

Kaichun Mo

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RESEARCH INTERESTS

3D Computer Vision, Graphics, Robotics, and 3D Deep Learning, with particular interests in object-centric 3D deep learning, and structured visual representation learning for 3D data.

EMPLOYMENT

NVIDIA Research, USA

Aug 2022 – Now

Research Scientist

- **Manager:** Prof. Dieter Fox;
- **Lab:** Seattle Robotics Lab.

EDUCATION

Stanford University, USA

Sept 2016 – June 2022

Ph.D., Computer Science

- **Advisor:** Prof. Leonidas Guibas;
- **Lab:** Stanford Geometry Lab and Stanford Artificial Intelligence Lab;
- **Disseration:** Learning Compositional and Actionable Visual Representations for 3D Shapes.

Shanghai Jiao Tong University, China

Sept 2012 – July 2016

B.S.E., Computer Science, ACM Honored Class, Zhiyuan College

- ACM Honored Class is a highly selective class (top 33 students) in SJTU.
- GPA: 3.96/4.30 (91.87/100) Rank: **1/33**.

PUBLICATIONS

Kaichun Mo*, Yian Wang*, Ruihai Wu*, Jiaqi Ke, Qingnan Fan, Leonidas J. Guibas and Hao Dong, *AdaAfford: Learning to Adapt Manipulation Affordance for 3D Articulated Objects via Few-shot Interactions*, ECCV 2022.

Yang Zheng, Yanchao Yang, **Kaichun Mo**, Jiaman Li, Tao Yu, Yebin Liu, Karen Liu and Leonidas J. Guibas, *GIMO: Gaze-Informed Human Motion Prediction in Context*, ECCV 2022.

Yining Hong, **Kaichun Mo**, Li Yi, Leonidas J. Guibas, Antonio Torralba, Joshua Tenenbaum and Chuang Gan, *Fixing Malfunctional Objects With Learned Physical Simulation and Functional Prediction*, CVPR 2022.

Kaichun Mo*, Jie Yang*, Yu-Kun Lai, Leonidas J. Guibas and Lin Gao, *DSG-Net: Learning Disentangled Structure and Geometry for 3D Shape Generation*, ACM Transactions on Graphics (presented at SIGGRAPH 2022).

Kaichun Mo*, Qi Li*, Yanchao Yang, Hang Zhao and Leonidas J. Guibas, *IFR-Explore: Learning Inter-object Functional Relationships in 3D Indoor Scenes*, ICLR 2022.

Kaichun Mo*, Ruihai Wu*, Yan Zhao*, Zizheng Guo, Yian Wang, Tianhao Wu, Qingnan Fan, Xuelin Chen, Leonidas J. Guibas and Hao Dong, *VAT-Mart: Learning Visual Action Trajectory Proposals for Manipulating 3D ARTiculated Objects*, ICLR 2022.

Chuanyu Pan*, Yanchao Yang*, **Kaichun Mo**, Yueqi Duan and Leonidas J. Guibas, *Object Pursuit: Building a Space of Objects via Discriminative Weight Generation*, ICLR 2022.

Kaichun Mo, Yuzhe Qin, Fanbo Xiang, Hao Su and Leonidas J. Guibas, *O2O-Afford: Annotation-Free Large-Scale Object-Object Affordance Learning*, CoRL 2021.

Shuo Cheng, **Kaichun Mo** and Lin Shao, *Learning to Regrasp by Learning to Place*, CoRL 2021.

Kaichun Mo, Leonidas J. Guibas, Mustafa Mukadam, Abhinav Gupta and Shubham Tulsiani, *Where2Act: From Pixels to Actions for Articulated 3D Objects*, ICCV 2021.

Jialei Huang*, Guanqi Zhan*, Qingnan Fan, **Kaichun Mo**, Lin Shao, Baoquan Chen, Leonidas J. Guibas and Hao Dong, *Generative 3D Part Assembly via Dynamic Graph Learning*, NeurIPS 2020.

