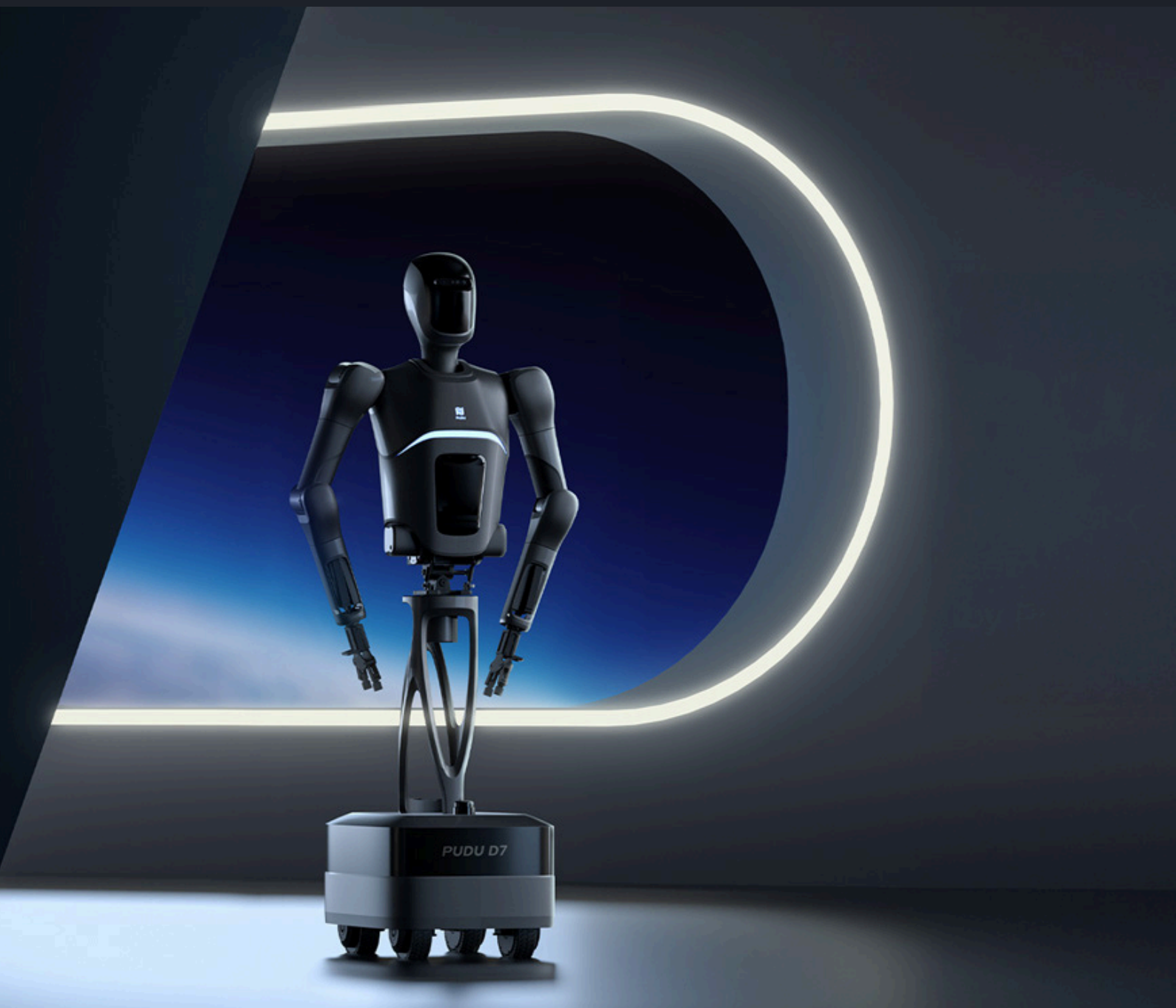
BytePlus | PUDU

Case Study

From Startup to Global Leader:

The Pudu Robotics Story



Since its founding in 2016, Pudu Robotics has transformed into a commanding leader in commercial service robotics, capturing 23% of the global market according to Frost & Sullivan's 2023 research. With its distinctive cat-shaped BellaBot and cutting-edge delivery robots becoming familiar sights in restaurants and commercial spaces across 60 countries, Pudu has established a significant global presence.

With over 80,000 robots deployed worldwide, Pudu's BellaBot can be found in locations ranging from restaurants and retail stores (like The Cocoa Tree in Singapore's Suntec City) to hotels and shopping malls across multiple continents. The company's robots operate in vastly different environments, processing data from crowded restaurants in Tokyo to hotel corridors in Paris and shopping malls in Singapore. This success story represents more than just technological innovation — it demonstrates how intelligent service robots are becoming an integral part of global commerce.

