

# Boce Hu

## CONTACT INFORMATION

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## EDUCATION

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### Columbia University

New York, USA

Master of Science in Mechanical Engineering

Sep 2021 - May 2023 (expected)

Advanced Master Concentration in Robotics and Control, GPA: 3.9/4.0

- Coursework: *Intro to Robotics, Robotics Studio (A+), Evolution Algorithm, Data Science, Robot Learning, Deep Learning (A+), Natural Language Processing, Reinforcement Learning (In progress)*

### Civil Aviation University of China (CAUC)

Tianjin, CN

Bachelor of Engineering in Flight Vehicle Power Engineering, GPA: 3.62/4.00

Sep 2016 - Jul 2020

- Coursework: *Aviation Engine Principle, Aviation Engine Control, Aviation Engine Structure, Aviation Engine Emission, Dynamics of Aircraft*

## PUBLICATIONS

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**Boce Hu**, Chenfei Zhu, Xupeng Ai, Sunil K. Agrawal, "ACRNet: Attention Cube Regression Network for Multi-view Real-time 3D Human Pose Estimation in Telemedicine"

*IEEE Robotics and Automation Letters (RAL)*, Under Review, 2023. [\[Arxiv\]](#)

Xupeng Ai, Victor Santamaria, Jiawei Chen, **Boce Hu**, Chenfei Zhu, Sunil K. Agrawal, "A Deep-Learning Based Real-Time Prediction of Seated Postural Limits and its Application in Trunk Rehabilitation"

*IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE)*, Accepted, 2022. [\[PDF\]](#)

Wenting Lu, Yajun Chen, Xianjie Song, Keyu Wang, **Boce Hu**, Xuntao Zhang, "Study on the Removal Process of Oxide Scale on the 17-4PH Aviation Fasteners"

*PLATING&FINISHING*, 2019

## PATENTS

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Yajun Chen, Chenchen Liu, **Boce Hu**, Xiaoxiao Song, Pengda Xu, Jinchuan Yang, "Pre-corrosion and Alternating Corrosion Test Device for Mechanical Property Testing"

Patent number: ZL 201820669567.1

Yajun Chen, Keyu Wang, Xuntao Zhang, **Boce Hu**, Fusheng Wang, Xiaoxiao Song, "An Electrolysis-Ultrasonic Synergistic Pickling Experimental Equipment with Adjustable Parameters"

Patent number: ZL 201911184712.2

## TEACHING

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### Teaching Assistant

Columbia University

Data Science for Mechanical Systems

Fall 2022

- Provided academic support for students according to course material
- Graded and provided Q&A for weekly assignments

## Work Experience

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### Dilato Innovative Technology Limited

Beijing, CN

Software Development Intern, mentored by Xiaoyu Peng

Dec 2020 - Jun 2021

- Developed and tested functional modules for Adobe XD project using Java
- Completed the black-box test to support the latest version to go live

## RESEARCH EXPERIENCE

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### **Robotics and Rehabilitation (ROAR) Lab, Columbia University**

New York, USA

Advisor: Professor Sunil K. Agrawal

Oct 2021 - Present

- Collected the depth-image-based upper body movement dataset (UBM) and hand movement dataset (PAKH) based on the medical guideline of the Star Excursion Balance Test and Parkinson's finger tapping test.
- UBM and PAKH contained 156K trunk movement depth images collected from 16 healthy subjects and 92k hand tapping depth images collected from 16 healthy subjects, respectively.
- Designed an Attention Cube Regression Network (ACRNet) and a Shifted Attention Regression Network (SARN) to accomplish the task of body pose estimation and hand pose estimation.
- Validated that these two networks achieve state-of-the-art performance on public datasets and have the potential to be used in real rehabilitation scenarios.
- Developed a new deep-learning-based controller for the trunk support trainer (TruST) to predict the dynamic virtual motion boundary of upper body movements in real time.

### **Laboratory of Aircraft Structure Strength Test and Corrosion Analysis, CAUC**

Tianjin, CN

Advisor: Professor Yajun Chen

Mar 2018 - Dec 2019

- Read literature to study the effects of oxides on aviation fasteners and heat treatment techniques for descaling.
- Created a device to be jointly used with Instron 8803 fatigue testing system to build a corrosion test platform.
- Built a multi-parameter adjustable electrolytic pickling device, which includes four modules: electrolytic reaction module, liquid level control module, temperature control module, and stirring magnetic module.

## SELECTED COURSE PROJECTS

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### **Dynamic Torque Control of Multi-link Robotic Arms According to End Effector Target Positions**

May 2022

Advised by professor Matei Ciocarlie

- Controlled the state (i.e., velocity, angle, and torque) of multi-link robotic arms to achieve specific positions.
- Compared the speed of approaching the target position and the ability to maintain the current state after reaching the target position of simple deep learning and multiple deep reinforcement learning algorithms.
- Leveraged OpenAI Gym, PyTorch, and Stable-Baselines3 to build the real physical working environment and train the model to complete different control tasks.

### **Design, Fabrication, and Programming of a Humanoid Robot**

Dec 2021

Advised by professor Hod Lipson

- Designed and fine-tuned the detail of each component of the humanoid two-legged robot's CAD model.
- Fabricated each part of the robot using 3D printing and assembled them with the Raspberry Pi, motors, the controller board, etc., as the entire robot.
- Programmed and tested each motor of the robot, allowing our robot to walk and dance stably. [\[Journey Video\]](#)

### **Glass Cleaning Robot Design**

Dec 2021

Advised by professor Sunil K. Agrawal

- Applied SolidWorks to design a 4 DOF redundant robotic arm with a rotating base.
- Simulated the cleaning robot in MATLAB using Robotics System Toolbox.
- Analyzed the workspace and the cleaning trajectory of the robot depending on the simulation. [\[Final Report\]](#)

### **Soft Robot Locomotion Training with Evolutionary Algorithm**

Dec 2021

Advised by professor Hod Lipson

- Built an engine to simulate the real-world environment with Python and OpenGL, satisfying the laws of physics.
- Treated each soft robot as a parent genotype and iteratively utilized the selection, mutation, and crossover mechanism to evolve the internal state of soft robots to improve the speed of hopping gait.
- Calculated the speed of each robot and used this speed as a reward to optimize the soft robot population.

## SKILLS

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**Programming Languages:** Python, MATLAB, C++, JAVA, Git

**Software:** TensorFlow, PyTorch, OpenCV, Stable-baselines-3, Robot Operating System (ROS), SolidWorks, Blender, Ultimaker Cura (3D-Printing), LaTeX, Linux