He Wang*, Zetian Jiang*, Li Yi, **Kaichun Mo**, Hao Su and Leonidas J. Guibas, *Rethinking Sampling in 3D Point Cloud Generative Adversarial Networks*, CVPR 2021 Workshop "Learning to generate 3D Shapes and Scenes".

Kaichun Mo*, Yichen Li*, Lin Shao, Minhyuk Sung and Leonidas J. Guibas, *Learning 3D Part Assembly from a Single Image*, ECCV 2020.

Kaichun Mo, He Wang, Xinchun Yan and Leonidas J. Guibas, *PT2PC: Learning to Generate 3D Point Cloud Shapes from Part Tree Conditions*, ECCV 2020.

Kaichun Mo*, Paul Guerrero*, Li Yi, Hao Su, Peter Wonka, Niloy Mitra and Leonidas J. Guibas, *StructEdit: Learning Structural Shape Variations*, CVPR 2020.

Fanbo Xiang, Yuzhe Qin, **Kaichun Mo**, Yikuan Xia, Hao Zhu, Fanchen Liu, Minghua Liu, Hanxiao Jiang, Yifu Yuan, He Wang, Li Yi, Angel Chang, Leonidas Guibas and Hao Su, *SAPIEN: A Simulated Part-based Interactive ENvironment*, CVPR 2020 (Oral).

Tiange Luo, **Kaichun Mo**, Zhiao Huang, Jiarui Xu, Siyu Hu, Liwei Wang, Hao Su, *Learning to Group: A Bottom-Up Framework for 3D Part Discovery in Unseen Categories*, ICLR 2020.

Kaichun Mo*, Paul Guerrero*, Li Yi, Hao Su, Peter Wonka, Niloy Mitra and Leonidas J. Guibas, *StructureNet: Hierarchical Graph Networks for 3D Shape Generation*, ACM Transactions on Graphics (SIGGRAPH Asia 2019).

Kaichun Mo, Shilin Zhu, Angel X.Chang, Li Yi, Subarna Tripathi, Leonidas J. Guibas and Hao Su, *PartNet: A Large-scale Benchmark for Fine-grained and Hierarchical Part-level 3D Object Understanding*, CVPR 2019. (**featured in:** IEEE Spectrum, The Robot Report, etc.)

Charles R. Qi, Hao Su, **Kaichun Mo**, and Leonidas J. Guibas, *PointNet: Deep Learning on Point Sets for 3D Classification and Segmentation*, CVPR 2017 (Oral).

Yujun Li, **Kaichun Mo** and Haishan Ye, *Accelerating Random Kaczmarz Algorithm Based on Clustering Information*, AAAI 2016.

MANUSCRIPTS

Yan Zhao*, Ruihai Wu*, Zhehuan Chen, Yourong Zhang, Qingnan Fan, **Kaichun Mo** and Hao Dong, *DualAfford: Learning Collaborative Visual Affordance for Dual-gripper Object Manipulation*, arXiv:2207.01971 [cs.CV].

Mingxin Yu*, Lin Shao*, Zhehuan Chen, Tianhao Wu, Qingnan Fan, **Kaichun Mo** and Hao Dong, *RoboAssembly: Learning Generalizable Furniture Assembly Policy in a Novel Multi-robot Contact-rich Simulation Environment*, arXiv:2112.10143 [cs.RO].

Songfang Han, Jiayuan Gu, **Kaichun Mo**, Li Yi, Siyu Hu, Xuejin Chen and Hao Su, *Compositionally Generalizable 3D Structure Prediction*, arXiv:2012.02493 [cs.CV].

Kaichun Mo, Haoxiang Li, Zhe Lin and Joon-Young Lee, *The AdobeIndoorNav Dataset: Towards Deep Reinforcement Learning based Real-world Indoor Robot Visual Navigation*, arXiv:1802.08824 [cs.RO].

Luo Luo, **Kaichun Mo**, Zhihua Zhang, *Blockwise Matrix Completion for Image Colorization*, technical report, 2015.

OTHER RESEARCH EXPERIENCES

Research Intern June 2020 – Sep 2020
Facebook AI Research, Facebook Inc., USA

- Mentors: Shubham Tulsiani, Mustafa Mukadam and Prof. Abhinav Gupta.
- Object-centric segmentation, affordance and actionable information for robotic manipulation.