But behind this seamless global expansion lies a critical challenge: how to harness the massive volumes of operational data generated by thousands of robots working in dramatically different environments while navigating the complex maze of international data privacy regulations.

This is where BytePlus's ByteHouse analytics platform entered the picture, providing Pudu with the real-time insights and compliance framework needed to fuel its remarkable **85.7% year-over-year growth rate**.

The Global Data Challenge:

Beyond Technical Limitations

For Willa Zhong, Director of Brand and Marketing at Pudu Robotics, expanding across continents meant confronting two interrelated challenges that threatened to slow the company's momentum:

Navigation Through Regulatory Complexity

As Zhong explained in the original case study: "As we expanded across 17 countries and regions including Japan, South Korea, the United States, and Europe, we needed a data solution provider with compliant data processing and analysis capabilities." She further noted that "This meant finding a platform with certifications including GDPR, ISO, and CBPR to protect user data privacy across all our operating regions."

Pudu's previous self-built ClickHouse solution lacked the sophisticated compliance architecture necessary to handle this regulatory diversity, creating potential barriers to expansion in privacy-conscious markets.

The Real-Time Intelligence Gap

More critically, Pudu's robots needed to make split-second decisions based on real-time data analysis—whether navigating crowded restaurant floors during dinner rush in Hong Kong or adapting to changing configurations in American shopping malls.

According to Zhong, their previous solution had significant limitations: "ClickHouse had significant latency issues," she noted. "It couldn't achieve the real-time data upload and processing we needed to monitor and optimize our robots across multiple time zones."

ByteHouse:

Transforming Robot Data Into Strategic Intelligence

The implementation of BytePlus's ByteHouse platform fundamentally transformed how Pudu processes and leverages its global data streams. The solution addressed three critical data categories:

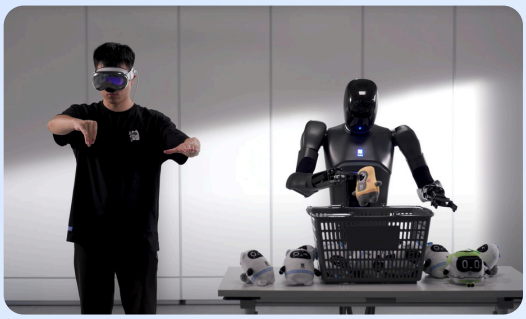
1 The Robot's Digital Pulse

ByteHouse captures the digital heartbeat of each robot in Pudu's global fleet — recording everything from battery levels and sensor readings to task execution sequences and system alerts. This comprehensive operational visibility allows Pudu to:

- Identify performance patterns unique to specific operating environments.
- Detect early warning signs of potential mechanical or software issues.
- Compare efficiency metrics across different regional deployments.
- Optimize resource allocation during peak demand periods.

2 The Human Connection

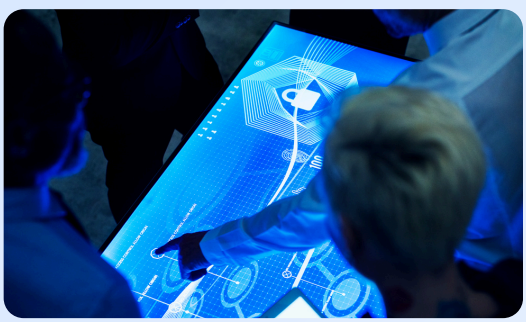
Every voice command, touch interaction, and user response provides valuable insight into how people across different cultures engage with robotic assistants. ByteHouse processes this interaction data to reveal:



- Regional preferences in communication styles and service expectations.
- Language-specific optimizations for voice recognition systems.
- Cultural variations in user satisfaction drivers.
- Opportunities for personalization based on usage patterns.

3 Robots That Understand Their World

Perhaps most fascinating is ByteHouse's ability to process complex environmental perception data—creating a contextual understanding of each robot's surroundings:



- Real-time mapping of dynamic spaces like restaurant dining areas.
- Traffic pattern analysis to optimize navigation routes.
- Adaptation to environmental variables such as lighting and temperature.
- Regional differences in spatial configurations and obstacle types.

From Implementation to Impact:

Measurable Global Results

The partnership between Pudu Robotics and BytePlus delivered immediate and quantifiable improvements across the company's international operations:

Performance Leap: Efficiency Across Borders

The numbers tell a compelling story of optimization:

5% increase in global task execution efficiency

8% reduction in fault response time

12% improvement in processing capacity during peak demand periods

As Zhong revealed in the original case study: "The average task execution efficiency of robots globally increased by 5%, and the fault response time was reduced by 8%, effectively lowering maintenance costs across different regions." She added that "Through algorithm optimization and resource allocation strategies, the robots' processing capacity during peak hours has improved by 12%, ensuring service stability and continuity."

