TIANFAN XUE

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Research Interests

- Computer Vision, Computational Photograph, Artificial Intelligence

Education

- **Ph.D. (Computer Sci.), Massachusetts Institute of Technology**   Aug. 2012 – Aug. 2017
  - GPA: 5.0/5.0
  - Supervisor: Prof. William T. Freeman
  - Thesis: Exploiting Visual Motion to Understand Our Visual World
  - Thesis committee: Prof. Frédo Durand, Dr. Richard Szeliski, and Dr. Ce Liu
  - Research projects:
    - ◇ **Motion analysis.** Proposed a fluid geometry and motion estimation algorithm based on the micro refractive motion in RGB videos. Proposed a novel task-oriented motion analysis algorithm for video enhancement.
    - ◇ **Video generation and editing.** Proposed a probabilistic video generation algorithm using variational auto-encoder. Proposed a multi-view reflection removal algorithm using motion parallax.
    - ◇ **Physical property analysis.** Proposed a structure analysis algorithm based on spectral of vibration.
    - ◇ **3D Reconstruction and synthesis.** Proposed a series of single-image 3D geometry estimation algorithms using synthetic data and learned prior. Proposed the first 3D generative adversarial network for 3D object synthesis.
- **M.Phil. (Information Eng.), Chinese University of Hong Kong**   Aug. 2009 – Jul. 2011
  - GPA: 4.0/4.0
  - Supervisor: Prof. Xiaoou Tang
  - Thesis: Recovering 3D Geometry from Single Line Drawings
  - Research projects:
    - ◇ Proposed a series of 3D reconstruction algorithms from line drawings.
    - ◇ Proposed a single image 3D reconstruction using symmetry.
    - ◇ Proposed a joint color and depth map super resolution algorithm using a learned mapping dictionary.
- **B. Eng. (Computer Sci. & Tech.), Tsinghua University**   Aug. 2005 – Jul. 2009
  - GPA: 92.06/100.00
  - Supervisor: Prof. Bo Zhang
  - Thesis: Human tracking in video analysis
    - ◇ Proposed a human tracking algorithm that based on particle filter and HOG detector.

Working Experience

- **Assistant Professor, The Chinese University of Hong Kong**   Nov. 2022 –
  - Mission: Research on advanced computer vision and artificial intelligence algorithms.

- **Staff Software Engineer, Google Research, U.S.A.**   Aug. 2017 – Oct. 2022
  - Mission: Research on advanced image and video processing algorithms.
  - Manager: Dr. Samuel W. Hasinoff
  - Achievements:
    - ◇ Designed a night sight algorithm, published in SIGGRAPH, and landed as a main feature for Pixel 3.
    - ◇ Designed a fast bilateral processing algorithm, published in ECCV, and landed as a AI-powered tonemapping component of Google Tensor Chip.
    - ◇ Designed the dynamic filter for Google Photos, as the one of the most popular image editing feature.

- **Research Intern, Facebook**   May. 2016 – Aug. 2016
  - Proposed an extension to the traditional 3D reconstruction algorithms that applies to casual 360 videos.
  - Mentor: Dr. Richard Szeliski

- **Research Intern, Microsoft Research**   Jun. 2015 – Sept. 2015
  - Proposed an edge-based stereo matching algorithm that merges information from multiple frames.
  - Mentor: Dr. Richard Szeliski

- **Research Intern, Microsoft Research**   Jun. 2014 – Aug. 2014
  - Proposed a unified computational approach that removes reflecting or occluding visual obstructions in images.
  - Mentor: Dr. Ce Liu

- **Research Assistant, Chinese University of Hong Kong**   Aug. 2011 – Jul. 2012
  - Mission: Research on 3D reconstruction techniques
  - Supervisor: Prof. Xiaoou Tang

Teaching Experience

- **Teaching Assistant, Massachusetts Institute of Technology**   Sept. 2015 – Dec. 2015
  - Course: 6.867 Machine Learning.

