研究报告 Research Report

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理想汽车 Li Auto (2015 HK)

MindVLA 引领汽车迈向物理智能体时代
MindVLA Leads Cars into the Era of Physical Intelligent Agents

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热点速评 Flash Analysis

(Please see APPENDIX 1 for English summary)

事件

3 月 18 日，在英伟达 GTC2025 大会上，理想汽车智驾负责人首次展示 MindVLA 进展，上周全年业绩会公司曾表示已启动 VLA 技术架构研发，计划与今年纯电 SUV 理想 I8 同时发布。

点评

MindVLA 引领汽车迈向物理智能体时代。理想通过封闭研发 MindVLA 实现了技术跨越，象征着传统车辆正从简单的驾驶工具转变为拥有高度智能与自主决策能力的综合体。该系统将视觉、语言和行动智能有机融合，以 3D 高斯中间表征为核心，实现了多层次、多尺度的空间信息刻画；同时，依托 MoE 架构与稀疏注意力机制，即使在庞大模型下也能确保端侧推理的高效运算。借助自监督学习及模拟"快思考"与"慢思考"相结合的策略，车辆在复杂交通情境中能精准判断并迅速做出安全决策。

此外，扩散模型配合常微分方程采样器，对驾驶轨迹的预测进行了革命性优化，显著提升了系统的实时响应和环境适应性。引入"重建+生成"一体化世界模型及闭环强化学习机制，使车辆在虚拟仿真中持续自我迭代和升级。正因如此，配备 MindVLA 的汽车不仅能高效捕捉并快速应对周边动态，还具备理解用户指令、主动交互和制定个性化驾驶策略的能力，从而实现全维度智能交互。这一变革不仅重构了自动驾驶系统的底层架构，也为未来物理智能体的发展探索出全新路径，使车辆真正蜕变为具备高级认知与自主决策能力的智能伙伴。

VLA 大模型比端到端+VLM 强在哪？目前，端到端+VLM 系统主要依靠视觉与语言信息的融合来完成环境感知和决策处理，但在具体动作执行上仍显不足。相比之下，下一代 VLA 模型在此基础上引入了动作反馈模块，实现了从感知到执行的全流程闭环优化。该模型通过分层数据融合与智能决策算法，实时整合路况、信号和驾驶意图，并迅速选定最佳行动方案，有效缩短了响应时延。依托实时反馈和多任务协同学习，VLA 在复杂交通环境中能够主动预判风险并迅速调整策略，从而显著提升整体鲁棒性和安全性。我们认为，凭借对视觉、语言与行动数据的深度整合，理想的下一代 VLA 有望为自动驾驶系统注入更高的自主决策能力，推动自动驾驶的形态演进。

风险

VLA 架构开发迭代不及预期，单车算力瓶颈风险，智驾竞争加剧，宏观经济下行。

APPENDIX 1

Summary

Event

On March 18, during NVIDIA's GTC2025, Li Auto’s head of intelligent driving presented the latest progress on MindVLA for the first time. Last week at the annual performance meeting, the company announced that development of the VLA technology architecture had commenced, with plans to launch it alongside the pure-electric SUV, Li Auto I8, this year.

Comments

MindVLA is driving the evolution of vehicles into physical intelligent agents. Li Auto’s closed-development approach for MindVLA represents a significant technological leap, marking the transition of traditional vehicles from mere driving tools to sophisticated systems with high-level intelligence and autonomous decision-making capabilities. The system seamlessly integrates visual, linguistic, and behavioral intelligence, centered around a 3D Gaussian intermediate representation that facilitates multi-layered and multi-scale spatial encoding. By leveraging an MoE architecture and sparse attention mechanism, efficient on-device inference is maintained even in large-scale models. Utilizing self-supervised learning combined with strategies akin to “fast” and “slow” thinking, the vehicle is capable of accurately assessing complex traffic scenarios and making swift, safe decisions.

