

# CHENGHAO XU

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## EDUCATION

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### Southern University of Science and Technology

Shenzhen, China

Sep.2016 - Jun.2020

- B.Eng in Mechanical Engineering
- Overall GPA: **3.65** / 4.00, Major GPA: **3.85** / 4.00
- Courses: CAD Engineering Drawing, Fundamentals of Mechanical Design, Advanced Manufacturing Practice

### Delft University of Technology

Delft, Netherlands

Sep.2020 - Present

- MSc Robotics (GPA: 8.2/10)
- Courses: Dynamics & Control, Planning & Decision Making, Machine Perception, Deep Learning

### The University of British Columbia

Vancouver, Canada

Jul.2017 - Aug.2017

- Vancouver Summer Program (Grades: A-)

## PROFESSIONAL EXPERIENCE

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### Active Visual SLAM for Aerial Robots

Master Thesis

Advisor: [Prof. Aamir Ahmad](#)

Max Planck Institute for Intelligent Systems, Germany

Aug.2022 - Present

- Developed a synthetic indoor UAV navigation dataset with optical flow ground truth, motion blur and event stream
- Conducted literature review and comparative testing on SLAM frameworks including RTAB-Map, DynaSLAM, etc.

### Multi-Camera Real-Time Surveillance Video Stitching

Computer Vision Engineer

Internship

Lely Technologies, Netherlands

Feb.2022 - Jul.2022

- Investigated feature-based image stitching methods for multiview cameras with parallax, and conducted a comparative analysis of **ORB, BRISKS, SIFT and VGG16 features** for image stitching
- Proposed a feature matching strategy based on the AutoStitch framework by mapping original features into undistortion images within corresponding ROIs separately to improve overall stitching performance
- Deployed the real-time stitching systems and positioning system in ROS2

### Control Engineer for Industrial Manipulator

Internship

ROKAE Robotics, China

Jul.2021 - Sep.2021

- Developed the online trajectory planning algorithm for industrial robots based on the **discrete-time double S profile**, which achieves trajectory update in real-time with **continuous acceleration**
- Accomplished trajectory planning and optimization under multiple industrial scenarios, and simulated joint states (such as peak torque, angular speed, power) during the movements using Robotics System Toolbox
- Investigated the impact of DH parameter deviation on the end effector position accuracy by Robotics Toolbox

### Quadruped Robot based on Discontinuous Terrain Perception

Student Research Assistant

Advisor: [Dr. Jianwen Luo](#)

SUSTech Institute of Robotics, China

Jun.2019 - Dec.2019

- Accomplished and optimized the design of robot structure by SolidWorks to obtain higher stability
- Constructed the prototype and adjusted motor control to achieve basic stepping or walking locomotion
- Secured funding from Youth Program of National Natural Science Foundation of China

### Upper-Limb Passive Adaptive Assisted Exoskeleton

Research & Development Intern

Advisor: [Prof. Hongqiang Wang](#)

Milebot Robotics, China

Jun.2019 - Sep.2019

- Conducted marketing analysis on exoskeleton products and used decision matrix to generate design concepts
- Optimized structural design of the energy storage and adaptive device for achieving adjustable assist effect

- Accomplished assist effect through mechanical analysis and numerical simulations using MATLAB
- Investigation of EMG signal and oxygen consumption for their secondary effect in working environment

## PROJECT EXPERIENCE

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### TIAGo Robot for Expiring Items Picking in Retail Environment

*Best Project Award with Ahold Delhaize*

*Apr.2022 - Jun.2022*

- Developed **motion planning module** that dynamically adjusts goals based on detected human information, which keeps a safe distance and brings less interruption to customers
- Developed the indoor localization method based on Apriltag and indoor exploration algorithm
- Deployed the real-time YOLO v5 model to detect items in store, which reaches a mAP of 0.7

### Autonomous Navigation for Site Inspection with Spot Robot

*Part-time at Yes!Delft, Netherlands*

*Mar.2022 - Jun.2022*

- Deploying autonomous inspection module based on Spot SDK including Mapping and Waypoint Planning
- Designed the functional GUI based on PyQt5 and Open3D to accomplish **Camera View Navigation and Visualization** remotely from the point cloud captured by Spot