- **Teaching Assistant, Chinese University of Hong Kong**   Jan. 2012 – May. 2012
  - Course: ENGG2040 Probability Models and Applications.

- **Teaching Assistant, Chinese University of Hong Kong**   Aug. 2010 – Dec. 2010
  - Course: IERG4190 Multimedia Coding and Processing.
  - Award: Outstanding Teaching Assistant Award

- **Teaching Assistant, Chinese University of Hong Kong**   Jan. 2010 – May. 2010
  - Course: ENGG2013 Advanced Engineering Mathematics.

Publications

- **Conferences**
  - Y. Jiang, B. Wronski, B. Mildenhall, J. T. Barron, Z. Wang, **T. Xue**, "Fast and High-Quality Image Denoising via Malleable Convolutions," in Proc. of European Conference on Computer Vision (**ECCV**) 2022.
  - Y. Wu, Q. He, **T. Xue**, R. Garg, J. Chen, A. Veeraraghavan, J. T. Barron, "How to Train Neural Networks for Flare Removal," in Proc. of the International Conference on Computer Vision (**ICCV**), 2021.
  - S. Xin, N. Wadhwa, **T. Xue**, J. T. Barron, P. P. Srinivasan, J. Chen, I. Gkioulekas, R. Garg, "Defocus Map Estimation and Deblurring from a Single Dual-Pixel Image," in Proc. of the International Conference on Computer Vision (**ICCV**), 2021.
  - X. Xia, **T. Xue**, W. Lai, Z. Sun, A. Chang, B. Kulis, J. Chen, "Real-time Localized Photorealistic Video Style Transfer," in Proc. of the IEEE/CVF Winter Conference on Applications of Computer Visionm (**WACV**), 2021.
  - S. Niklaus, X. C. Zhang, J. T. Barron, N. Wadhwa, R. Garg, F. Liu, **T. Xue**, "Learned Dual-View Reflection Removal," in Proc. of the IEEE/CVF Winter Conference on Applications of Computer Visionm (**WACV**), 2021.
  - X. Zhang, S. Fanello, Y.T. Tsai, T. Sun, **T. Xue**, R. Pandey, S. Orts-Escolano, P. Davidson, C. Rhemann, P. Debevec, J.T. Barron, "Neural light transport for relighting and view synthesis," **ACM SIGGRAPH, Oral**, 2021.
  - O. Liba, K. Murthy, Y.T. Tsai, T. Brooks, **T. Xue**, N. Karnad, Q. He, J.T. Barron, D. Sharlet, R. Geiss, S.W. Hasinoff, 2019. "Handheld mobile photography in very low light," **ACM SIGGRAPH, Oral**, 2019.
  - T. Brook, B. Mildenhall, **T. Xue**, Chen. T, D. Sharlet, J.T. Barron, "Unprocessing images for learned raw denoising," in Proc. of IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), **Oral**, 2019.
  - J. Wang, **T. Xue**, J.T. Barron, J. Chen, "Stereoscopic dark flash for low-light photography," in Proc. of IEEE International Conference on Computational Photography (**ICCP**), **Oral**, 2019.
  - X. Zhang, T. Dekel, **T. Xue**, T. Owen, Q. He, J. Wu, S. Mueller, W.T. Freeman, "Mosculp: Interactive visualization of shape and time," in Proc. ofACM Symposium on User Interface Software and Technology (**UIST**), **Oral**, 2018.
  - X. Sun, J. Wu, X. Zhang, Z. Zhang, C. Zhang, **T. Xue**, J. B. Tenenbaum, W. T. Freeman, "Pix3D: Dataset and Methods for Single-Image 3D Shape Modeling," in Proc. of IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2018.
  - **T. Xue**, J. Wu, Z. Zhang, C. Zhang, J. B. Tenenbaum, W. T. Freeman, "Seeing tree structure from vibration," in Proc. of IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2018.
  - J. Wu, Y. Wang, **T. Xue**, X. Sun, W. T. Freeman, J. B. Tenenbaum, "MarrNet: 3d shape reconstruction via 2.5 d sketches," in Proc. of the Annual Conference on Neural Information Processing Systems (**NIPS**) 2017.
  - **T. Xue***, J. Wu*, K. L. Bouman, W. T. Freeman, "Visual Dynamics: Probabilistic Future Frame Synthesis via Cross Convolutional Networks," in Proc. of the Annual Conference on Neural Information Processing Systems (**NIPS**), **Oral**, 2016.

