

# Kai He

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## EDUCATION

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- **ShanghaiTech University** Shanghai, China  
*B.Eng. in Computer Science and Technology; GPA: 3.75/4.0*  
*Advisors: Prof. Jingyi Yu & Prof. Lan Xu*  
Sept. 2020 – Present
- **University of California, Berkeley** Berkeley, CA  
*Undergraduate Exchange Student in Computer Science; GPA: 4.0/4.0*  
Jan. 2023 – May. 2023

## RESEARCH INTERESTS

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- I am broadly interested in **3D vision**. My current research focuses on the high-quality **3D reconstruction and rendering** of humans, common objects, and large-scale scenes. Additionally, I am exploring **generative modeling** that enables humans to **edit and interact with objects** in virtual environments.

## PUBLICATIONS

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- Relightable Neural Human Assets from Multi-view Gradient Illuminations  
*Taotao Zhou\*, Kai He\*, Di Wu\*, Teng Xu, Qixuan Zhang, Kuixiang Shao, Wenzheng Chen, Lan Xu, Jingyi Yu (\* Equal contribution)*  
*(Project Page) (Paper)* **CVPR, 2023**
- Free-view Face Relighting using a Hybrid Parametric Neural Model on a SMALL-OLAT Dataset  
*Youjia Wang, Kai He, Taotao Zhou, Kaixin Yao, Nianyi Li, Lan Xu, Jingyi Yu*  
*(Project Page) (Paper)* **IJCV, 2022**

## RESEARCH EXPERIENCE

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- **Carnegie Mellon University** Pittsburgh, PA  
*Robotics Institute Summer Scholar at AirLab. Advised by Prof. Sebastian Scherer*  
May. 2023 - Present
  - **Real-time Neural SLAM with LiDAR Data** *In Progress*
    - \* Produce the first LiDAR SLAM with implicit neural representation.
    - \* Two-stage optimization achieves real-time and high-accuracy dense reconstruction for large-scale environments.
    - \* Propose a novel method for neural localization with LiDAR data and achieve state-of-the-art results.
    - \* *(Poster) (Video)*
- **ShanghaiTech University** Shanghai, China  
*Undergraduate Researcher at VRVC. Advised by Prof. Jingyi Yu & Prof. Lan Xu*  
July. 2021 - Present
  - **Garment Generation via Sewing Pattern Representation** *In Progress*  
*Collaborating with Prof. Lingjie Liu from the University of Pennsylvania.*
    - \* Generate sewing pattern from multi-modal inputs with an autoregressive model, ready for neural or traditional simulation process.
    - \* Fine-tune the pretrained Latent Diffusion Model for layered PBR texture generation.
  - **Relightable Neural Human Assets from Multi-view Gradient Illuminations** *CVPR, 2023*
    - \* Present a novel human-centric dataset under multi-view and multi-illumination settings.
    - \* Fine-grained neural geometry modeling using implicit neural surface representation and volume rendering.
    - \* Using depth-guided G-buffer re-projection to synthesize high-quality novel-view renderings.
    - \* Material decomposition using photometric normal and albedo map priors on real human images for free-view photorealistic full-body relighting
  - **Free-view Face Relighting using a Hybrid Parametric Neural Model** *IJCV, 2022*

- \* Present a novel neural pipeline to produce high-quality relightable, and render-ready 3D face models from single portrait images.
- \* Use a small OLAT dataset and conduct semi-supervised learning to achieve comparable neural relighting quality.
- \* Implement neural facial material editing to support complex adjustments, which can be used to augment expensive OLAT datasets.
- **Editable 3D-GAN using a small labeled-dataset**
  - \* Train a 3D semantic field using a lightweight MLP with a small training dataset based on the pretrained NeRF volume in tri-plane representation.
  - \* Achieve real-time semantic map editing and appearance generation using transferable latent vectors.
  - \* Implement a real-time user-friendly UI to perform continuous semantic map and appearance editing, together with free-view visualization.

## COMPETITION EXPERIENCE

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- **Gold Medal**, The 45th International Collegiate Programming Contest (Regionals, Nanjing) *Dec. 2020*
- **Gold Medal**, The 45th International Collegiate Programming Contest (Regionals, Yinchuan) *May. 2021*

## HONORS & AWARDS

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- Merit Student, ShanghaiTech University *2021, 2022*
- Undergraduate Scholarship, ShanghaiTech University *2021, 2022*

## ACTIVITIES

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- **ACM Club, ShanghaiTech University** *Sept. 2020 - Present*  
*President, student coach, ICPC (International Collegiate Programming Contest) participant.*
  - Won the first ICPC gold medal in ShanghaiTech's history in Dec. 2020.
  - Organize club members to participate in ICPC competitions as the student coach.
- **GeekPie, ShanghaiTech University** *Sept. 2020 - Dec. 2022*  
*Vice-President, core member*
  - Provide technical support in algorithms for members and new students.
- **Teaching Assistant in Algorithms and Data Structures, ShanghaiTech** *Sept. 2022 - Jan. 2023*  
*Teaching Assistant*
  - Give office hours and recitation lessons.
  - Assist homework assignments and corrections.

## COURSE PROJECTS

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- **Chrome Dinosaur Game in RISC-V Course of Computer Architecture I:** Use RISC-V to implement the Chrome Dinosaur Game on the Longan Nano development board.
- **ATNet in Computer Network:** Developed a computer network using sound cards and acoustic signals. Implemented from the physical layer to the transport layer, providing a reliable data link that supports ICMP ping, basic NAT, and FTP.

## PROGRAMMING SKILLS

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- **Programming Languages:** Python, C/C++, Java, MATLAB, RISC-V
- **Tools & Frameworks:** PyTorch, Maya, Blender, git,  $\LaTeX$ , Markdown