

# Jun Gao

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I am interested in computer vision, computer graphics and machine learning. I develop 3D generative AI models to create realistic, high-quality and diverse 3D content for reconstructing, generating and simulating 3D worlds.

## EDUCATION

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<b>University of Toronto (UofT)</b> Ph.D. Student in Computer Science Advisor: Sanja Fidler	Jan. 2020 - Present
<b>University of Toronto (UofT)</b> Master of Science in Computer Science Advisor: Sanja Fidler	Sept. 2018 - Jan. 2020
<b>Peking University (PKU)</b> Bachelor of Science (Summa Cum Laude) in Computer Science Advisor: Liwei Wang	Sept. 2014 - Jul. 2018

## EMPLOYMENT

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<b>NVIDIA Toronto AI lab</b> Research Scientist, Manager: Sanja Fidler	Nov. 2019 - Present Toronto, Canada
<b>NVIDIA Toronto AI lab</b> Research Intern, Manager: Sanja Fidler	Oct. 2018 - Nov. 2019 Toronto, Canada
<b>Microsoft Research Asia</b> Research Intern, Manager: Di He	Feb. 2018 - May 2018 Beijing, China

## SELECTED AWARDS AND HONORS

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2023 SIGGRAPH Asia Best Paper Award  
2022 NeurIPS Outstanding Reviewer Award  
2020 Platform Computing Graduate Fellowship in Computer Science, University of Toronto  
2018 Vector Scholarships in Artificial Intelligence, Vector Institute  
2018 SUMMA CUM LAUDE, Peking University  
2016 Merit Student Award, Peking University  
2015 National Scholarship, China

## PROFESSIONAL SERVICE

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### Area Chair

- Program Committee: ACM SIGGRAPH Asia 2024
- Area Chair: Neural Information Processing Systems (NeurIPS) 2023

### Conference Reviewer

- *Computer Vision*: CVPR, ICCV, ECCV
- *Machine Learning*: NeurIPS, ICML, ICLR
- *Computer Graphics*: SIGGRAPH, SIGGRAPH Asia

## PUBLICATIONS

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\*: Authors with equal contribution. †: Students/Interns who I (co-)mentored.

### Journal publications

1. Adaptive Shells for Efficient Neural Radiance Field Rendering  
Zian Wang<sup>\*,†</sup>, Tianchang Shen<sup>\*,†</sup>, Merlin Nimier-David<sup>\*</sup>, Nicholas Sharp, **Jun Gao**, Alexander Keller, Sanja Fidler, Thomas Müller, Zan Gojic  
ACM Transactions on Graphics (Proc. **SIGGRAPH Asia**), 2023, (**Best Paper Award**), [Project](#), [Paper](#)
2. Flexible Isosurface Extraction for Gradient-Based Mesh Optimization  
Tianchang Shen<sup>†</sup>, Jacob Munkberg, Jon Hasselgren, Kangxue Yin, Zian Wang, Wenzheng Chen, Zan Gojic, Sanja Fidler, Nicholas Sharp<sup>\*</sup>, **Jun Gao**<sup>\*</sup>  
ACM Transactions on Graphics (Proc. **SIGGRAPH**), 2023, [Project](#), [Paper](#), [Code](#)
3. Progressive Learning of 3D Reconstruction Network from 2D GAN Data  
Aysegul Dundar, **Jun Gao**, Andrew Tao, Bryan Catanzaro  
IEEE Transactions on Pattern Analysis and Machine Intelligence (**T-PAMI**), 2023, [Project](#), [Paper](#)
4. Fine Detailed Texture Learning for 3D Meshes with Generative Models  
Aysegul Dundar, **Jun Gao**, Andrew Tao, Bryan Catanzaro  
IEEE Transactions on Pattern Analysis and Machine Intelligence (**T-PAMI**), 2023, [Project](#), [Paper](#)

