

# Peng SUN

Harbin Institute of Technology, Shenzhen

✉ [220320331@stu.hit.edu.cn](mailto:220320331@stu.hit.edu.cn)

## RESEARCH INTERESTS

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My research centers on navigation, motion control, and human-robot interaction, with the aim of enabling robots with semantic understanding of open-world human environments and generate contextually appropriate behaviors.

## EDUCATION

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**Harbin Institute of Technology**

*Sep 2022 - Jun 2026 (Expected)*

*B.E. in Automation (Shenzhen Campus), GPA: 91.25/100*

Honors: First-Class Academic Scholarship, Second-Class Enterprise Scholarship

## PUBLICATIONS

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- [1] S. Luo\*, J. Zhu\*, **P. Sun\***, Y. Deng, C. Yu, A. Xiao, X. Wang, "GSON: A Group-based Social Navigation Framework with Large Multimodal Model ", In submission to *International Conference on Robotics and Automation (ICRA)*. [\[Paper\]](#) [\[Video\]](#)

## RESEARCH

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**Center for Artificial Intelligence and Robotics, Tsinghua SIGS**

*Jan 2024 – Sep 2024*

Research Intern with [Prof. Xueqian Wang](#)

Shenzhen, China

- Developed a group-based social navigation framework (GSON) to enable mobile robots to perceive and exploit the social group of their surroundings by leveling the visual reasoning capability of the Large Multimodal Model.
- Applied visual prompting techniques to zero-shot extract the social relationship among pedestrians and combined the result with a robust pedestrian detection and tracking pipeline.
- Proposed a novel planning framework that integrates a social structure-based mid-level planner between global path planning and local motion planning to preserve the global context and reactive response.

## PROJECTS

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**Wheeled Biped Robot: Modeling and Control**

*Dec 2022 – Dec 2023*

Project Lead; Advisor: Dr. Yaming Ge

Education Center of Experiment and Innovation, HITsz

- Performed systematic modeling of the wheel-leg inverted pendulum system and linearized the model. Applied Virtual Model Control (VMC) principles to derive joint motor torques and designed an LQR controller for optimized control.
- Developed the chassis structure and electrical system for the wheel-leg robot, using an STM32 microcontroller as the primary control unit to implement the control algorithms effectively.
- Conducted motion control simulation and validation within the Simscape Multibody framework and deployed the control system on the physical robot platform.

**Small-scale Autonomous Driving System**

*Oct 2023 - Dec 2023*

Project Lead; Advisor: Dr. Yaming Ge

Education Center of Experiment and Innovation, HITsz

- Developed an autonomous driving system that uses traffic cones for trajectory tracking, incorporating the Gmapping algorithm for real-time mapping along with integrated path planning and navigation functions.
- Implemented the A\* algorithm for global path planning, optimized trajectories using Minimum Snap, and applied Pure Pursuit for local tracking.
- Employed YOLO for object detection, converted it to an RKNN model to enable NPU acceleration, ensuring efficient inference.

**Motion Target Control and Autonomous Tracking System**

*2ed - 5th Aug 2023*

Advisor: Dr. Yuanqing Li

Education Center of Experiment and Innovation, HITsz

- Designed two standalone laser gimbal systems: one dedicated to edge detection and tracking of two-dimensional objects, and the other for tracking the motion of the first system.
- Applied the Sobel operator for edge extraction and implemented a PD controller for precise tracking.
- The system reliably tracks rotational movements of an A4 paper frame within 0.5 seconds, maintaining an inter-laser error below 0.02 meters.

COMPETITION AWARD

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• National Undergraduate Electronics Design Contest	<b>National First Prize</b>	<i>Aug 2023</i>
• National Undergraduate Smart Car Contest (Racing Competition)	<b>National First Prize</b>	<i>Dec 2023</i>
• National Undergraduate Smart Car Contest (Intelligent Inspection)	<b>National First Prize</b>	<i>Aug 2024</i>

SKILLS

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- **Programming:** C/C++, Python, MATLAB
- **Software & Tools:** ROS, OpenCV, CubeMX, Keil, Solidworks
- **Hardware:** Multiple Motors and Sensors, STM32, Arduino