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* indicates equal contribution.

- J. Wu*, **T. Xue***, J. Lim, Y. Tian, J. B. Tenenbaum, A. Torralba, W. T. Freeman, "Single Image 3D Interpreter Network,", in Proc. of European Conference on Computer Vision (**ECCV**) 2016.
- J. Wu, C. Zhang, **T. Xue**, W. T. Freeman, J. B. Tenenbaum, "Learning a Probabilistic Latent Space of Object Shapes via 3D Generative-Adversarial Modeling", in Proc. of the Annual Conference on Neural Information Processing Systems (**NIPS**), 2016
- **T. Xue**, M. Rubinstein, C. Liu, W. T. Freeman, "A Computational Approach for Obstruction-Free Photography," ACM **SIGGRAPH**, **Oral**, 2015.
- **T. Xue**, H. Mobahi, F. Durand, W. T. Freeman, "The Aperture Problem for Refractive Motion," in Proc. of IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2015.
- **T. Xue**, M. Rubinstein, N. Wadhwa, A. Levin, F. Durand, W. T. Freeman, "Refraction Wiggles for Measuring Fluid Depth and Velocity from Video," in Proc. of European Conference on Computer Vision (**ECCV**), **Oral**, 2014.
- **T. Xue**, J. Liu, X. Tang, "Example-Based 3D Object Reconstruction for Line Drawing," in Proc. of IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2012.
- Y. Li, **T. Xue**, L. Sun, J. Liu, "Joint Example-based Depth Map Super-Resolution," in Proc. of IEEE International Conference on Multimedia & Expo (**ICME**), **Oral**, 2012.
- **T. Xue**, J. Liu, X. Tang, "Symmetric Piecewise Planar Object Reconstruction from a Single Image," in Proc. of IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**) 2011.
- Y. Jie, L. Sun, **T. Xue**, "Fast Frame-rate Up-conversion of Depth Video via Video Coding," in Proc. of ACM Multimedia 2011 (**ACM MM**), 2011.
- **T. Xue**, J. Liu, X. Tang, "Object Cut: Complex 3D object reconstruction through line drawing separation," in Proc. of IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**) 2010.
- Y. Tang, **T. Xue**, J. Jiang, B. Liu, "Deflation DFA: Remembering History is Adequate," in Proc. of IEEE International Conference on Communications (**ICC**), 2010.

- **Journals**
  - **T. Xue**, A. Owen, D. Scharstein, M. Goesele, R. Szeliski, "Multi-frame stereo matching with edges, planes, and superpixels," **Image and Vision Computing**, 91, pp.103771, 2019.
  - **T. Xue**, Chen, B., Wu, J., Wei, D. and Freeman, W.T., "Video enhancement with task-oriented flow," International Journal of Computer Vision (**IJCV**), 8, pp.1106-1125, 2019.
  - **T. Xue**, J. Wu, K.L. Bouman, W.T. Freeman, "Visual dynamics: Stochastic future generation via layered cross convolutional networks," IEEE transactions on pattern analysis and machine intelligence (**T-PAMI**), 41(9), pp.2236-2250, 2018.
  - J. Wu*, **T. Xue***, J. Lim, Y. Tian, J. Tenenbaum, A. Torralba, W. T. Freeman, "3D Interpreter Networks for Viewer-Centered Wireframe Modeling," International Journal of Computer Vision (**IJCV**), pp.1009-1026, 2018.
  - S. Oron, T. Dekel, **T. Xue**, W. T. Freeman, S. Avidan, "Best-Buddies Similarity – Robust Template Matching using Mutual Nearest Neighbors," IEEE Transactions on Pattern Analysis and Machine Intelligence (**T-PAMI**), 2017.
  - C. Zou, **T. Xue**, X. Peng, H. Li, B. Zhang, P. Tan, J. Liu, "An example-based approach to 3D man-made object reconstruction from line drawings," **Pattern Recognition**, 2017.