### Conference publications

1. Neural Fields meet Explicit Geometric Representations for Inverse Rendering of Urban Scenes  
Zian Wang<sup>†</sup>, Tianchang Shen, **Jun Gao**, Shengyu Huang, Jacob Munkberg, Jon Hasselgren, Zan Gojic, Wenzheng Chen, Sanja Fidler  
Computer Vision and Pattern Recognition (**CVPR**), 2023, [Project](#), [Paper](#), [Video](#)
2. Magic3D: High-Resolution Text-to-3D Content Creation  
Chen-Hsuan Lin<sup>\*</sup>, **Jun Gao**<sup>\*</sup>, Luming Tang<sup>\*</sup>, Towaki Takikawa<sup>\*</sup>, Xiaohui Zeng<sup>\*</sup>, Xun Huang, Karsten Kreis, Sanja Fidler<sup>\*</sup>, Ming-Yu Liu<sup>\*</sup>, Tsung-Yi Lin  
Computer Vision and Pattern Recognition (**CVPR**), 2023, (**Highlight**), [Project](#), [Paper](#)
3. GET3D: A Generative Model of High Quality 3D Textured Shapes Learned from Images  
**Jun Gao**, Tianchang Shen, Zian Wang, Wenzheng Chen, Kangxue Yin, Daiqing Li, Or Litany, Zan Gojic, Sanja Fidler  
Conference on Neural Information Processing Systems (**NeurIPS**), 2022, (**Spotlight**), [Project](#), [Paper](#), [Code](#)
4. Extracting Triangular 3D Models, Materials, and Lighting from Images  
Jacob Munkberg, Jon Hasselgren, Tianchang Shen, **Jun Gao**, Wenzheng Chen, Alex Evans, Thomas Müller, Sanja Fidler  
Computer Vision and Pattern Recognition (**CVPR**), 2022, (**Oral**), [Project](#), [Paper](#), [Code](#)
5. Deep Marching Tetrahedra: a Hybrid Representation for High-Resolution 3D Shape Synthesis  
Tianchang Shen<sup>†</sup>, **Jun Gao**, Kangxue Yin, Ming-Yu Liu, Sanja Fidler  
Conference on Neural Information Processing Systems (**NeurIPS**), 2021, [Project](#), [Paper](#), [Code](#), [Video](#)
6. DIB-R++: Learning to Disentangle Material from Lighting Using a Deferred Image-based Renderer  
Wenzheng Chen, Joey Litalien, **Jun Gao**, Zian Wang, Clement Fuji Tsang, Sameh Khamis, Or Litany, Sanja Fidler  
Conference on Neural Information Processing Systems (**NeurIPS**), 2021, [Project](#), [Paper](#)
7. 3DStyleNet: Creating 3D Shapes with Geometric and Texture Style Variations  
Kangxue Yin, **Jun Gao**, Maria Shugrina, Sameh Khamis, Sanja Fidler  
International Conference on Computer Vision (**ICCV**), 2021, (**Oral**), [Project](#), [Paper](#)
8. DatasetGAN: Efficient Labeled Data Factory with Minimal Human Effort  
Yuxuan Zhang<sup>\*,†</sup>, Huan Ling<sup>\*</sup>, **Jun Gao**, Kangxue Yin, Jean-Francois Laféche, Adela Barriuso, Antonio Torralba, Sanja Fidler  
Computer Vision and Pattern Recognition (**CVPR**), 2021, (**Oral**), [Project](#), [Paper](#), [Code](#)
9. Image GANs meet Differentiable Rendering for Inverse Graphics and Interpretable 3D Neural Rendering  
Yuxuan Zhang<sup>\*,†</sup>, Wenzheng Chen<sup>\*</sup>, Huan Ling, **Jun Gao**, Yanan Zhang, Antonio Torralba, Sanja Fidler  
International Conference on Learning Representations (**ICLR**), 2021, (**Oral**), [Project](#), [Paper](#)

