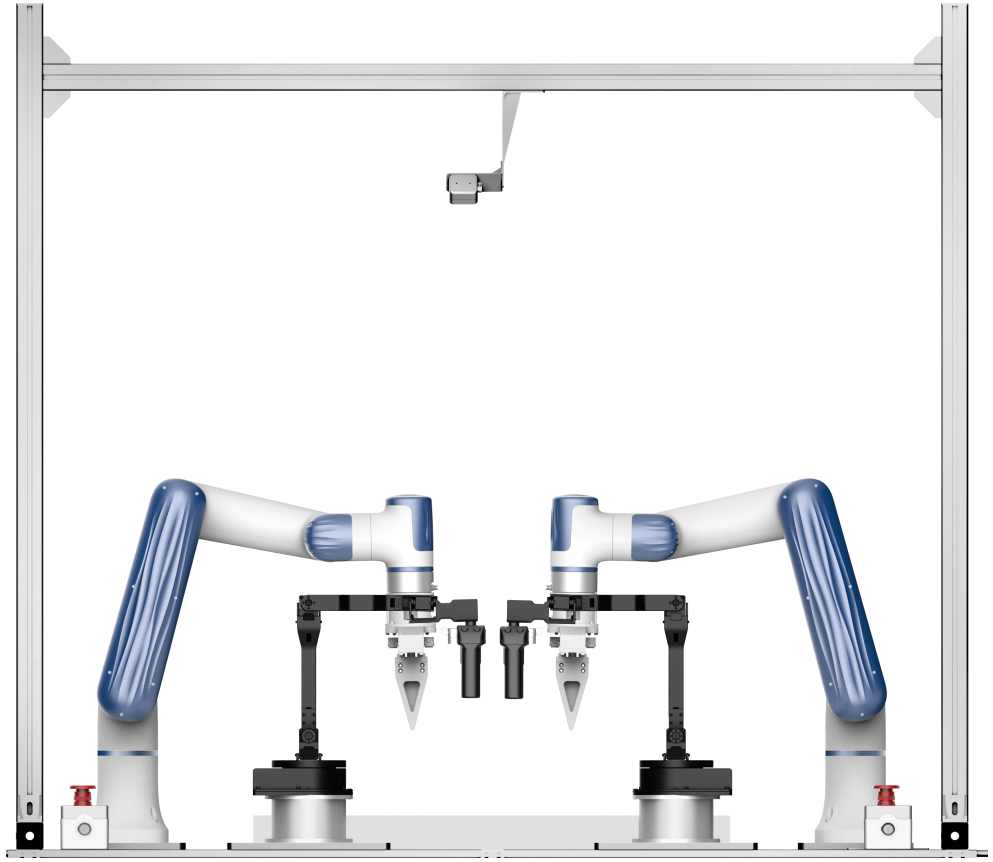
DOBOT X-Trainer

AI Data Collection and
Training Robotic System



CONTENT

Content

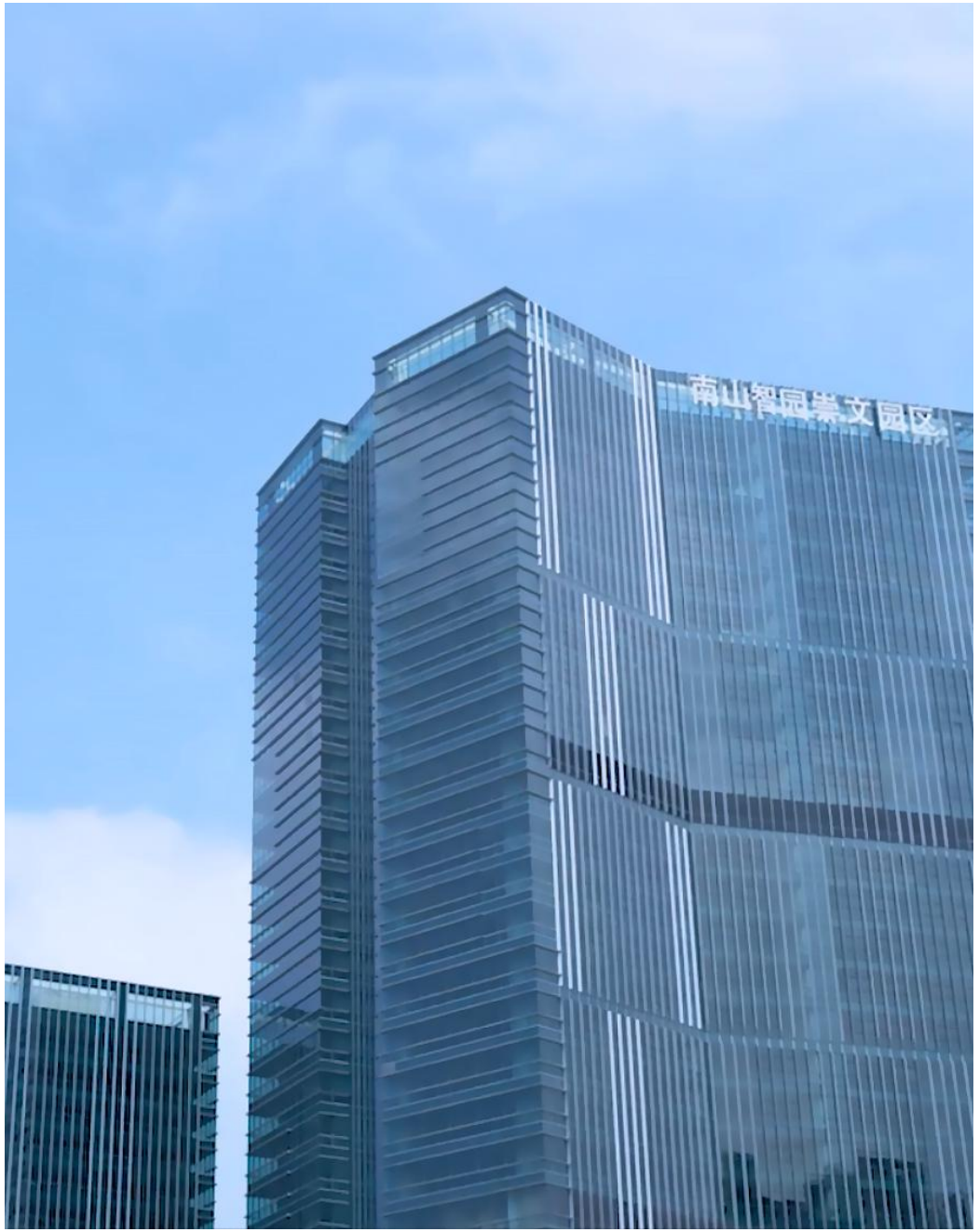
01 Introduction

02 Applications

03 Key Features

01 Introduction

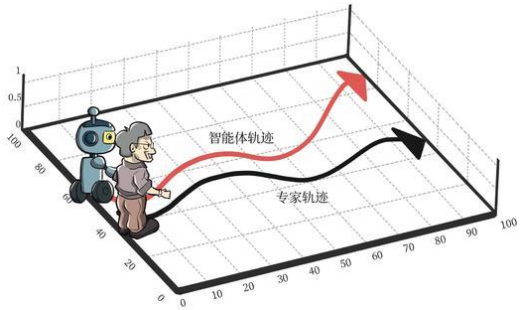
ABOUT X-Trainer



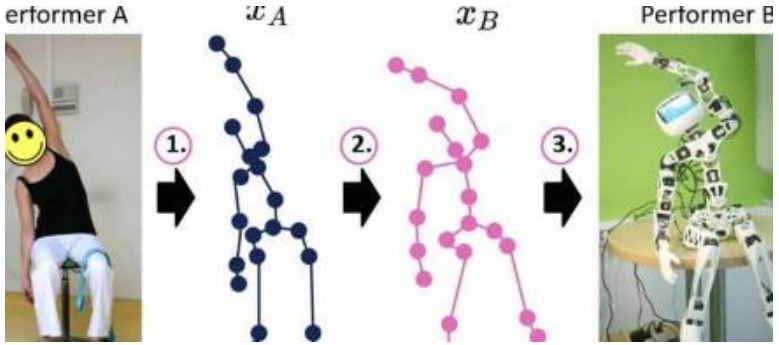
AGI (Artifcial General Intelligence) Imitation Learning

Embodied intelligence is an important step towards Artificial General Intelligence (AGI), and learning by imitation from demonstrations provided by humans is a promising development approach for the future.

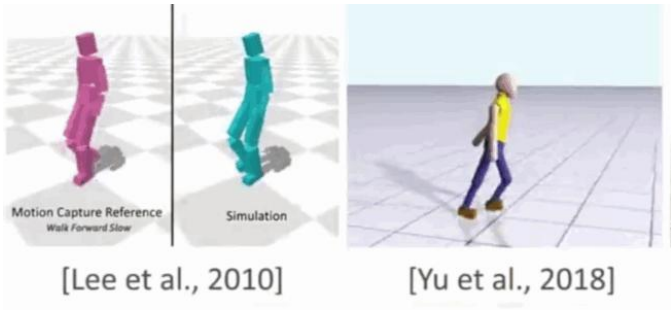
This "behavior cloning" approach can enable robots to learn a variety of basic skills, from simple pick-and-place operations to more fine-grained manipulations.



Experts Trajectory Learning



Pose-based Motion Learning



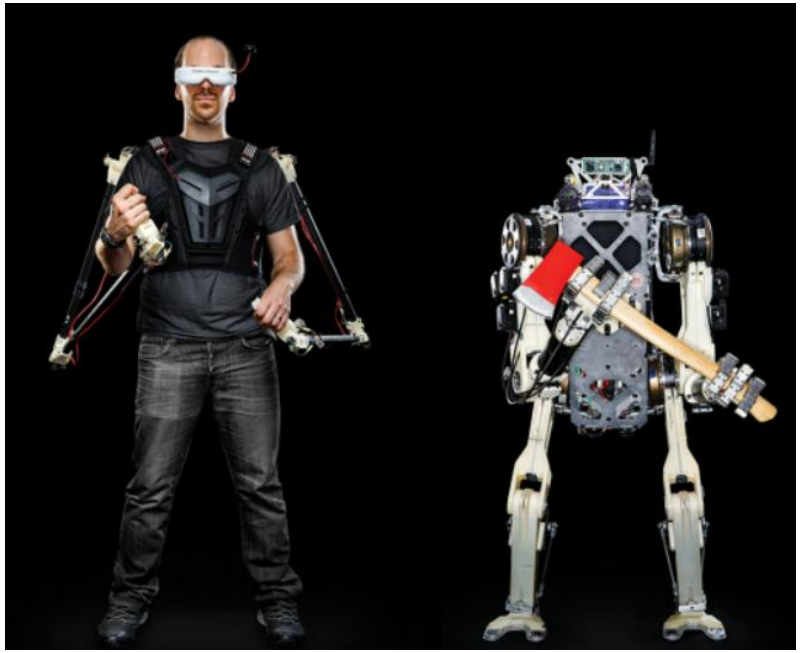
[Lee et al., 2010] [Yu et al., 2018]

