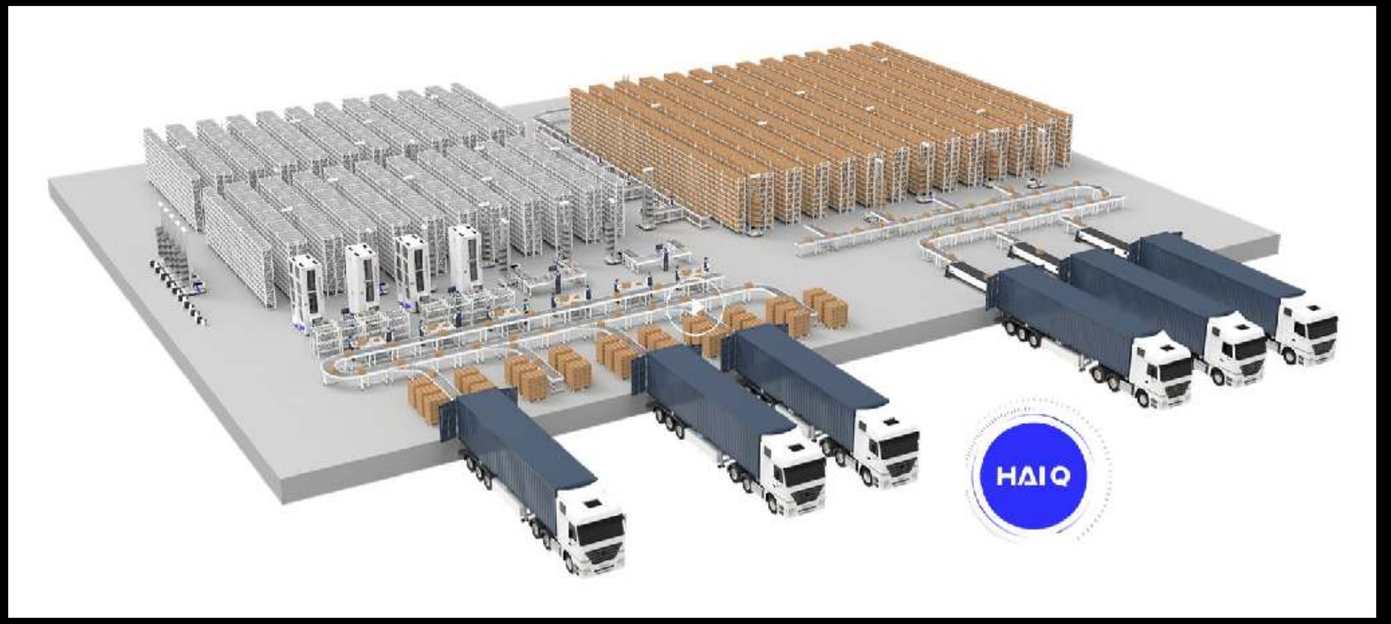
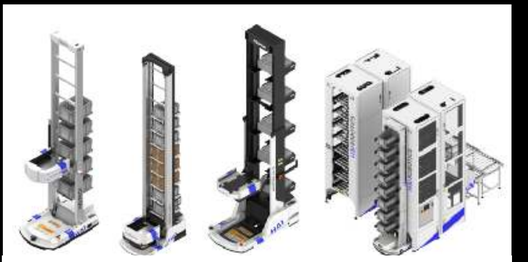
HAI ROBOTICS

CHALLENGE : MAKING WAREHOUSES SMART

- 7 DAYS FOR DEPLOYMENT / 1 MONTH TO GO LIVE
- INCREASE OPERATIONAL EFFICIENCY BY 3-4 TIMES
- INCREASE STORAGE DENSITY BY 80%-130%





+ Smart Charger + Software

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Introducing

HAI ROBOTICS

targeting

SMART WAREHOUSE LOGISTICS

on an international scale.

