

Autonomous driving in the age of generative AI

June 11, 2026

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Where Leaders Meet

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Background GSA-McKinsey cooperation



Intensive **research collaboration** focusing on the **most relevant topics** for the **semiconductor industry**

- 2015 The Internet of Things – opportunities and challenges for semiconductor companies
- 2016 Security in the Internet of Things
- 2018 Rethinking car software and electronics architecture
- 2019 Automotive software and electronics 2030
- 2020 Cybersecurity in automotive
- 2021 Semiconductors in the autonomous age
- 2022 The future of automotive computing: Cloud and edge
- 2023 Getting ready for next-generation E/E architecture with zonal compute
- 2024 Advanced semiconductors for the era of centralized E/E architectures
- 2025 The rise of edge AI in automotive
- 2026 **E2E AI ADAS: The Future of Autonomous Driving**

Project steering by GSA EMEA Leadership Council, with knowledge input through interviews and surveys by many industry players/GSA members

Publications and wide industry dissemination



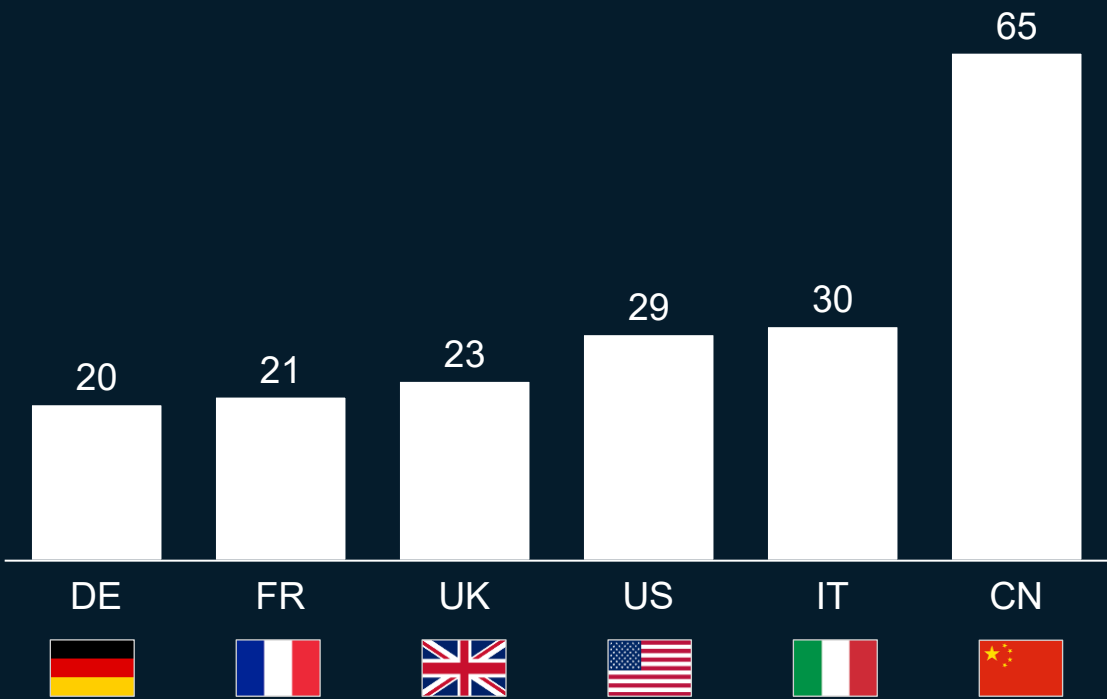
Published on June 09, 2026



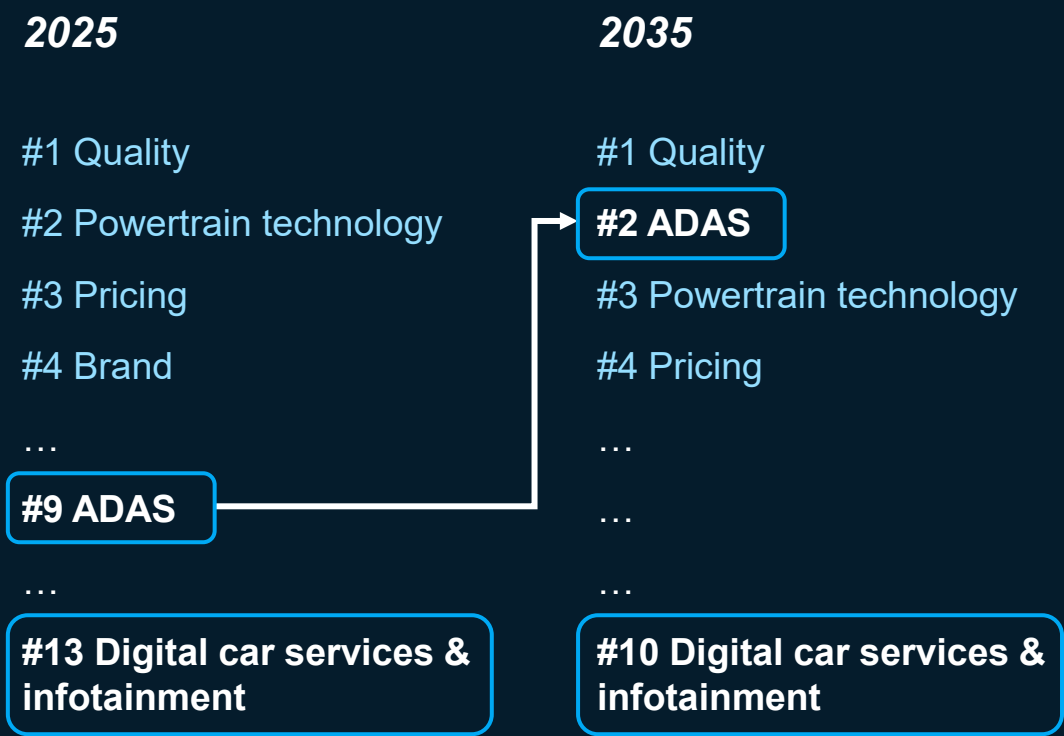
Motivation: Autonomous features becoming a clear differentiator for consumers

Expectation for autonomy in car parc by 2035, %

“I expect most cars on the road to drive fully autonomous by 2035”