10. Learning Deformable Tetrahedral Meshes for 3D Reconstruction  
**Jun Gao**, Wenzheng Chen, Tommy Xiang, Alec Jacobson, Morgan McGuire, Sanja Fidler  
 Conference on Neural Information Processing Systems (**NeurIPS**), 2020, [Project](#), [Paper](#), [Code](#)
11. Beyond Fixed Grid: Learning Geometric Image Representation with a Deformable Grid  
**Jun Gao**, Zian Wang, Jinchen Xuan, Sanja Fidler  
 European Conference on Computer Vision (**ECCV**), 2020, [Project](#), [Paper](#), [Code](#)
12. Interactive Annotation of 3D Object Geometry using 2D Scribbles  
 Frank Shen\*,<sup>¶</sup>, **Jun Gao\***, Amlan Kar, Sanja Fidler  
 European Conference on Computer Vision (**ECCV**), 2020, [Project](#), [Paper](#), [Video](#)
13. ScribbleBox: Interactive Annotation Framework for Video Object Segmentation  
 Bowen Chen\*, Huan Ling\*, Xiaohui Zeng, **Jun Gao**, Ziyue Xu, Sanja Fidler  
 European Conference on Computer Vision (**ECCV**), 2020, [Project](#), [Paper](#)
14. Learning to Predict 3D Objects with an Interpolation-based Differentiable Renderer  
 Wenzheng Chen, **Jun Gao\***, Huan Ling\*, Edward J. Smith\*, Jaakko Lehtinen, Alec Jacobson, Sanja Fidler  
 Conference on Neural Information Processing Systems (**NeurIPS**), 2019, [Project](#), [Paper](#), [Code](#)
15. Fast Interactive Object Annotation with Curve-GCN  
 Huan Ling\*, **Jun Gao\***, Amlan Kar, Wenzheng Chen, Sanja Fidler  
 Computer Vision and Pattern Recognition (**CVPR**), 2019, [Paper](#), [Code](#), [Video](#)
16. Representation Problem in Training Natural Language Generation Models  
**Jun Gao\***, Di He\*, Xu Tan, Tao Qin, Liwei Wang, Tie-Yan Liu  
 International Conference on Learning Representations (**ICLR**), 2019, [Paper](#), [OpenReview](#)
17. DeepPrimitive: Image Decomposition by Layered Primitive Detection  
 Jiahui Huang, **Jun Gao**, V. G.Subramanian, Hao Su, Yin Liu, Chengcheng Tang, Shi-Min Hu, Leonidas J. Guibas  
 Computational Visual Media (**CVM**), 2018, [Paper](#)
18. Learning to Navigate for Fine-grained Classification  
 Ze Yang, Tiange Luo, Dong Wang, Zhiqiang Hu, **Jun Gao**, Liwei Wang  
 European Conference on Computer Vision (**ECCV**), 2018, [Paper](#), [Code](#)
19. Dropout Training, Data-dependent Regularization and Excess Risks  
 Wenlong Mou, Yuchen Zhou, **Jun Gao**, Liwei Wang  
 International Conference on Machine Learning (**ICML**), 2018, [Paper](#)

## TEACHING EXPERIENCE

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<b>Teaching Assistant</b> CSC 420: Introduction to Image Understanding at UofT, <a href="#">website</a>	Winter 2022
<b>Guest Lecturer</b> CSC 420: Introduction to Image Understanding at UofT, <a href="#">website</a>	Winter 2022 & 2023
<b>Guest Lecturer</b> CS 479: Machine Learning for 3D Data at KAIST, <a href="#">website</a>	Fall 2023
<b>Guest Lecturer</b> CSCI 677: Advanced Computer Vision at USC	Fall 2023

## RESEARCH MENTORSHIPS

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Tianchang Shen, Ph.D. student at the University of Toronto  
 Weiwei Sun, Ph.D. student at the University of British Columbia  
 Zian Wang, Ph.D. student at the University of Toronto  
 Gary Leung, Master student at the University of Toronto  
 Jinchen Xuan, Undergrad student at the Peking University  
 Yuxuan Zhang, Undergrad student at the University of Waterloo  
 Yinan Zhang, Undergrad student at the University of Waterloo

## INVITED TALKS

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- *Revisit Representation, Data and Algorithm for Scaling Up 3D Content Generation*
  - Cornell University: Noah Snavely's research group Sept. 2023
  - MIT: Vision and Graphics Seminar Sept. 2023
  - Max Planck Institute for Intelligent Systems: Michael Black's research group Aug. 2023
  - Waabi: Raquel Urtasun's research group Aug. 2023
- *Towards High-Quality 3D Content Creation with a Hybrid Representation*
  - BIRS Workshop on 3D Generative Models July 2023
- *Machine Learning for 3D Content Generation*
  - CVPR 2023 Workshop: Structural and Compositional Learning on 3D Data, [recording](#) June 2023
  - Tsinghua University: Li Yi's research group May 2023
- *Towards Generative Modeling of 3D Objects Learned from Images*
  - Johns Hopkins University: Alan Yuille's research group Feb. 2023
  - University of Toronto: Toronto AI in Robotics Seminar, [recording](#) Nov. 2022
  - University of Oxford: Visual Geometry Group Sept. 2022
  - Peking University: Baoquan Chen's research group Sept. 2022
- *Learning Geometric Representation for Computer Vision*
  - GAMES: Graphics And Mixed Environment Symposium Nov. 2020
  - University of Alberta: Deep Learning Seminar May 2020