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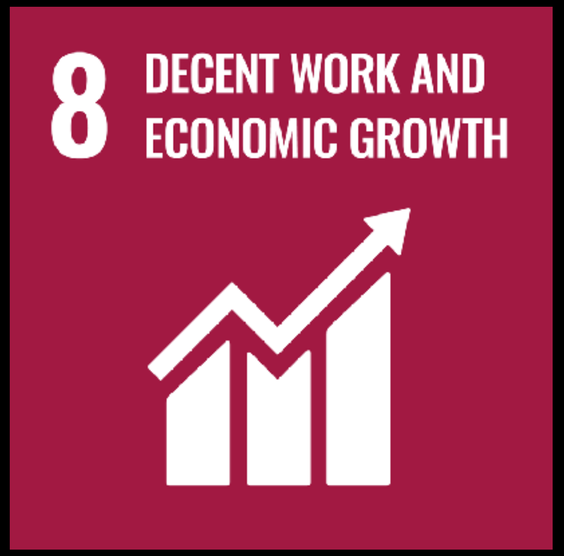
SDGs TACKLED



https://sdgs.un.org/

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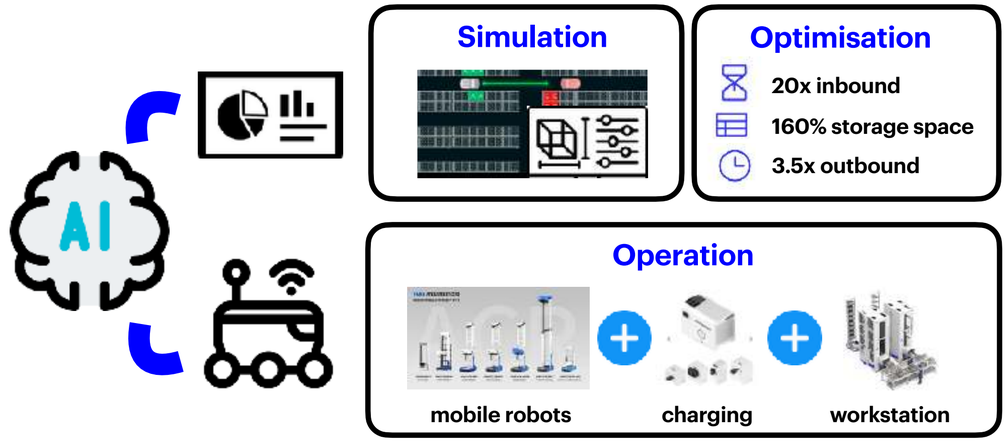
KEY FACTS

INDUSTRY:	**Smart Warehousing**
FORMATION:	**2016 in Shenzhen**
FUNDING STAGE:	**Series D+ (2022)**
URL:	https://www.hairobotics.com
CHINESE NAME:	Shenzhen Hairou Intelligent Technology Co., Ltd. / 深圳市海柔智能科技有限公司



SOLUTION

PRODUCT:	**service robots and predictive order processing / optimisation** for smart warehouses
VALUE PROPOSITION:	**increased efficiency & cost savings** through workflow optimisation and improved storage **easy & affordable upgrading** without impacting any running operations.
MONETIZATION:	**SaaS** (software-as-a-service), **RaaS** (robotics-as-a-service)

USP

- **765 patents, 150 trademarks, 1000+ customer projects**
- **patented technology** covering the **entire workflow** from storage to dispatch (SW+HW)[1]
- **AI powered digital warehouse twin** driving & optimising goods-to-person efficiency in real-time
- **autonomous mobile robot (AMR) fleet** tailored to the lifting, picking & moving of bins & goods
- **flexible and scalable** multi-agent system that can be scaled dynamically based on the customers' needs

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DATE: JUNE 2023 URL: https://www.hairobotics.com 1 SW: software; HW: hardware