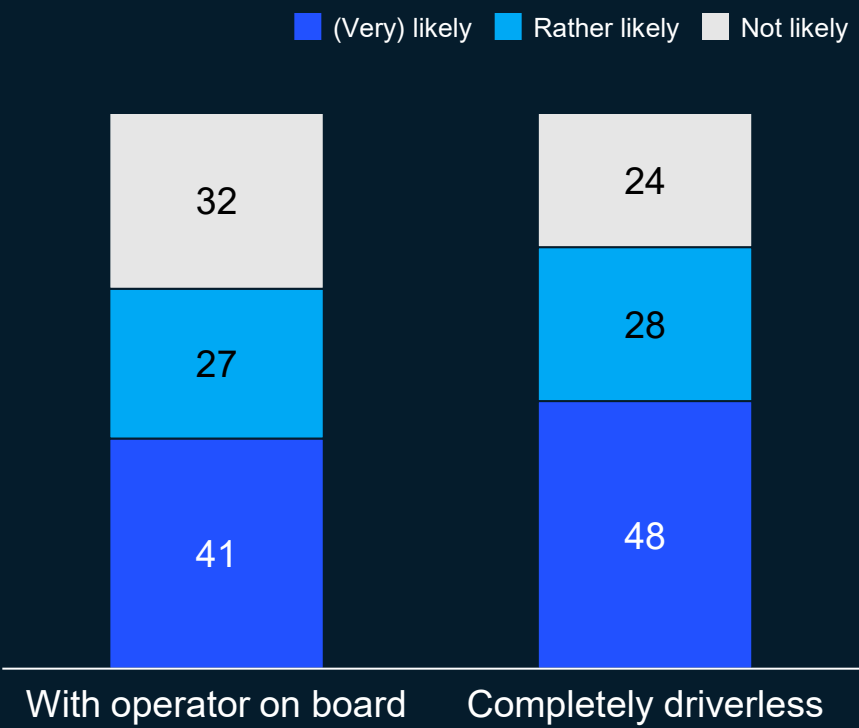


ADAS as premium brand differentiator globally



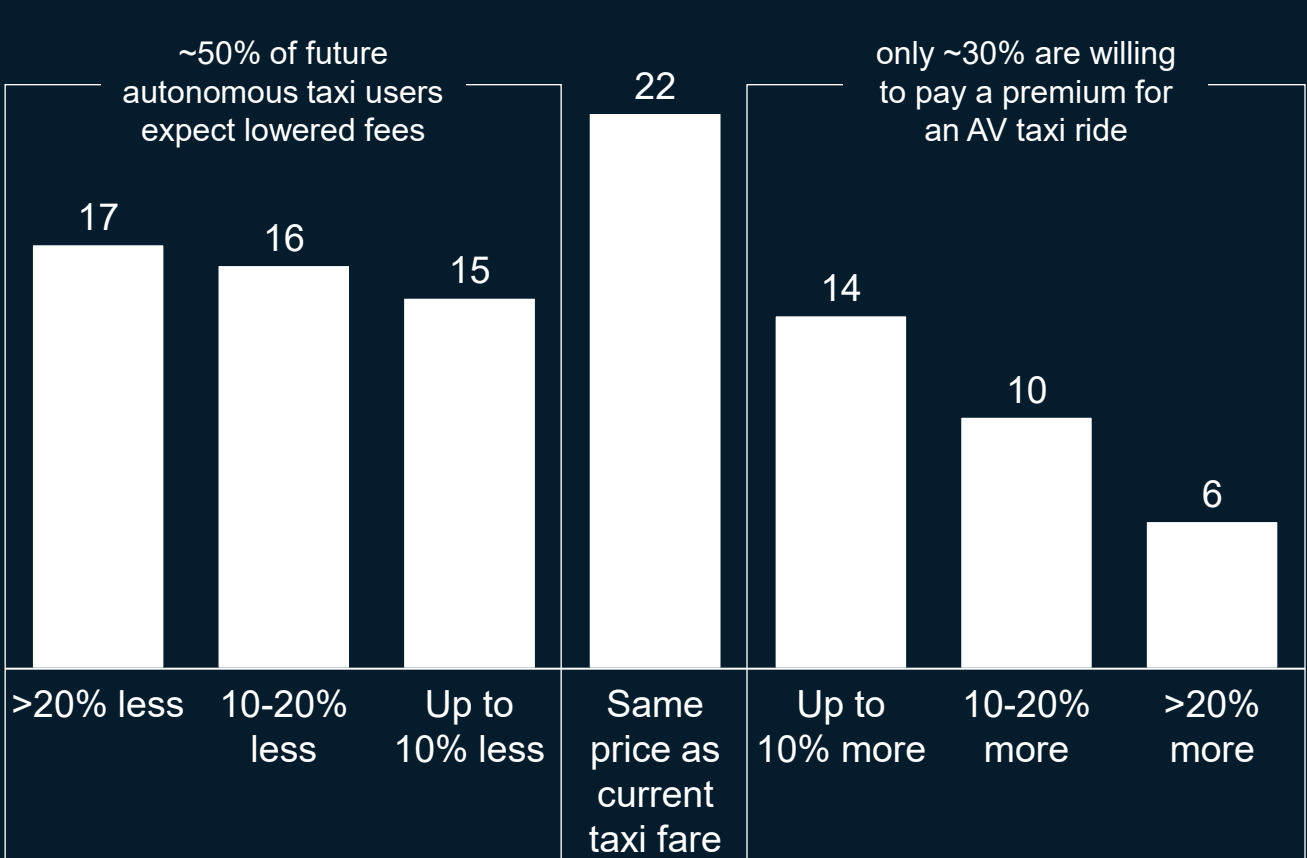
Motivation: Consumer openness towards autonomous taxi services is given with expectation to bring down cost per ride