Predictive Maintenance: Solving Problems Before They Occur

ByteHouse's real-time analytics capabilities have proven particularly valuable in Pudu's European operations, where distances between service locations can be substantial:

Zhong highlighted that ByteHouse's real-time query capabilities "has enabled us to successfully preempt and resolve multiple potential malfunctions, significantly improving robot uptime and task completion rates." This proactive approach helps address problems before they affect customer operations.

Robots That Speak Your Language

Most impressively, ByteHouse has enabled Pudu to tailor its robots' interactions based on deep analysis of regional preferences:

Analysis of user interaction data allowed Pudu to customize service content based on local language habits and cultural backgrounds. As Zhong explained, "This resulted in a significant increase in user satisfaction," highlighting how data-driven insights helped the company adapt its robots to diverse global contexts.

Building Trust Through Compliance Excellence

For a company deploying thousands of robots equipped with sensors, cameras, and microphones in public spaces worldwide, data security and privacy compliance are paramount concerns.

ByteHouse provides Pudu with a comprehensive compliance framework that addresses the requirements of diverse international markets:

Compliance Standard	Region/ Focus	Significance for Pudu
GDPR	European Union	Enables compliant data processing across EU markets
ISO 27001/27017/27018	Global/ Cloud Security	Demonstrates adherence to international security standards
CBPR	Asia-Pacific	Facilitates cross-border data transfers in Asian markets
SOC II	North America	Provides assurance for US enterprise customers
CSA STAR	Cloud Security	Validates cloud security controls and practices
ISO 27701	Privacy Information	Addresses personal data protection requirements
PCI DSS	Payment Security	Supports secure transaction processing capabilities

Zhong explained that "ByteHouse complies with international security and compliance standards such as CSA STAR, ISO 27701/22301/9001/20000/27001/27017/27018, SOC II, GDPR, CBPR, PCI DSS, and more." She added that "This allows us to strictly adhere to multi-national regulatory requirements while processing global robot data, effectively protecting user data privacy."

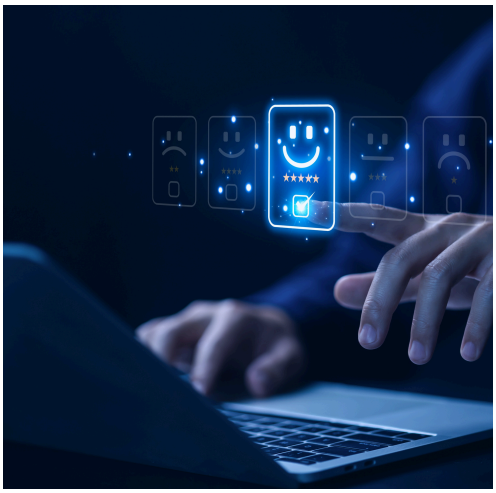
Competitive Edge Through Data Excellence

The ByteHouse implementation has equipped Pudu with three distinct competitive advantages that strengthen its position as the global leader in service robotics.

Global Robot Performance Monitoring and Optimization

ByteHouse enables real-time analysis of robot operational data from different regions, allowing Pudu to compare performance metrics across locations. This systematic approach helps the company identify and preemptively address performance bottlenecks.

The platform supports targeted optimization of robot algorithms and configuration parameters based on regional characteristics and user needs, ensuring stable and efficient operation of Pudu's robots worldwide.



Personalized Service and Enhanced User Experience

By building comprehensive user profile models from global interaction data, Pudu can deliver personalized service recommendations and interactive interfaces based on user location and preferences.

The company leverages analysis of regional function usage patterns to optimize service processes and functionality design, which has demonstrably improved user satisfaction and loyalty across their diverse markets.

Intelligent Decision-Making and Market Expansion

The integration of environmental perception data with historical operational information optimizes path planning, task scheduling, and resource allocation strategies for robots in different regions.

Meanwhile, analysis of global market trends provides Pudu with crucial insights for strategic expansion decisions across Europe, Asia, North America, and emerging markets—supporting the company's continued growth trajectory.

Looking Forward:

A Partnership Driving Robotics Innovation

As Pudu Robotics continues writing the next chapter of the global service robotics revolution, its partnership with BytePlus stands as a testament to how cloud-native analytics can transform operations across international boundaries.

Zhong emphasized: "We have established a strong technical partnership with BytePlus. Their expert technical team provides comprehensive support, covering areas such as cluster deployment, performance optimization, and data security."

For BytePlus, the collaboration showcases how its cloud and data solutions are helping drive innovation in advanced manufacturing and robotics — key pillars of the Industry 4.0 revolution. As Pudu's friendly robot faces continue appearing in new locations around the world, ByteHouse remains the invisible intelligence powering their seamless global operations.