Visiting Graduate July 2019 – Sep 2019
Su Lab, University of California, San Diego (UCSD), USA

- Advisor: Prof. Hao Su;
- 3D weakly-supervised learning for shape part and structure discovery;
- Object-centric physical simulation for 3D robotic vision, control and planning.

Research Intern June 2018 – Sep 2018
Machine Intelligence group, Autodesk Research, Autodesk Inc., USA

- Mentor: Mike Haley;
- Unsupervised shape structure induction from a collection of 3D shapes.

Research Intern June 2017 – Sep 2017
Imagination Lab, Adobe Research, Adobe System Inc., USA

- Mentors: Haoxiang Li, Joon-Young Lee, Zhe Lin and Ersin Yumer;
- Autonomous robot indoor navigation using Reinforcement Learning.

Rotation Student April 2017 – June 2017
Computer Graphics Lab, Stanford University, USA

- Advisor: Prof. Doug James;
- Sound synthesis using 3D CAD ShapeNet models.

Rotation Student Jan 2017 – April, 2017
Computational Vision and Geometry Lab, Stanford University, USA

- Advisor: Prof. Silvio Savarese;
- Multi-agent collaboration and theory of mind using Reinforcement Learning.

Exchange Research Scholar July 2015 – Dec 2015
Graphics and Vision Lab, Cornell University, USA

- Advisor: Prof. Kavita Bala;
- Algorithmic propagation of material properties from 2D images to 3D ShapeNet models.

Research Assistant

June 2014 – June 2016

Brain-like Computing and Machine Intelligence Lab, Shanghai Jiao Tong University, China

- Advisor: Prof. Zhihua Zhang;
- Accelerating random kaczmarz algorithm via clustering;
- Improving Block-RPCA algorithm performance on image inpainting.

TEACHING EXPERIENCE

- Guest Lecturer, Spring 2022, Machine Learning for 3D Data (CS 492A), KAIST.
- Teaching Assistant, Winter 2022, Neural Generative Models for 3D Geometry (CS 348n), Stanford University
- Guest Lecturer, Spring 2021, Geometric and Topological Data Analysis (CS 233), Stanford University
- Guest Lecturer, Winter 2021, Machine Learning Meets Geometry (CSE 291-I00), UCSD
- Teaching Assistant, Spring 2020, Geometric and Topological Data Analysis (CS 233), Stanford University
- Guest Lecturer, Spring 2018, Geometric and Topological Data Analysis (CS 233), Stanford University
- Teaching Assistant, Fall 2014, Introduction To Computer Science (CS 120), Shanghai Jiao Tong University

PROFESSIONAL SERVICES

- **Workshop Lead Organizer:** VOLI: Visual Object-oriented Learning meets Interaction: Discovery, Representations, and Applications (ECCV 2022); StruCo3D2021: Structural and Compositional Learning on 3D Data (ICCV 2021);
- **Conference Area Chair:** NeurIPS Datasets and Benchmarks Track 2022;
- **Senior Program Committee Member:** AAAI 2023;
- **Conference Reviewer:** ICML 2021, 2022; ICLR 2021, 2022, 2023; NeurIPS 2020, 2021, 2022; NeurIPS Datasets and Benchmarks Track 2021; CVPR 2020, 2021 (outstanding reviewer), 2022; ICCV 2019, 2021; ECCV 2020, 2022; CoRL 2022; RSS 2021; ICRA 2020; IROS 2021; Siggraph 2021, 2022; Siggraph Asia 2020, 2021, 2022; AAAI 2020, 2021, 2022; ACCV 2020; 3DV 2017, 2018, 2019, 2020, 2021, 2022; Pacific Graphics 2020; WACV 2020, 2021, 2022; MVA 2019;
- **Workshop Reviewer:** SEAI (Simulation Technology for Embodied AI) 2021; CICV (Compositionality in Computer Vision) 2020, 3DRW (3D Reconstruction in the Wild) 2018, 2019; VLEASE (Visual Learning and Embodied Agents in Simulation Environments) 2018;
- **Journal Reviewer:** Robotics and Automation Letters (RA-L); Transactions on Pattern Analysis and Machine Intelligence (TPAMI); IEEE Transactions on Visualization and Computer Graphics (TVCG); IEEE Transactions on Image Processing (TIP); IEEE Transactions on Multimedia; IEEE Transactions on Robotics (TRO); ACM Transactions on Graphics (TOG); Computational Visual Media (CVM); Signal Processing: Image Communication; Computers Graphics; Information Fusion; International Journal of Advanced Robotic Systems.