## PATENTS

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1. Extracting Triangular 3D Models, Materials, and Lighting from Images  
Carl Jacob Munkberg, Jon Niklas Theodor Hasselgren, Tianchang Shen, **Jun Gao**, Wenzheng Chen, Alex John Bauld Evans, Thomas Müller-Höhne, Sanja Fidler  
U.S. Patent Application 17/827,918
2. Transferring Geometric and Texture Styles in 3D Asset Rendering Using Neural Networks  
Kangxue Yin, **Jun Gao**, Masha Shugrina, Sameh Khamis, Sanja Fidler  
U.S. Patent Application 17/467,792
3. Synthesizing High Resolution 3D Shapes from Lower Resolution Representations for Synthetic Data Generation Systems and Applications  
Tianchang Shen, **Jun Gao**, Kangxue Yin, Ming-Yu Liu, Sanja Fidler  
U.S. Patent Application 17/718,172
4. Hybrid Differentiable Rendering for Light Transport Simulation Systems and Applications  
Wenzheng Chen, Joey Litalien, **Jun Gao**, Zian Wang, Clement Tse Tsian Christophe Louis Fuji, Sameh Khamis, Or Litany, Sanja Fidler  
U.S. Patent Application 17/826,611
5. Neural Rendering for Inverse Graphics Generation  
Wenzheng Chen, Yuxuan Zhang, Sanja Fidler, Huan Ling, **Jun Gao**, Antonio Torralba Barriuso  
U.S. Patent Application 17/981,770
6. Generating Labels for Synthetic Images Using One or More Neural Networks  
Yuxuan Zhang, Huan Ling, **Jun Gao**, Wenzheng Chen, Antonio Torralba Barriuso, Sanja Fidler  
U.S. Patent Application 17/020,649
7. Systems and Methods for Polygon Object Annotation and a Method of Training an Object Annotation System  
Sanja Fidler, Amlan Kar, Huan Ling, **Jun Gao**, Wenzheng Chen, David Jesus Acuna Marrero  
U.S. Patent Application 11/556,797

## SELECTED PRESS COVERAGE

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- **GET3D: A Generative Model of High Quality 3D Textured Shapes Learned from Images**  
[Two Minute Papers](#): NVIDIA's New AI: Generating 3D Models!  
[Yahoo](#): NVIDIA's new AI model quickly generates objects and characters for virtual worlds  
[Engadget](#): NVIDIA's new AI model quickly generates objects and characters for virtual worlds  
[VentureBeat](#): Nvidia CEO Jensen Huang says AI will autopopulate the 3D imagery of the metaverse  
[NVIDIA](#): World-Class: NVIDIA Research Builds AI Model to Populate Virtual Worlds With 3D Objects, Characters
- **Magic3D: High-Resolution Text-to-3D Content Creation**  
[Two Minute Papers](#): NVIDIA's New AI: Wow, 8x Better Text To 3D!  
[Forbes](#): What Nvidia's New Text-To-3D Means For Engineering & Product Design  
[Ars Technica](#): 3D for everyone? Nvidia's Magic3D can generate 3D models from text
- **FlexiCubes: Flexible Isosurface Extraction for Gradient-Based Mesh Optimization**  
[VectureBeat](#): NVIDIA's FlexiCubes uses generative AI to create 3D meshes  
[Two Minute Papers](#): NVIDIA's New AI: 20% Faster Game Graphics!  
[NVIDIA](#): Better 3D Meshes, from Reconstruction to Generative AI
- **NVDiffrec: Extracting Triangular 3D Models, Materials, and Lighting From Images**  
[Two Minute Papers](#): NVIDIA's New AI Grows Objects Out Of Nothing!  
[NVIDIA](#): AI in the Big Easy: NVIDIA Research Lets Content Creators Improvise With 3D Objects
- **DIB-R: Learning to Predict 3D Objects with an Interpolation-based Differentiable Renderer**  
[Two Minute Papers](#): This Neural Network Creates 3D Objects From Your Photos