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FUNDING

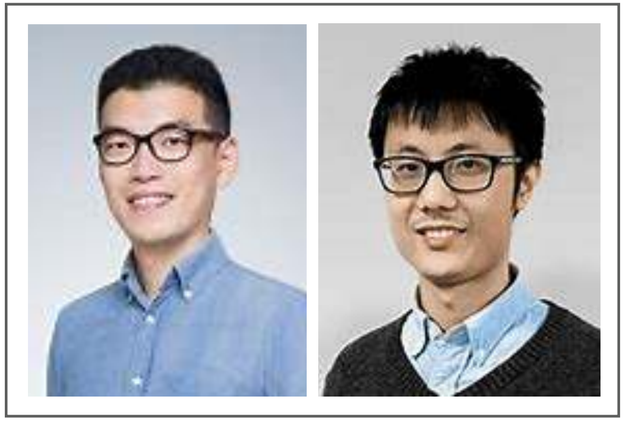
FUNDING STAGE:	Series D
LAST ROUND:	April 14th, 2023
FUNDING RAISED:	**$ 400,000,000+ Total Funding To Date[1]** $ 100,000,000 (Series D+) $ 200,000,000 (Series D) $ (undisclosed) (Series C) $ 100,000,000 (Series B+) ...
REGISTERED CAPITAL:	$ 620,000 (ca.)[1]

MAJOR INVESTORS

- LEAD: CAPITAL TODAY (今日资本)
- SEQUOIA CAPITAL CHINA (红杉资本)
- WUYUAN CAPITAL (五源资本)
- SOURCE CODE CAPITAL (源码资本)
- ZERO ONE VENTURE CAPITAL (零一创投跟投)

TEAM

- **Chen Yuqi, CEO & Chairman:** Master in Robotics from **ETH Zurich**, Master of Electronics from Hong Kong Polytechnic University; research fields: bin picking
- **Xu Shengdong, Technical Director:** Master in Robotics at **ETH Zurich**, Bachelor in Mechanical Engineering from Zhejiang University.
- **Li Zexiang, Mentor and Chief Consultant:** Professor of **Hong Kong University of Science and Technology (HKUST)**, founder of Automation Technology Center (HKUST ATC) & Robot Research Institute (HKUST RI); BS degree in Electrical Engineering & Economics (with honors) from Carnegie-Mellon University, MA degree in Mathematics and PhD degree in Electrical Engineering and Computer Science from the **University of California at Berkeley**
- **1600+ headcount, offices in US, UK, Netherlands, Japan, Singapore, Hong Kong, Korea**



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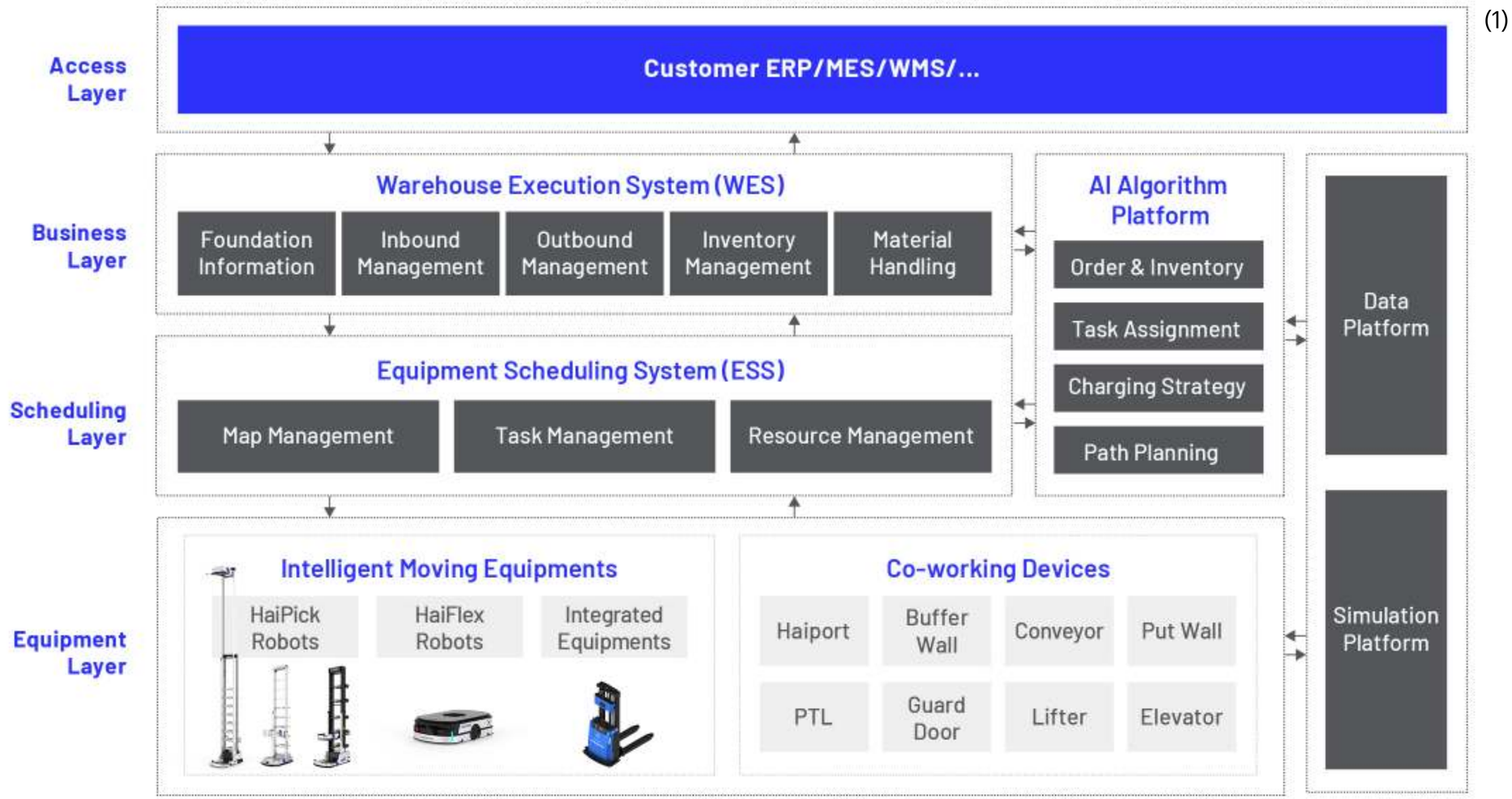
DATE: JUNE 2023 URL: https://www.hairobotics.com 1 acc. to 天眼查 TianYanCha (Chinese company register), values converted from CNY into USD