Consideration to use autonomous taxis
Share of respondents



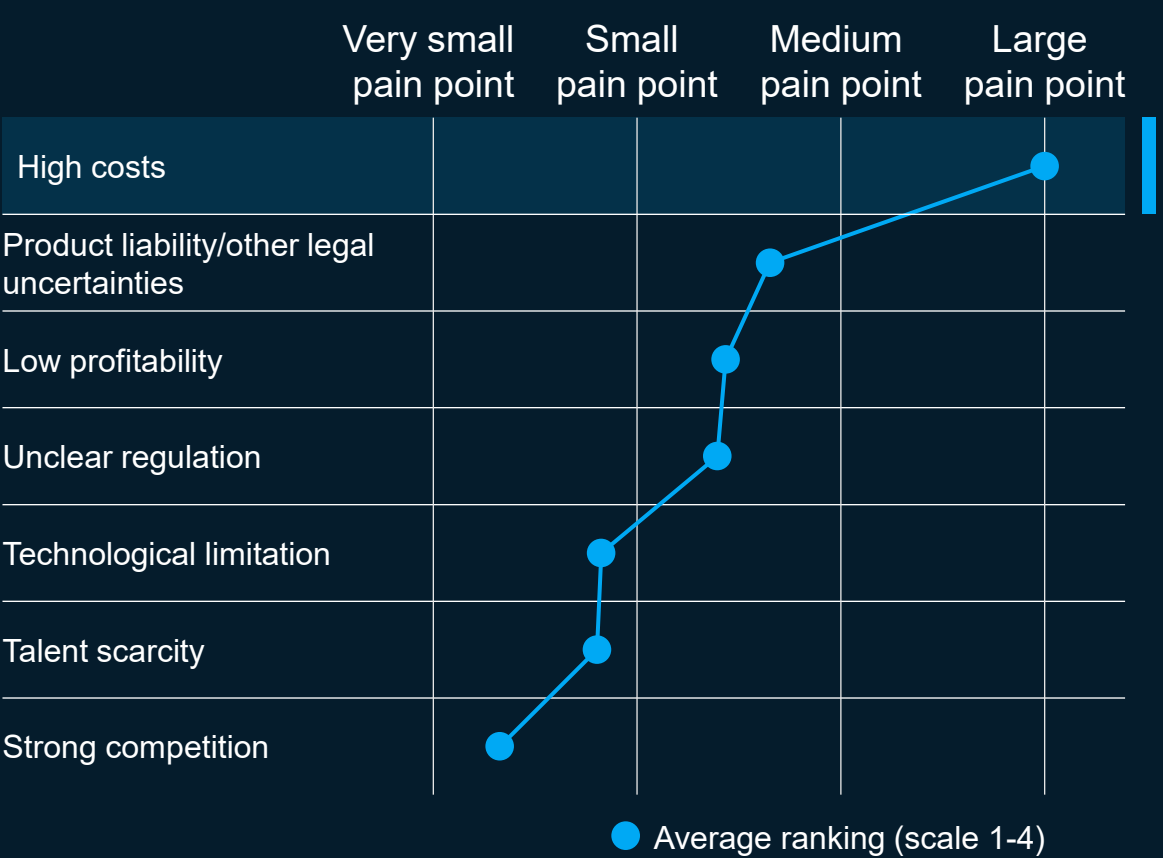
ⓘ Provided that the technology is safe and service operations are reliably established, how likely are you to use autonomous taxi services where a driver is still (no longer) on board.