Locomotion Learning

Pain Points for Imitation Learning

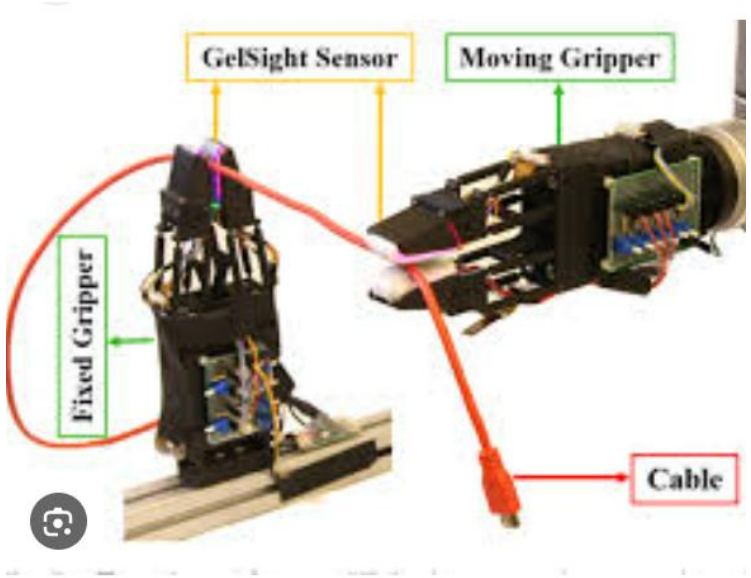
High Cost of Data Collection Systems

Traditional data collection systems are expensive to build and difficult to set up, requiring high-end robots, high-precision sensors, complex environmental modeling, or intricate calibration systems.



Inflexible Traditional Robotic Manipulators

For delicate tasks, such as threading flexible cables, the challenges for robots are enormous. They require high precision, high coordination, and complex real-time vision-based feedback systems, making it difficult to match the dexterity and flexibility of the human hand.



Key Features

X-Trainer

Rapid Training
Routine scenario training can be completed in just 2 hours.

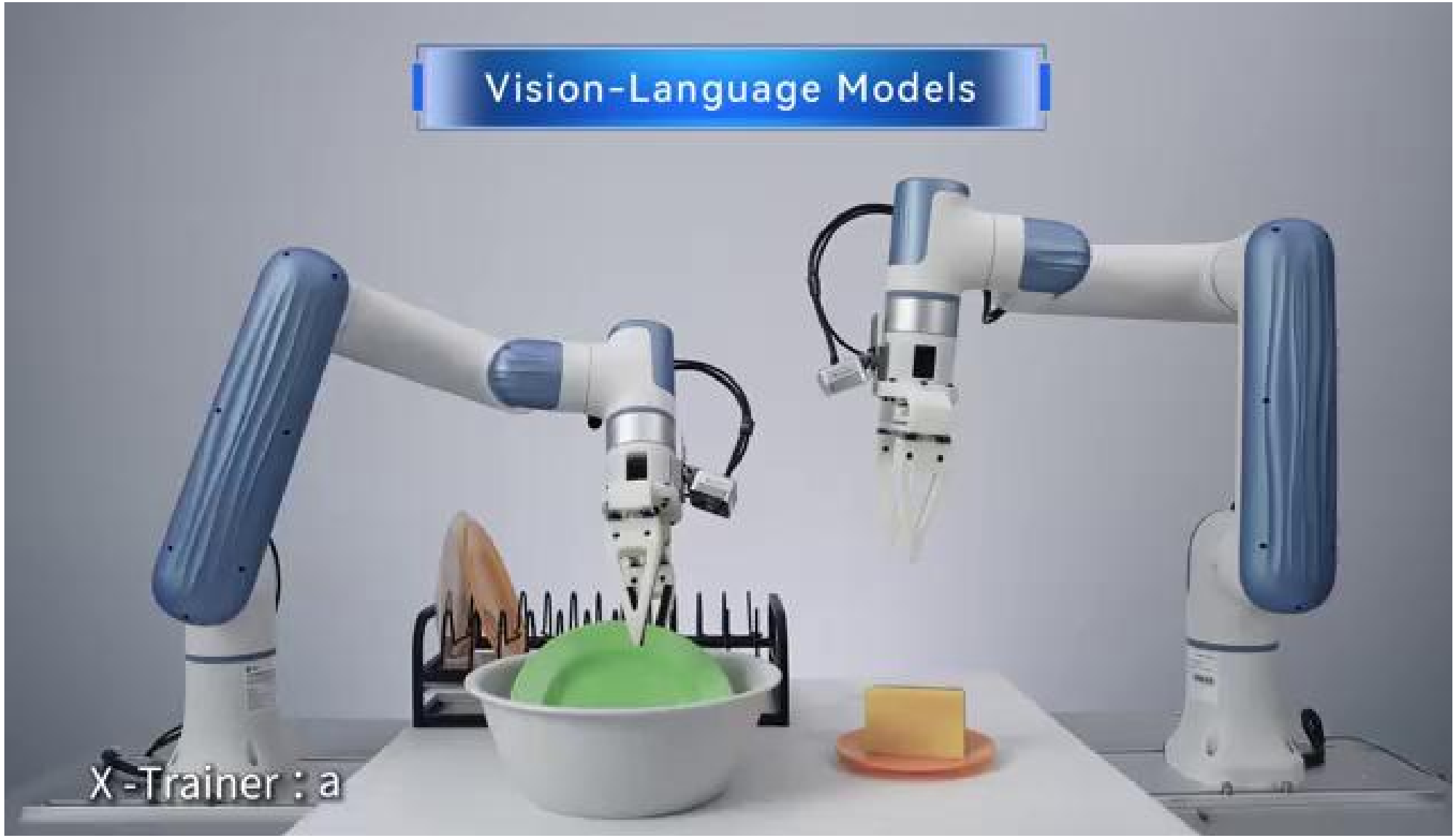
Interference Resistance
Real-time interference and autonomous correction.