SOFTWARE ARCHITECTURE



(1)

DATE: JUNE 2023 URL: https://www.hairobotics.com 1 source: https://www.hairobotics.com/products/haiq

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REMARKS

PROBLEM EXPLAINED: Problems of trad. warehouses incl. **high costs and failure rates**, rigid and **inflexible architecture**, high complexity and **redundancy**, slow and degrading performance, inadequate **storage space** (and inefficient use of available storage), plus the inability to **adapt to changing needs.** Smart warehouses help solve these issues.

COSTS: Optimisable costs in warehouses: (a) **labor** costs (by automating manual tasks), (b) **energy consumption**, (c) **inventory** costs, (d) **transportation** costs, and (e) **maintenance** costs. The actual cost savings depend on the specific warehouse and the extent of automation implemented.

RELATED CARBON EMISSIONS: The inefficient operation of warehouses can lead to increased energy consumption, carbon emissions and costs. According to a report by the U.S. Department of Energy[1], the **average energy consumption** for a 100,000 square foot warehouse is **approximately 6.1 million kWh per year.**

MARKET: The global smart warehouse market size is estimated to grow from USD 5.3 billion in 2020 to USD 7.9 billion by 2025 (+50%), at a Compound Annual Growth Rate / **CAGR of 15.6%** from **2021-2028**.[2] Anticipated growth of mobile robot (AMR) market: **5x from $3.6 B to $18 B** (2021-2025). The cost savings potential of smart warehouses is expected to be significant. Exemplary cost saving estimates: labor: 50%; inventory: 30%, energy: 25%, maintenance: 10%.

REGULATORY STATUS: The EU & US are pushing smart warehousing as an effective way to improve the efficiency & decarbonisation of supply chains. Operators are expected to achieve **100% net zero-carbon warehousing by 2050**.

SCALABILITY: Can be applied in multiple warehouse scenarios, covering **various sizes** and **levels of automation**.

IMPACT TIMELINE: HAI ROBOTICS is **highly flexible** to implement tailored solutions in multiple scenarios **today with immediate impact**. With its international presence and customer base it's already making a difference on a global scale.