Price expectation for autonomous taxis vs. current taxi fees
Share of respondents who consider using

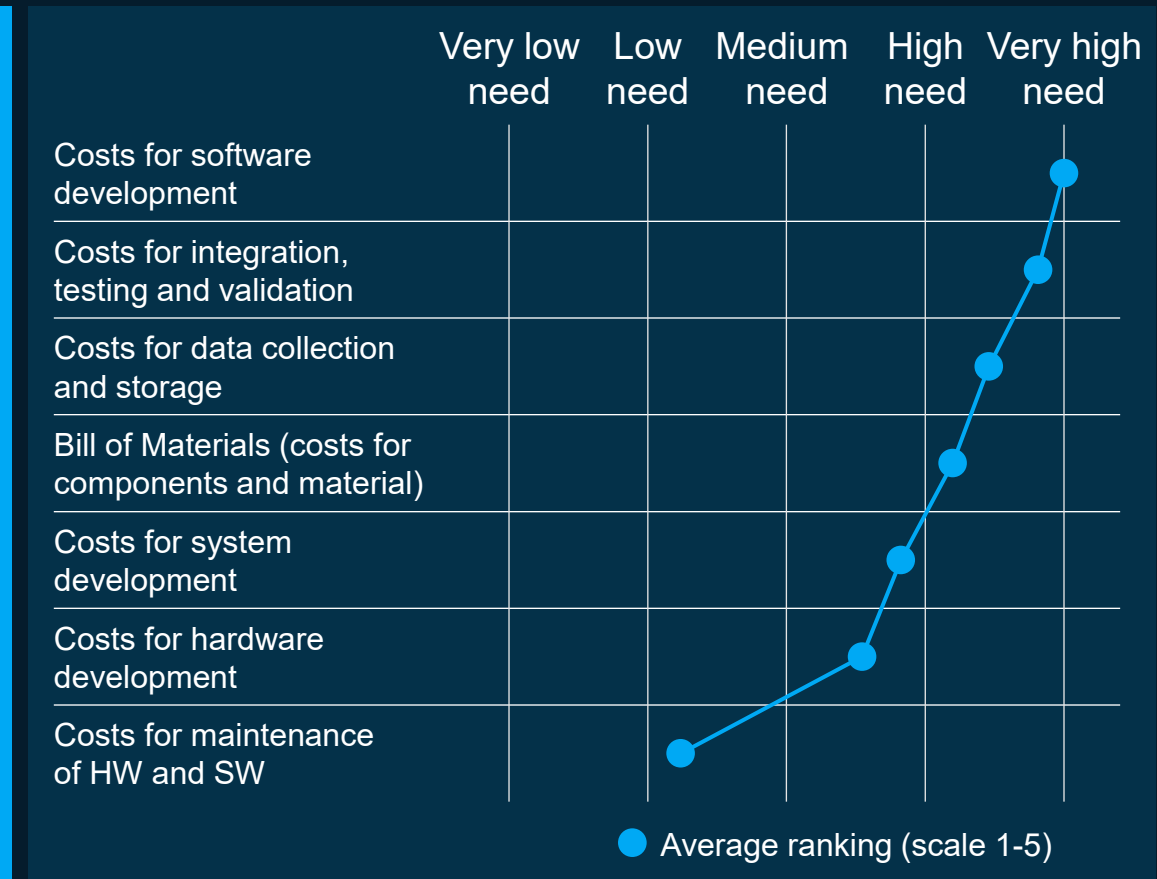


Motivation: High cost driven by software development cost, validation cost & cost for data collection are main points in the industry

