

# BOTAO HE

botao@umd.edu • (+1) 202-247-6088 • [GitHub](#) • [bottle101.github.io](#)

## EDUCATION

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**University of Maryland**, College Park, U.S.

08/2022 – Now

Ph.D. student in Computer Science.

**Nanjing Institute of Technology**, Nanjing, China

09/2018 – 07/2022

B.Eng. in Robot Engineering, School of Automation.

## COLLABORATION

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**Carnegie Mellon University**, Pittsburgh, U.S.

05/2023 – Now

Advised by Dr. Ji Zhang.

**Zhejiang University**, Hangzhou, China

01/2020 – 08/2022

Advised by Prof. Fei Gao

## RESEARCH INTERESTS

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Field Robotics, Active Perception, Interactive Navigation.

## PUBLICATIONS

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- **Botao He**, Ze Wang, Yuan Zhou, Jingxi Chen, Chahat Deep Singh, Haojia Li, Yuman Gao, Kaiwei Wang, Yanjun Cao, Chao Xu, Yiannis Aloimonos, Fei Gao, and Cornelia Fermuller  
“Microsaccade-inspired Event Camera for Robotics”  
**Science Robotics**. [\[Website\]](#) [\[Paper\]](#) [\[Pre-print\]](#) [\[Video\]](#) [\[Code\]](#)
- **Botao He\***, Guofei Chen\*, Wenshan Wang, Ji Zhang, Cornelia Fermuller, Yiannis Aloimonos  
“Interactive-FAR: Interactive, Fast and Adaptable Routing for Navigation Among Movable Obstacles in Complex Unknown Environments”  
Submitted to IROS 2024. [\[Website\]](#) [\[Pre-print\]](#) [\[Video\]](#) [\[Code\]](#)
- Tianyi Xiong\*, Jiayi Wu\*, **Botao He**, Cornelia Fermuller, Yiannis Aloimonos, Heng Huang, Christopher A. Metzler  
“Event3DGS: Event-Based 3D Gaussian Splatting for High-Speed Robot Egomotion”  
Submitted to CoRL 2024. [\[Pre-print\]](#), code coming soon.
- Chahat Deep Singh, **Botao He**, Cornelia Fermuller, Christopher Metzler, Yiannis Aloimonos  
“Minimal Perception: Enabling Autonomy in Resource-Constrained Robots”  
Submitted to Frountier Robotics.
- **Botao He**, Ze Wang, Yuan Zhou, Jingxi Chen, Chahat Deep Singh, Cornelia Fermuller, Yiannis Aloimonos, Chao Xu and Fei Gao.  
“Leveraging an Active Prism to Enhance Feature Detection in Event Cameras”  
Technical Report. [\[Report\]](#)
- Qianhao Wang\*, **Botao He\***, Zhiren Xun and Fei Gao.  
”GPA-Teleoperation: Gaze Enhanced Perception-aware Safe Assistive Aerial Teleoperation”  
IEEE Robotics and Automation Letters (RA-L) and IEEE International Conference on Robotics and Automation (ICRA 2022). [\[Paper\]](#) [\[Video\]](#) [\[Code\]](#)
- **Botao He\***, Haojia Li\*, Siyuan Wu, Dong Wang, Zhiwei Zhang, Qianli Dong, Chao Xu, and Fei Gao.  
“FAST-Dynamic-Vision: Detection and Tracking Dynamic Objects with Event and Depth Sensing”  
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021). [\[Paper\]](#) [\[Video\]](#) [\[Code\]](#)
- Shaohui Yang, **Botao He**, Zhepei Wang, Chao Xu and Fei Gao.  
“Whole-Body Real-Time Motion Planning for Multicopters,”  
IEEE International Conference on Robotics and Automation (ICRA 2021), [\[Paper\]](#) [\[Video\]](#)

## RESEARCH EXPERIENCE

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**Perception and Robotics Group**, University of Maryland

**09/2022 – Now**

*Active Perception for Autonomous Navigation*

Advised by Prof. [Yiannis Aloimonos](#) and Dr. [Cornelia Fermuller](#)

- Designed a drone-view image generation framework using NeRF, supports infinite view-point sampling.
- Proposed a robust network running in real-time on the drone for estimating the best subset of the next viewing angles based on the current human pose observation.
- Designed a planner that combines the perspective-aware guidance with other navigation constraints into an optimization-based motion planning framework for improving human pose estimation.
- To submit to IROS 2024.