### Path Planner for Quadrotor based on RRT\* and k-PRM Methods

*Course Project*

*Nov.2021 - Jan.2022*

- Employed RRT\* and k-PRM path planner to generate collision-free path on 3D random obstacle map
- Accomplished trajectory optimization using minisnap and corridor bounding method

### Manufacture of Aluminum Hollow Nested Cubes

*Course Project*

*Feb.2019 - May.2019*

- Accomplished the structural design and machining simulation of aluminum nested cubes
- Delivered the process planning with the skilled operation of CNC machining center and wire-cut EDM

## PUBLICATIONS & PRESENTATIONS

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- H. Liu, K. Fang, L. Chen, **C. Xu**, C. Chen, J. Luo, H. Wang\*, J. Ye, C. Fu, "Implementation of a Self-Adjustable Passive Upper-Limb Exoskeleton", *Submitted to IEEE Transactions on Robotics (T-RO)*, 2022.
- L. Chen, **C. Xu**, H. Liu, etc., "Design and Verification of Passive Upper Arm Assisted Exoskeleton", *Presented Poster at Annual Conference of Chinese Robotics Society*, 2019.
- **C. Xu**, "Breaking the Wall of Intensive Work Above Head", *Presented at Falling Walls Lab Berlin*, 2019.
- Patent: L. Chen, H. Liu, **C. Xu**, etc., Assisted exoskeleton devices. (Patent No. ZL201921545381.6)

## AWARDS & HONORS

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- 2016 Excellence Award | *Freshmen Scholarship*
- 2016 Champion | *The 2nd Shenzhen College Students Thinking and Debate Contest*
- 2017 Third Place, Best Debater | *The 3rd Shenzhen College Students Thinking and Debate Contest*
- 2018 Nomination Prize | *National Scholarship Award (Top 1%)*
- 2018 First Class | *Merit Student Scholarship for Exceptional Performance (Top 5%)*
- 2018 Dean's Award for Academic Excellence in College (*Top 1%*)
- 2018 Third Prize | *National College Student Social Practice and Science Contest on Energy Saving & Emission Reduction*
- 2019 Provincial second prize | *"TI Cup" National Undergraduate Electronics Design Contest*
- 2019 Excellence award | *Guangdong Entrepreneurship and Innovation Competition*
- 2019 First Prize | *Falling Walls Lab Shenzhen*
- 2019 First Class | *Merit Student Scholarship for Exceptional Performance (Top 5%)*
- 2019 Nomination Prize | *National Scholarship Award (Top 1%)*
- 2020 Gold Award | *"Challenge Cup" Guangdong College Student Entrepreneurship Plan Competition*

- 2020 Bronze Award | “*Challenge Cup*” National College Student Entrepreneurship Plan Competition
- 2020 Excellent Graduate in Southern University of Science and Technology (*Top 5%*)

## **EXTRACURRICULAR ACTIVITIES**

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**Secretary of SUSTech Student Union** *Sep.2016 - Jun.2017*

- Organized school cultural activities and coordinated the mission of various departments

**Senior Counselor for Freshmen of SUSTech** *Jun.2017 - Jun.2019*

- Advised 60 freshman students via a series of mini-lectures and activities
- Established a collaborative and caring community culture, solved problems and arranged social activities

**Debate Team Leader of SUSTech** *Feb.2018 - Feb.2019*

- Delivered training for members in competitions and maintained communications with other organizations

**Volunteer of The Asia-Pacific Regional Seminar on MOOCs for Higher Education** *Jun.2018*

**Volunteer of China Hardware Innovation Camp (CHIC2019)** *Jul.2019*

- Launched by École Polytechnique Fédérale de Lausanne (EPFL)
- Participated in the project *Heptabox* to improve the effectiveness of medication intake

## **TECHNICAL SKILLS**

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- **Programming:** Python, MATLAB, C++, HTML
- **Software:** ROS, OpenCV, Open3D, Pytorch, TensorFlow, Git, LaTeX, SolidWorks
- **Hardware:** Arduino, Mechanical Design, Machining (Milling, Turning, Wire-Cut EDM), 3D Printing