Industrial-Grade Precision
Repeat positioning accuracy up to ±0.05mm

High Performance, Low Latency
150% improvement in response speed

Safety
Master-Slave Synchronization, Collision Detection, Dual Global Emergency Stop, Anti-Drop Detection

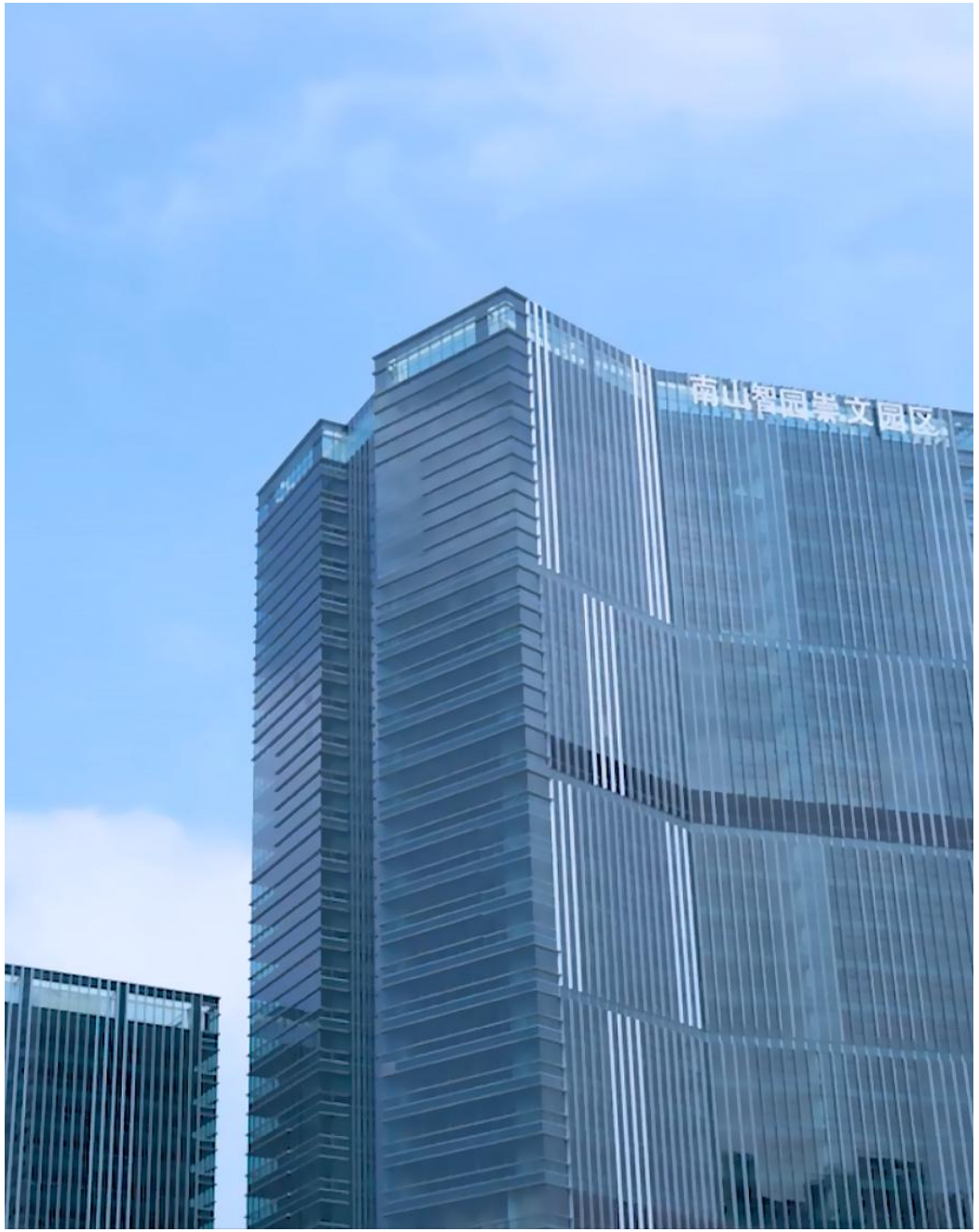
X-Trainer Imitation Training



X-Trainer Imitation Training

02 Application Scenarios

ABOUT X-Trainer Application



X-Trainer-Application Scenarios

AI Data Collection & Training

X-Trainer is capable of collecting diverse and contextualized data, such as images, videos, and positional information, to train embodied intelligence AI models. This enables the platform to meet the conventional data collection and training requirements of both academia and industry, such as simulating robots assisting with cooking at home or perorming tasks like assembly and handling in industrial areas.