Moreover, the revolutionary combination of diffusion models with ODE-based samplers has dramatically optimized trajectory prediction, markedly enhancing real-time responsiveness and environmental adaptability. The introduction of a unified “reconstruction plus generation” world model coupled with closed-loop reinforcement learning enables continuous self-iteration and system upgrades within simulated environments. Consequently, vehicles equipped with MindVLA can not only detect and rapidly respond to dynamic surroundings but also understand user commands, engage in proactive interaction, and tailor personalized driving strategies, thereby realizing all-dimensional intelligent interaction. This paradigm shift not only redefines the core architecture of autonomous driving systems but also charts a new course for the development of future physical intelligent agents, transforming vehicles into smart partners with advanced cognition and autonomous decision-making abilities.

Where does the VLA large model outperform the end-to-end + VLM? Currently, end-to-end + VLM systems primarily rely on the integration of visual and linguistic information to accomplish environmental perception and decision-making, yet they remain inadequate in executing specific actions. In contrast, the next-generation VLA model introduces an action feedback module on this basis, achieving full-process closed-loop optimization from perception to execution. The model employs hierarchical data fusion and intelligent decision algorithms to integrate road conditions, signals, and driving intentions in real time, rapidly selecting the optimal action plan and effectively reducing response latency. Relying on real-time feedback and multi-task collaborative learning, VLA can proactively anticipate risks and quickly adjust strategies in complex traffic environments, significantly enhancing overall robustness and safety. We believe that, with its deep integration of visual, linguistic, and action data, Li Auto’s next-generation VLA is expected to endow autonomous driving systems with higher autonomous decision-making capabilities, further developing the autonomous driving.

Risks

VLA architecture development and iteration may not meet expectations; risk of computing power bottlenecks at the individual vehicle level; intensifying competition in intelligent driving; and macroeconomic downturn.

附录 APPENDIX

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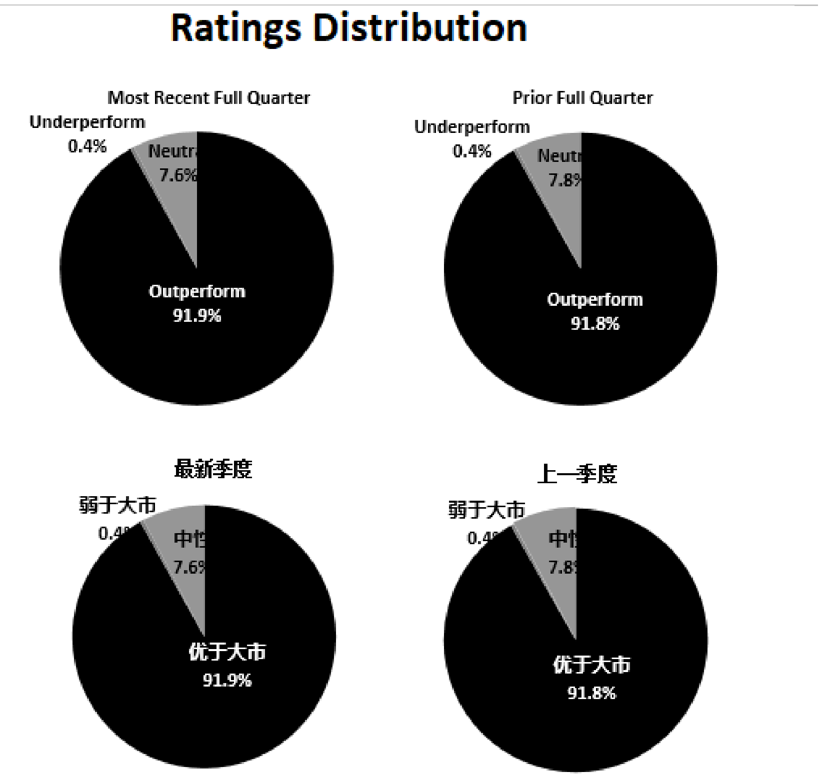