INVITED TALKS

- May 2022, *Learning Compositional and Actionable Visual Representations for 3D Shapes*, MIT Vision and Graphics Seminar.
- May 2022, *Compositional and Structural Learning on 3D Shapes*, Meta AI.
- Mar 2022, *Learning Compositional, Structural, and Actionable Visual Representations for 3D Shapes*, Google Research.
- Mar 2022, *Learning Actionable and Compositional Visual Representations for 3D Shapes*, Univ. of Washington.
- Feb 2022, *Learning Actionable and Compositional Visual Representations for 3D Shapes*, at Seattle Robotics Lab, NVIDIA.
- Dec 2021, *Self-supervised Affordance Learning for Manipulating Articulated 3D Objects*, at 4th Robot Learning Workshop, NeurIPS 2021.

- Dec 2021, *Learning 3D Shape Structure and Semantics*, at CompVision Seminar, UC Berkeley.
- Nov 2021, *Learning 3D Shape Structure and Semantics*, at Machine Learning and Friends Lunch, UMass Amherst.
- Aug 2021, *Learning 3D Shape Visual Actionable Information for Robotic Manipulation*, at SVL Reading Group, Stanford.
- June 2021, *Learning 3D Shape Structure and Semantics*, at CogAI Reading Group, Stanford.
- April 2021, *Learning 3D Shape Actionable Information from Simulated Interaction*, at SFU VCR (visual computing and robotics) seminar.
- March 2021, *Learning 3D Shape Actionable Information from Simulated Interaction*, at Autodesk Research.
- Feb 2021, *Where2Act: From Pixels to Actions for Articulated 3D Objects*, for the MatchLab at Imperial College London.
- Feb 2021, *Where2Act: From Pixels to Actions for Articulated 3D Objects*, for the PRIOR team at AI2.
- June 2020, *Part-level and Structural 3D Shape Understanding*, at Intelligent Graphics Laboratory (IGL).
- June 2020, *Part-level and Structural Understanding for 3D shape Perception, Synthesis and Editing*, GAMES: Graphics And Mixed Environment Seminar.
- April 2019, *PartNet: A Large-scale Benchmark for Fine-grained and Hierarchical Part-level 3D Object Understanding*, at Stanford GCafe Seminar.

MEDIA COVERAGE

- **IEEE Spectrum:** *Massive 3D dataset helps robots understand what things are;*
- **The Robot Report:** *Intel, OSU, Stanford, and UC San Diego work on reinforcement learning, PartNet could help household robots;*
- **Robotics Business Review:** *Researchers Launch 26K+ Object Dataset to Help Robots Learn Shapes;*
- **TechCrunch:** *Intel is doing the hard work necessary to make sure robots can operate your microwave;*
- **Intel AI Blog:** *Introducing PartNet: the first large-scale dataset with fine-grained, hierarchical, instance-level part annotations.*

HONORS AND AWARDS

- **School of Engineering Fellowship**, Stanford, 2016-2017
- **Meritorious Winner**, 2015 Mathematical Contest In Modeling, 2015 (top 10% of all participants)
- **National Scholarship**, 2015 (highest honor for undergraduates in China, awarded to top 1% students)
- **National Scholarship**, 2014 (highest honor for undergraduates in China, awarded to top 1% students)
- **KoGuan Scholarship**, 2013 (awarded to top 12 students in Zhiyuan College)
- **The First Prize**, National High School Mathematics Contest, China, 2011
- **The First Prize**, National Olympiad in Informatics in Provinces, China, 2010