Wash dishes

Cook eggs

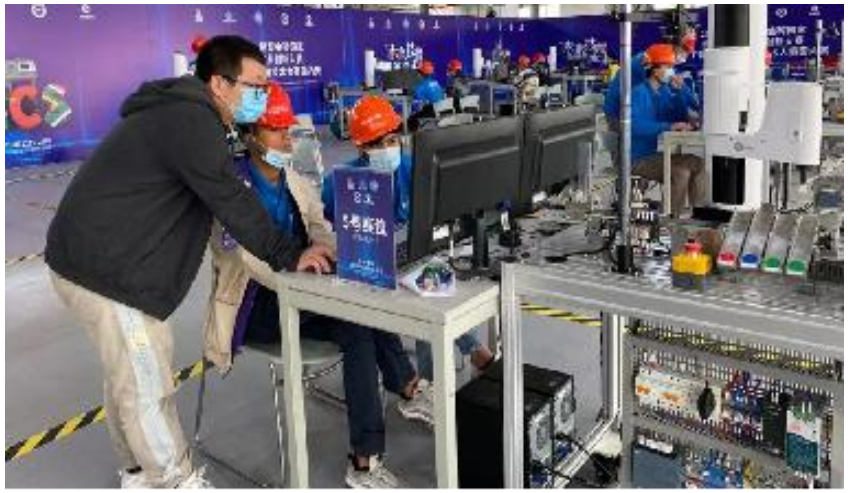
Pour water

Fold laundry

X-Trainer-Application Scenarios

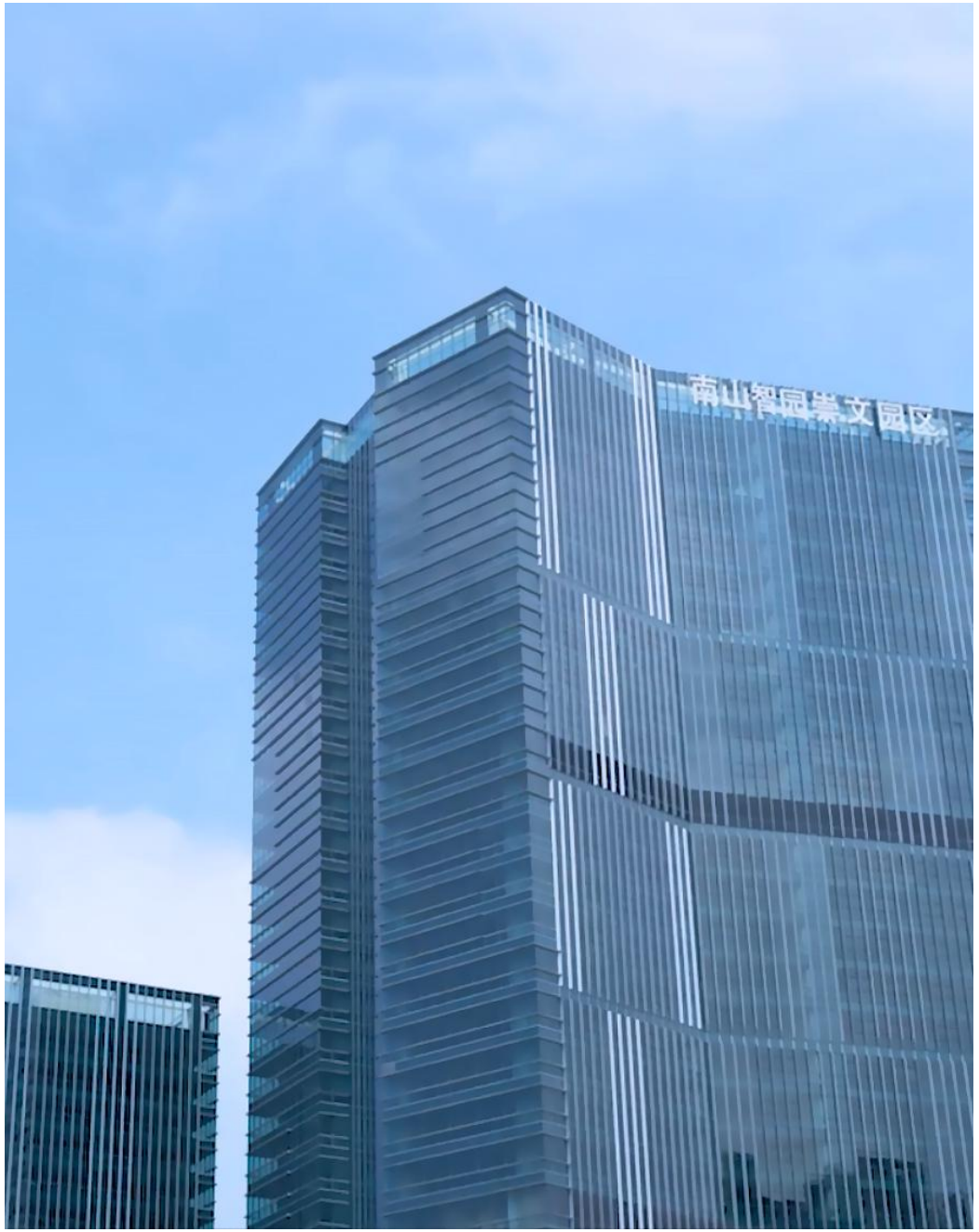
Practical Projects & Competitions

University students can take advantage of the X-Trainer for various robotics and AI-related practical projects and competitions, while using it for creative experimentation or developing AI applications. The end result is enhanced practical skills and innovation mindset.



03 Key Features

ABOUT X-Trainer Features



X-Trainer-Features

Rapid Training

Imitation learning data training is signifcantly shorened by 70%, and routine scenario training (such as dish-washing or folding clothes) can be completed in just 2 hours.

-70%
Training Duration

2 Hrs
Routine Scenario Training

X-Trainer-Features

Interference Resistance

During autonomous execution of scenario tasks, real-time disturbances can be quickly corrected. For example, the robot can recognize and remove stains that occur during the dish-washing process, resulting in a signifcant improvement in the robot's AI capabilities.

A certain degree of generalization

X-Trainer-Features

Industrial-Grade Precision

With Dobot Nova 2 Six-Axis Cobots, the X-Trainer platform achieves a high repeatability accuracy rate of up to 0.05mm.