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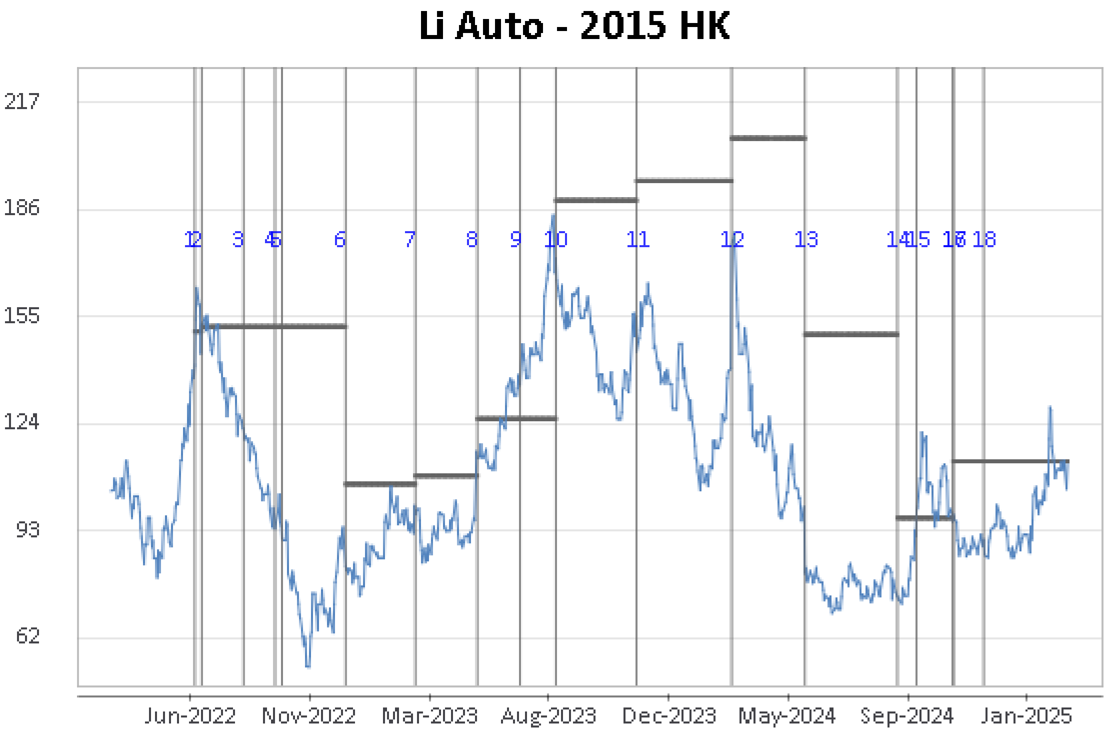

1. 22 Jun 2022 OUTPERFORM at 140.90 target 150.70.
2. 30 Jun 2022 OUTPERFORM at 144.30 target 152.06.
3. 17 Aug 2022 OUTPERFORM at 122.90 target 152.06.
4. 22 Sep 2022 OUTPERFORM at 93.60 target 152.06.
5. 2 Oct 2022 OUTPERFORM at 90.60 target 152.06.
6. 12 Dec 2022 OUTPERFORM at 94.00 target 106.51.
7. 2 Mar 2023 OUTPERFORM at 100.20 target 108.92.
8. 12 May 2023 OUTPERFORM at 115.90 target 125.40.
9. 2 Jul 2023 OUTPERFORM at 135.50 target 125.40.
10. 10 Aug 2023 OUTPERFORM at 171.80 target 188.61.
11. 10 Nov 2023 OUTPERFORM at 144.90 target 194.28.
12. 27 Feb 2024 OUTPERFORM at 175.50 target 206.60.
13. 21 May 2024 OUTPERFORM at 80.65 target 149.80.
14. 4 Sep 2024 OUTPERFORM at 74.05 target 96.70.
15. 26 Sep 2024 OUTPERFORM at 91.45 target 96.70.
16. 7 Nov 2024 OUTPERFORM at 95.70 target 113.10.
17. 7 Nov 2024 OUTPERFORM at 95.70 target 113.10.
18. 12 Dec 2024 OUTPERFORM at 95.70 target 113.10.