- J. Yin, H. Zhu, D. Yuan, **T. Xue**, "Sparse representation over discriminative dictionary for stereo matching," **Pattern Recognition**, 71, pp.278-289, 2017.
- **T. Xue**, J. Liu, X. Tang, "3D Modeling from a Single View of a Symmetric Object,", Transactions on Image Processing (**TIP**), 2012.

- **Patents**
  - R. Geiss, M. S. Levoy, S. Hasinoff, **T. Xue**, "Dual Exposure Control in a Camera System," US Patent App. 17/629,992 , 2022
  - R. Yang, **T. Xue**, J. T. Barron, Q. He, "Using Image-Processing Settings to Determine an Optimal Operating Point for Object Detection on Imaging Devices," 2021
  - **T. Xue**, J. Wang, J. Chen, J.T. Barron, "Dark Flash Photography With A Stereo Camera," US Patent App. 16120666, 2020
  - W. T. Freeman, F. Durand, **T. Xue**, M. Rubinstein, N. Wadhwa, "Devices for refractive field visualization," US Patent 10636149, 2020
  - W. T. Freeman, F. Durand, **T. Xue**, M. Rubinstein, N. Wadhwa, "Methods and apparatus for refractive flow measurement," US Patent PN/9710917, 2017

Services

- **Conference organizers**
  - Winter Conference on Applications of Computer Vision, 2022, Area chair
  - Conference on Computer Vision and Pattern Recognition, 2020, Web chair

- **Conference reviewers**
  - Conference on Computer Vision and Pattern Recognition, 2016, 2017, 2018, 2020, 2021, 2022
  - European Conference on Computer Vision, 2016, 2018, 2020, 2022
  - International Conference on Computer Vision, 2017, 2019, 2021
  - ACM SIGGRAPH, 2018, 2021, 2022
  - ACM SIGGRAPH Asia, 2017, 2021, 2022
  - Conference on Neural Information Processing Systems, 2016, 2021, 2022
  - Pacific Graphics, 2018
  - International Conference on Intelligent Robots, 2017
  - IEEE International Symposium on Circuits & Systems, 2017
  - Conference on Neural Information Processing Systems, 2016
  - International Conference on Learning Representations, 2022

- **Journal reviewers**
  - IEEE Transactions on Pattern Analysis and Machine Intelligence (T-PAMI)
  - IEEE Transactions on Computational Imaging (TCI)
  - IEEE Transactions on Multimedia (TMM)
  - IEEE Transactions on Image Processing (TIP)
  - IEEE Transactions on Circuits and Systems for Video Technology (T-CSVT)
  - IEEE Transactions on Systems, Man, and Cybernetics
  - IEEE Computer Graphics and Applications

- Artificial Intelligence
- Computer Vision and Image Understanding (CVIU)
- Cognitive Computation
- Computers and Electrical Engineering
- Image and Vision Computing (IVC)
- International Journal of Computer Vision (IJCV)
- Journal of the Optical Society of America
- Machine Vision and Applications
- Pattern Recognition Letter

Honors and Awards

• Outstanding reviewers of CVPR conference	2018
• Postgraduate Studentship in the Chinese University of Hong Kong	2009–2011
• Outstanding TA Award in the Chinese University of Hong Kong	2011
• Outstanding undergraduate thesis of Tsinghua University	2009
• National Scholarship	2007
• First Class Scholarship of Tsinghua University	2007