Nova 2
Robot Arms

±0.05mm
Repeatability Accuracy

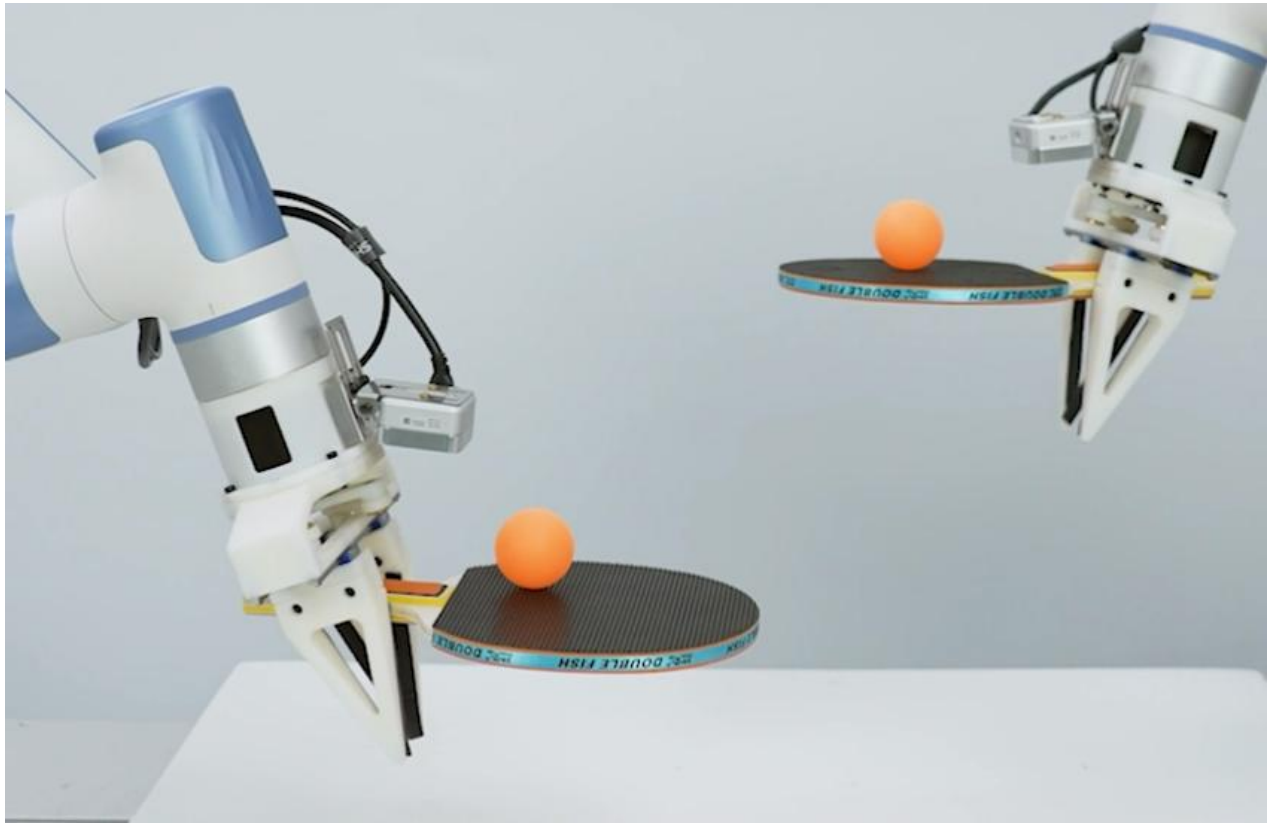
X-Trainer-Features

High Performance, Low Latency

25Hz **end-to-end** high-performance motion interface, 150% faster response speed compared to similar products, further improved robotic operational smoothness.

camera data
joint position data → joint position

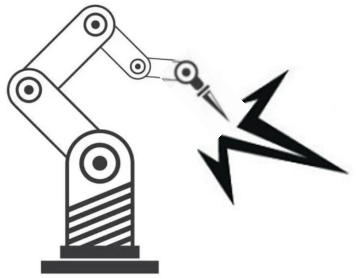
input output



X-Trainer-Safety Guarantee

Master-Slave Safety Synchronization

Automatic disconnecting the master and slave hand upon power loss to prevent slave arm collision damage.



Slave Arm Collision Detection

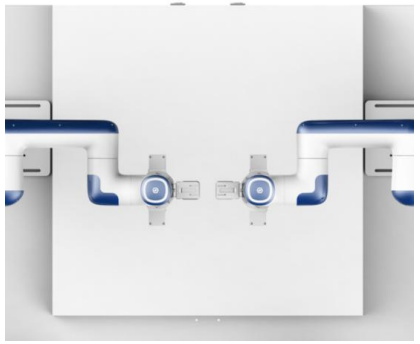
Nova 2 6-Axis collaborative robot with built-in level 5 collision detection, ISO15066 safety certified, worry-free human-robot collaboration.

Dual Emergency Stop Buttons

Equipped with dual emergency stop buttons, anywhere and anytime, pressing either one triggers a emergency stop to quickly prevent accidents.

Anti-Dropping Detection

Master-hand abnormal drop detection , effectively preventing operational errors from causing damage to the robot arm.
Flexible EVA foam padding in the work space: Significantly reduces the risk of end-effector and robot arm damage.



X-Trainer-High Performance Master-Hand

Smooth Operation, Control as Needed

The **lightweight design** ensures that **the load on the user's hand during operation is less than 400g**, making it more comforable and convenient to use. With high-perormance servo motors and springs, it achieves higher motion capture accuracy, resulting in a more seamless remote control experience.

Easy-to-Use Buttons

The master hand controller is equipped with **unlock and record buttons**. The unlock button allows for quick locking and unlocking of the master hand's posture, signifcantly reducing fatigue on the operator's hands. The record button enables convenient control of recording star or stop.

Ergonomic Master-Hand

- Master-Slave Hand Configuration Consistency: Lossless scaling optimization for intuitive and dexterous operation.
- Symmetric Design of Operation Handle and Buttons: Suitable for both left and right hands, accommodating different user preferences.

All-in-One Design

- Integrated Design of Master Hand: Integrated main controller in the base, resulting in a more compact form factor.
- One-Piece 3D Printed Linkage Components: Lighter and more streamlined robotic body.
- Hidden Wiring Design: Improved aesthetics and reduced interference, enhancing smooth operation.

X-Trainer- Industrial-Grade Slave Hand

Industrial-Grade Precision

Highly Precise Repeat Positioning Accuracy of ±0.05mm. Whether for delicate experimental operations or sensitive data collection, the robotic system can perform tasks with exceptional accuracy.

Large Payload, High Speed

- Nova2 has a max single-arm payload of 2Kg and a combined dual-arm payload of 3Kg, covering a wide range of applications.
- With a max speed of 1.6m/s, Nova2 boosts the efficiency of data collection, making it particularly suitable for rapid execution of data acquisition tasks.