Biggest pain points in developing ADAS technology today



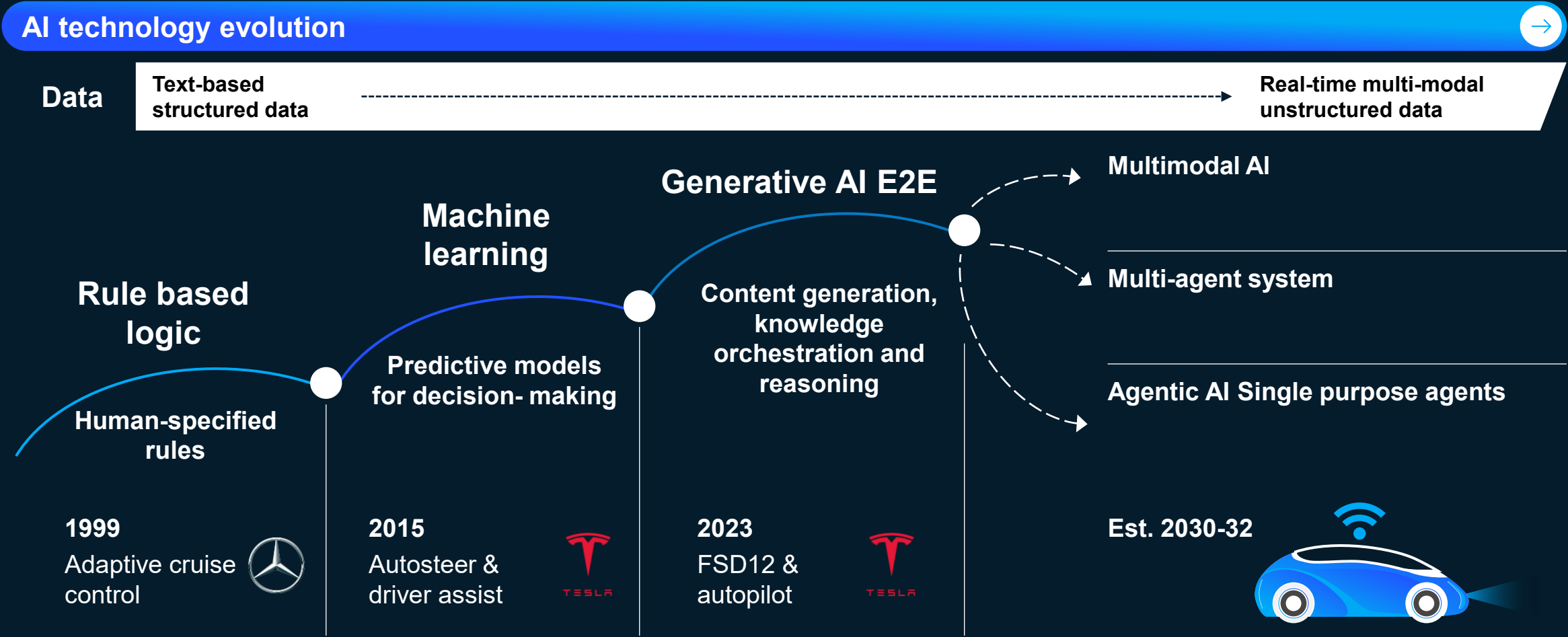
Cost drivers in ADAS technology development with largest optimization need (average ranking)



Question: What is the biggest pain point in developing ADAS/AD technology today? | For which of the following cost drivers in ADAS/AD technology development do you see most optimization need?

Source: 91 respondents (43 from Europe, 33 from NA, 5 from China, 7 from Asia-Pacific, 1 from Other) – 2025