*Microsaccade-inspired Event Camera for Robotics*

Advised by Prof. [Yiannis Aloimonos](#), Dr. [Cornelia Fermuller](#) and Prof. [Fei Gao](#)

- Proposed a new hardware design to make the event camera see static background even when it is static.
- Designed a new algorithm to transform the new data format to the same domain of standard event camera, making the proposed system a plug-in-and-use solution with existing event-based perception algorithms.
- Designed 6 real-world experiments to comprehensively validate the system under different low- and high-level vision tasks. Open-sourced all hardware design and code.
- Accepted by **Science Robotics**, to be published.

**FAST(Field Autonomous System & compuTing) Lab**, Zhejiang University

**01/2020 – 08/2022**

*Advanced Pilot Assistance System (APAS)*. Advised by Prof. [Fei Gao](#)

- Proposed a gaze enhanced assistive aerial teleoperation framework considering topological intent consistency and perception awareness. Make drone operation easy for everyone.
- Designed a topological path generation method, which significantly improves intention consistency.
- Published at **RA-L and ICRA 2022** ([paper](#)). Open-sourced on [Github](#).

*Event-based perception*. Advised by Prof. [Fei Gao](#)

- Proposed a perception system for dodging fast-moving objects with low latency and high precision.
- Designed the ego-motion compensation algorithm that balances efficiency and accuracy.
- Implemented a novel moving object detection method that enables the drone to robustly detect high-speed ( $>12\text{m/s}$ ) incoming object while flying at  $1.5\text{m/s}$ .
- Published at **IROS 2021** ([paper](#)). Open-sourced on [Github](#). Reported by media and got over 30,000 visits.

*Whole-body Motion Planning for UAVs*. Advised by Prof. [Fei Gao](#)

- Proposed a full-body, optimization-based, yaw-considered real-time motion planning framework for aerial robots. The time consumption and memory usage of our method surpasses others.
- Worked on real-world experiment implementation. Got familiar with the aerial motion planning framework.
- Published at **ICRA 2021** ([paper](#)).

**All-terrain Vehicle Lab**, Nanjing Institute of Technology

**10/2018 – 12/2019**

*Challenge Arena Fighting Robot*. Advised by Prof. [Guifang Qiao](#)

*Team leader*

*Electromagnetic Throw System*.

*Team leader*

*Lightweight quadruped robot*.

*Team leader*

- Acquired the ability to independently build a robot system.

## SERVICE

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**Reviewer for:** Robotics and Automation Letters (RA-L), Frontiers in Robotics and AI, The Visual Computer, CVPR Workshop (2023)

**Editor for:** [NeuroPAC](#)

## HONORS & AWARDS

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NeuroPAC Fellowship, NeuroPAC,	2023, 2024
Dean's Fellowship, UMD,	2022-2023

## SKILLS

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**Programming:** C/C++, Python, Keil-C, Matlab, Git, OpenCV.  
**Robotics:** ROS, Unity, Airsim, Gazebo, Adams, IoT chips(STM32, Arduino).  
**Hardware:** SolidWorks, machining, circuit design.

## ADDITIONAL ACTIVITIES

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Summer volunteering at the Wangmengzhuang Primary School in Peixian. Taught Maths, Astronomy, PE, and Sex-education.  
Volunteer teaching assistant at community autism school. 250+ volunteer hours in total.