Large Working Range

Nova2 reaches 625mm, and the combined dual-arm span can reach 1200mm. Coupled with 6-axis high flexibility, it can easily cover a broad workspace, effectively realizing data collection in different application scenarios.

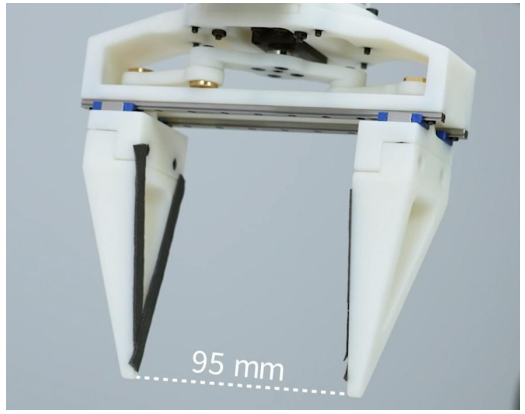
Collision Detection

Nova2 is equipped with 5-level collision detection functionality and is ISO15066 safety certified. It can immediately stop upon unexpected collisions, protecting the arm, surrounding equipment, and personnel, truly achieving human-robot collaboration.

X-Trainer- Slave-Hand Gripper

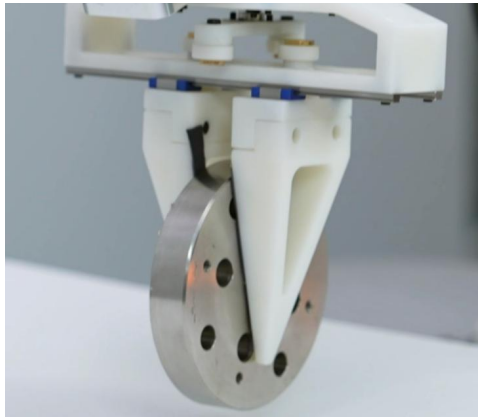
Large Gripper Stroke

Maximum gripper stroke of **95mm**: accommodating a wider range of operational needs from precise component assembly to handling larger items, the robotic system can easily handle diverse tasks.



High Gripping Force

High gripping force **up to 15N**, enabling more stable grasping operations.
Suitable for handling small everyday items as well as precision lab and industrial gripping tasks.

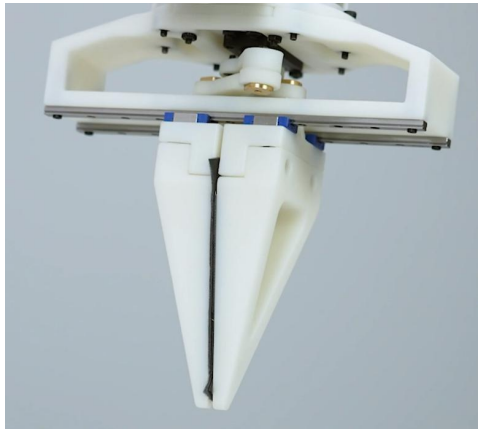


Parallel Dual Slider Design

Enables rapid and precise motion response during the gripper opening and closing process, achieving secure grasping.
Enhances the durability and reliability of the gripper, meeting the requirements for long-term, high-intensity data acquisition tasks.

Lightweight Design

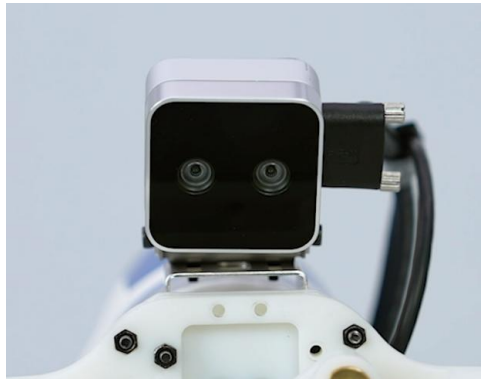
Lightweight design, monolithic 3d-printed structure - reduces the load on the entire robotic arm, effectively enhancing agility and precision of operation.



X-Trainer-3D In-depth Camera

Sub-millimeter Level Precision

The precise environmental data provides a solid foundation for machine learning and imitation learning, enabling the system to more accurately interpret the operational environment, thereby optimizing the training effectiveness of neural network models.

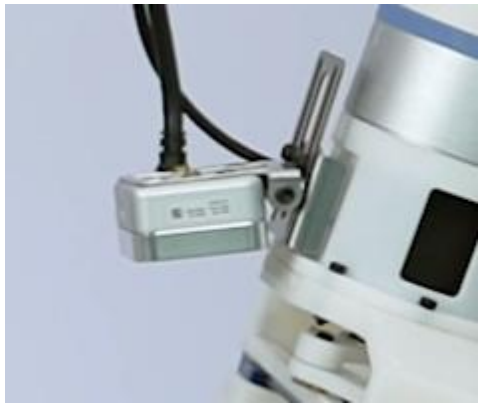


Wide Field of View

The wide field of view reduces the need for frequent angle adjustments, especially in complex or space-constrained environments. this allows capturing multi-angle data in a single shot, significantly improving the efficiency and practical utility of data collection.

Multi-Angle Adjustable

The camera is capable of **pitch, forward/backward** adjustments. the camera angle can be adjusted according to the specific task requirements, providing great flexibility for use in different scenarios.



3-view Camera Design for Richer Data

With three depth cameras, multi-angle observation and recording, the system can capture abundant visual information. this allows the system to better understand the environment and objects, and more quickly compute the optimal robot path and operation strategy.

