Wang. U.S. Patent No. 9,626,585, Apr. 2017.

- *Plane-based Self-Calibration for Structure form Motion*
  Hailin Jin, and **Zihan Zhou**. U.S. Patent No. 9,202,278, Dec. 2015.

- *Plane Detection and Tracking for Structure from Motion*
  Hailin Jin, and **Zihan Zhou**. U.S. Patent No. 9,153,025, Oct. 2015.

Professional Experience

University of Illinois at Urbana-Champaign 08/2007 - 12/2012
Research Assistant Urbana, IL, USA

- My research has been focused on developing and analyzing new computational tools for robust and efficient discovery of structural regularities in images and videos, and applying them to solve challenging real-world problems such as face recognition, structure from motion, and video stabilization. Results have been published in top-tier conferences and journals in computer vision including TPAMI, TIP, CVPR, ICCV, etc.

Visual Computing Lab, Adobe Systems Inc. 05/2011 - 08/2011
Research Intern San Jose, CA, USA

- Research on a novel approach to structure and motion recovery directly from one or more large planes in the scene. Built a complete plane-based structure from motion system and shown its advantage over conventional systems in handling two important issues in practice, namely, the plane degeneracy and the dynamic foreground problems.

Visual Computing Group, Microsoft Research Asia 05/2009 - 08/2009
Research Intern Beijing, China

- Research on the theory and first-order convex optimization algorithms for robust low-rank matrix recovery from grossly corrupted observations. As an application, I developed a new approach to reconstructing accurate camera geometry and 3D models from multiple uncalibrated large-baseline images for urban structures. This new method works in a holistic fashion by using global features based on transform-invariant low-rank textures, instead of relying on traditional local features such as points and edges.

Tsinghua University 02/2006 - 07/2007
Undergraduate Research Assistant Beijing, China

- Project on mobile phone camera-based name card recognition system.
- Project on 2D barcode recognition system.
- Research on multi-view face recognition.

Teaching Experience

IST210 Organization of Data Penn State University
Instructor: SP'13, SP'14 (2 sections), FA'14, SP'15, FA'15 (2 sections), FA'16 (2 sections)

IST220 Networking and Telecommunications Penn State University
Instructor: SP'15, SP'16 (2 sections), SP'17 (2 sections), SP'18, SP'19, FA'19

IST597 Reinforcement Learning and Its Applications Penn State University
Instructor: SP'19

DS340W Applied Data Sciences Penn State University
Instructor: SP'20, FA'20

Students Supervised

- Ph.D. dissertation advisor of:
  - Fengting Yang (IST, Penn State)
  - Rui Yu (IST, Penn State)
  - Jiachen Liu (IST, Penn State)
- On Ph.D. committee of:
  - Baris Kandemir (IST, Penn State, graduated 2018)
  - Farshid Farhat (IST, Penn State, graduated 2018)
  - Dafang He (IST, Penn State, graduated 2019)
  - Xiao Yang (CSE, Penn State, graduated 2019)
  - Yuchen Bian (IST, Penn State, graduated 2019)
  - Jinhang Choi (CSE, Penn State, graduated 2019)
  - Yu Luo (IST, Penn State, graduated 2020)
  - Porter Jenkins (IST, Penn State, graduated 2020)
  - Bingyuan Liu (Statistics, Penn State, graduated 2021)
  - Yuan Xue (IST, Penn State, graduated 2021)
- M.S. thesis advisor of:
  - Qian Sun (IST, Penn State, graduated 2019)
- On M.S. committee of:
  - Siqiong He (IST, Penn State, graduated 2015)
  - Yan Wang (IST, Penn State, graduated 2017)
  - Pengwei Lan (IST, Penn State, graduated 2017)
  - Qianying Zhou (IST, Penn State, graduated 2020)

Tutorial at Conferences

- *Holistic 3D Reconstruction: Learning to Reconstruct Holistic 3D Structures from Sensorial Data*
  Zihan Zhou, Yasutaka Furukawa, and Yi Ma. IEEE International Conference on Computer Vision (**ICCV**), Seoul, Korea, Oct. 2019.

Talks and Presentations

- "Holistic 3D Reconstruction: Learning to Reconstruct 3D Structures from Sensorial Data"
  PSU Stuckmam Center for Design Computing (SCDC) Seminar, University Park, PA, Dec. 2019.
- "Learning to Discover Structure for 3D Computer Vision"
  PSU Electrical Engineering Colloquia, University Park, PA, Apr. 2018.
- "Towards Automatic Composition Modeling and Feedback for Photographers"
  Vision and Learning Seminar (VALSE), July 2016.
- "Beyond Structure From Motion: Exploring Structure Regularities for 3D Vision"
  Seminar Series of SIST, ShanghaiTech University, July 2016.
- "Modeling Perspective Effects in Photographic Composition"
  ACM Multimedia Conference Talk, Brisbane, Australia, Oct. 2015.
- "Holistic Reconstruction of Urban Structures from Low-rank Textures"
  ICCV-3dRR Workshop Talk, Barcelona, Spain, Sep. 2011.

- "A Holistic Approach to 3D Modeling, Reconstruction and Recognition of Objects" Qualcomm Innovation Fellowship Final Presentation, Bridgewater, NJ, Apr. 2011.
- "TILT: Transform Invariant Low-rank Textures", Illinois Vision Workshop Talk, Chicago, IL, Dec. 2010.
- "Stable Principal Component Pursuit" ISIT Conference Talk, Austin, TX, June 2010.

Honors and Awards

- Finalist, Qualcomm Innovation Fellowship, 2011.
- Finalist, ISIT Best Student Paper Award, 2010.
- Tsinghua Outstanding Graduate (B. Eng.), 2007.
- Beijing Outstanding Graduate (B. Eng.), 2007.
- Second Prize of Excellent Student Scholarship of Tsinghua University, 2006 (top 5%).
- Third Prize of the Mathematical Modeling Contest of Tsinghua University, 2006 (top 5%).
- The HSBC Scholarship, 2005 (top 1%).
- First Prize in Chinese Physics Olympiad, 2003.

Professional Activities

- Workshop Organizer:
  - ICCV 2021 Workshop: Holistic Structures for 3D Vision
  - ECCV 2020 Workshop: Holistic Scene Structures for 3D Vision
- Journal Reviewer (a partial list):
  - International Journal of Computer Vision
  - IEEE Transactions on Pattern Analysis and Machine Intelligence
  - IEEE Transactions on Image Processing
  - IEEE Transactions on Signal Processing
  - IEEE Transactions on Multimedia
  - IEEE Transactions and Medical Imaging
  - Proceedings of the IEEE
  - ACM Transactions on Intelligent Systems and Technology
  - Transportation Research Part C
- Conference Program Committee:
  - IEEE Conference on Computer Vision and Pattern Recognition (CVPR): 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021
  - IEEE International Conference on Computer Vision (ICCV): 2015, 2017, 2019
  - European Conference on Computer Vision (ECCV): 2014, 2016, 2018, 2020
  - British Machine Vision Conference (BMVC): 2017, 2018, 2019, 2020
  - Asian Conference on Computer Vision (ACCV): 2016, 2018
  - AAAI Conference on Artificial Intelligence (AAAI): 2020
- Grant Proposal Review:
  - NSF Panelist: 2018