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DATE: JUNE 2023 URL: https://www.hairobotics.com 1 sources: https://www.eia.gov/consumption/commercial/data/2012/c&e/cfm/pba4.php 2 sources: MarketsandMarkets and ResearchAndMarkets

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CONCLUSION

COMPETITIVE ADVANTAGE (TODAY):

I. SERVICE SPECTRUM:

Simulation + operation + forecasting

HAI ROBOTICS covers the full service spectrum of WH[1] automation incl. hardware & software, and builds a DIGITAL TWIN that helps with the execution, monitoring and optimisation of processes.

We assume that, with its scalable solution, H[2] will help

- **lower the entry hurdles** for the automation of warehouses of all sizes,
- **accelerate upgrading & decarbonisation globally.**

II. TECHNOLOGY:

HAI ROBOTICS has profound experience in future key technologies such as autonomous mobile robotics, computer vision and big data analytics.

Comparing different Chinese competitors, H seems to be among the **top candidates for technological leadership**. If the startup maintains its operational excellence & pace plus further extends its focus, it has a high likelihood to **outperform competition globally.**

OUTLOOK

CHALLENGE — INTERNATIONALISATION & BD:

The robustness, speed and scalability of H's multi-agent AMR operations has already been proven.

Pilot projects have been converted into real-time installations in both new AND traditional warehouse environments, plus on an international scale.

In order to obtain intl. market leadership, the startup will have to focus at rapidly expanding its **global presence and customer base** (currently 7 countries) with focus and excellence.

Given H's rapid progress, we assume that the startup is using **pilot projects with intl. companies in China** as an entry point into collaborations with corporates and SMEs world-wide.

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DATE: JUNE 2023 URL: https://www.hairobotics.com 1 WH: warehouse 2 H: HAI ROBOTICS 3 SW: smart warehousing

OPPORTUNITIES

I. DARK WAREHOUSE LOGISTICS

Given the team's strong tech background and the growing importance of **100% net zero-carbon warehousing**, we assume that "**dark warehouse logistics**" will be an important focus of the startup going forward.

The extension of the startup's tech stack combined with investments in this field should help extend HAI ROBOTICS competitive advantage and accelerate its growth.

II. ADDITIONAL USE CASES

HAI ROBOTICS could further **extend its use case coverage** (currently focused on small to medium parts; pilots include: e-commerce, fashion, retail, healthcare, electronics, automotive, 3PL[1], cross-boarder e-commerce).

III. SMART FACTORY LOGISTICS

Smart factory logistics could be an additional space for the startup to enter, since it provides access to even broader opportunities to scale the business in the long run.

DATE: JUNE 2023 URL: https://www.hairobotics.com 1 3PL: 3rd-party logistics

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IMPACT ANALYSIS

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IMPACT FACTOR	local market excellence	global scalability	sustainable business model	actionable solution	educational & transformative
YES / NO	**IN CHINA**	**FROM CHINA TO GLOBAL**	**MEASURABLE IMPACT FACTORS**	**STAKEHOLDER AGNOSTIC**	**DISRUPTIVE MODEL**
	▶ Multiple high quality pilots with local & intl. customers in CN, competing with others for 1st place, strong team & funding, market penetration is still low due to startup's early stage.	▶ The solution can be applied in any other market with immediate effect. ▶ Expected international rollout (short/mid-term): • Asia • Europe	▶ The economic impact of the solution is substantial & measurable. ▶ Business model seems feasible & sustainable. ▶ CO2 reduction & climate impact tbd.	▶ Available software & hardware packages allow for flexible scaling and offer actionable solutions for multiple warehouse sizes / industries (short/mid/long-term).	✓ Concepts exist to disruptively transform the tech space via AMR, AI & data mining. ✓ The startup educates on the challenge it is solving via YouTube videos.

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> **The startup is solving a problem of high global relevance. Educational campaigns should be installed to further increase the outreach of the project & guide traditional warehouses on upgrading their premises.**

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“HAI ROBOTICS has the potential to disrupt the smart warehousing space with its holistic digital twin solution on a global scale.
China provides the perfect prototyping platform for complex use cases which will likely lead to fast acceleration and growth.”