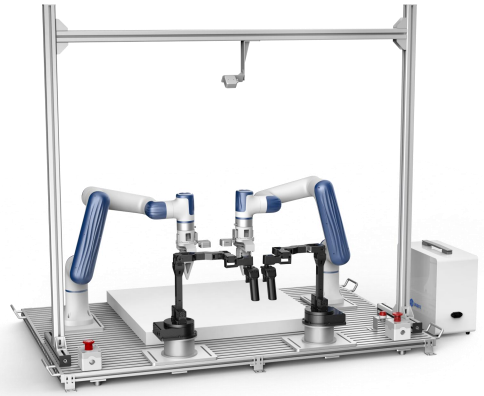
X-Trainer- Multi-Fuction Base

Full Base, Easy to Deploy

The main and auxiliary robotic arms, as well as the control cabinet, are all integrated into a single base unit - greatly enhancing the flexibility and ease of use of the device
This allows deployment and usage across diverse environments, meeting the needs of various applications.

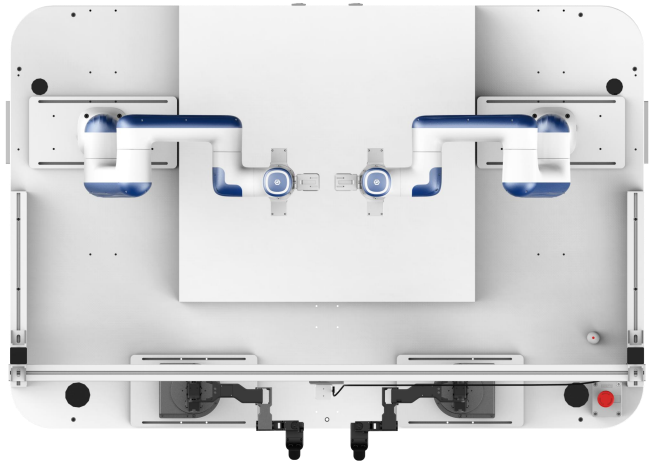
Lightweight Base, Covenient to Remove

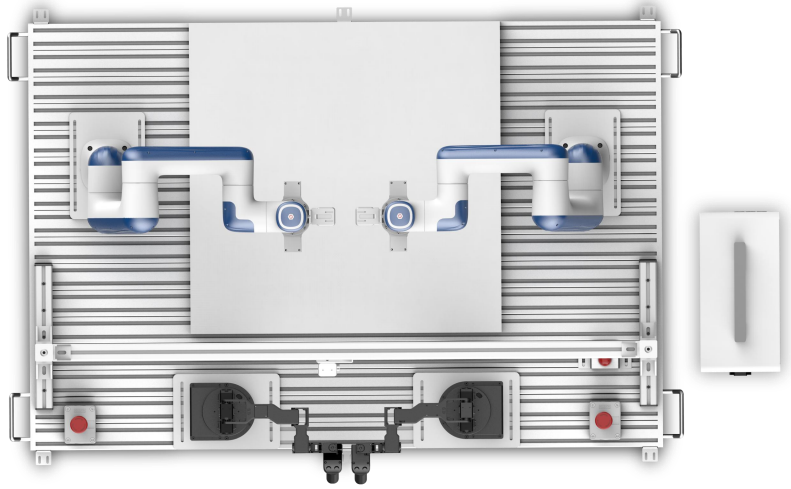
The lightweight design reduces the weight by 70%, with a separate control cabinet, and 4 convenient handles, enabling flexible deployment and easy transportation.
6 fixed feet are included to enhance the stability of the device when deployed on a desktop.



Large Operational Space with Brillant Expandability

The master hand and slave hand can have their **installation positions freely adjusted based on the requirements**, to adapt to different application scenarios.
Nova 2 slave hand can be rotated 90 degrees for installation, enabling it to perform tasks that extend beyond the platform.

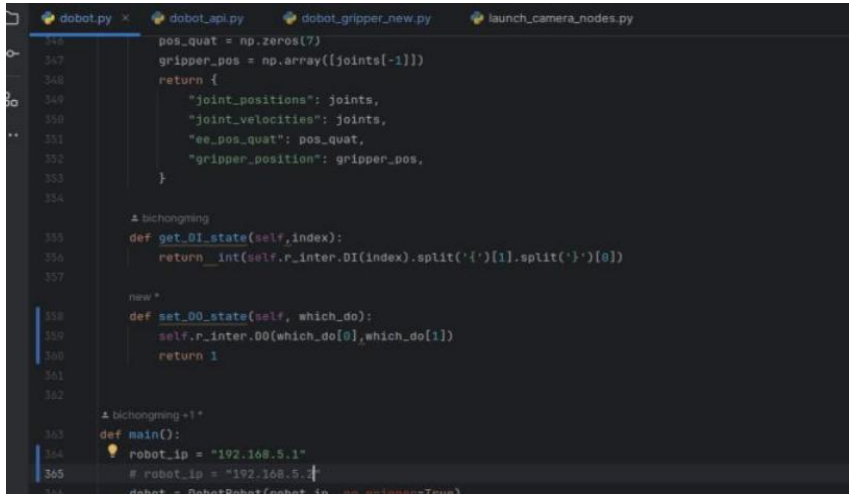




X-Trainer- Secondary Development

Full SDK for data collection, training, and inference

Provides complete development scripts covering the entire workflow, **from data collection to autonomous inference**. Includes detailed user manuals to systematically guide users from the basics, greatly simplifying the learning and application process, and accelerating the transition from theory to practice.



Open API Interfaces

The system is equipped with a data training SDK, offering open API interfaces. it supports exporting data in specialized formats, enabling direct integration with custom AI neural network models. It allows for multi-model large-model training and research, facilitating various research projects.

The API interfaces include: reading/controlling the joint angles of the main arm, reading/controlling the joint angles and Cartesian coordinates of the slave arm, controlling the gripper open/close degree, and capturing RGB camera images.

Thank you.

www.dobot-robots.com

sales@dobot-robots.com

www.linkedin.com/company/dobot-usa/

linkedin.com/company/dobotrobotics/

youtube.com/@DobotRobotics