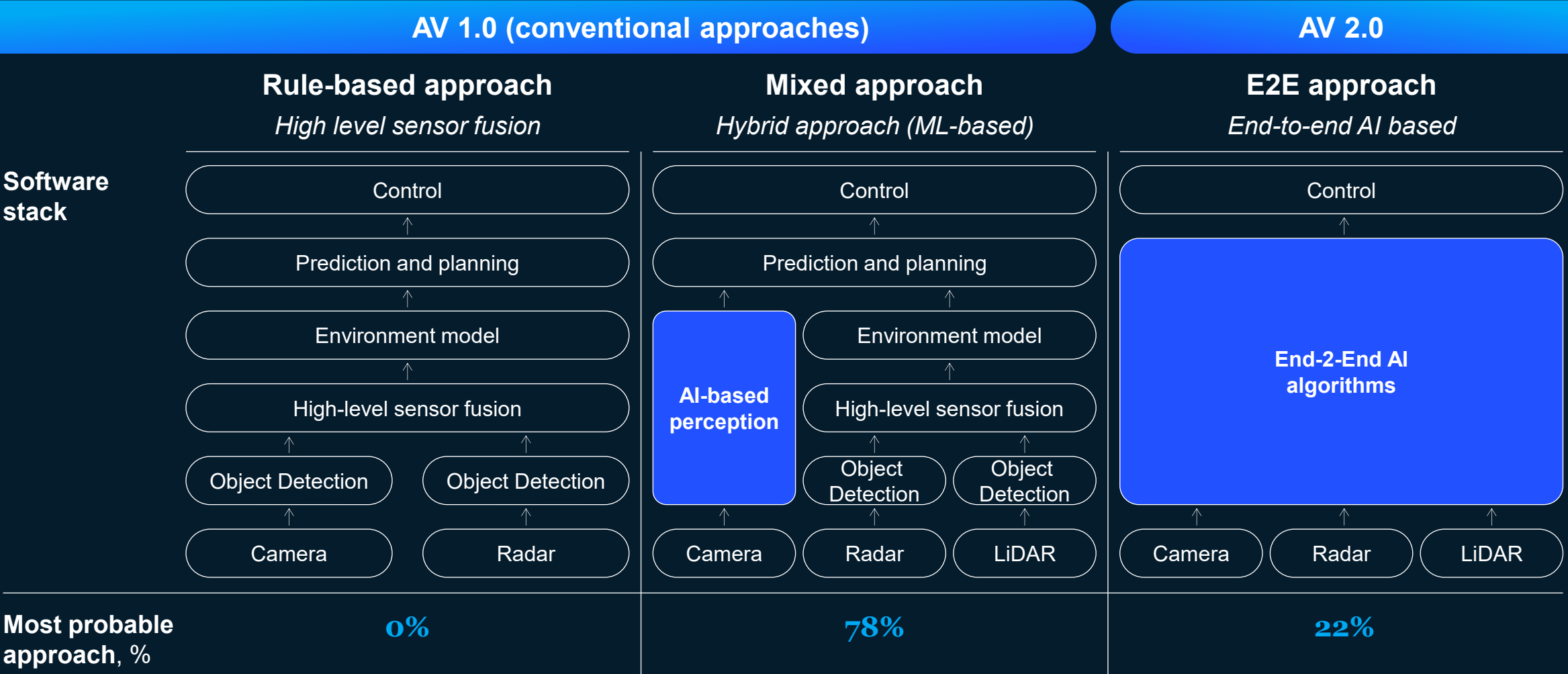
History of ADAS: Pace of progress of AV technology has been accelerated by emergence of GenAI and agents



AI Approach to ADAS: E2E approach uses learned models which can reason, owing to training on internet-scale data

Highly simplified illustration

AI software Key: **Lx** Production ready **Lx** Pilot only



1. 91 respondents (43 from Europe, 33 from NA, 5 from China, 7 from Asia-Pacific, 1 from Other) – 2025 (Question: As new software development approaches emerge in the industry, which approach do you believe will dominate in the future?)

AI Approach to ADAS: AV 2.0 delivers superior performance and adaptability in complex scenarios but remains difficult to interpret and safety-validate

Benefits



Driving comfort and experience

36%

Continuous improvement through learning

24%

Scalability & Generalization

21%

Time to market & lower R&D effort

18%

Challenges



Interpretability & safety assessment

39%

Computational and Infrastructure requirements

30%

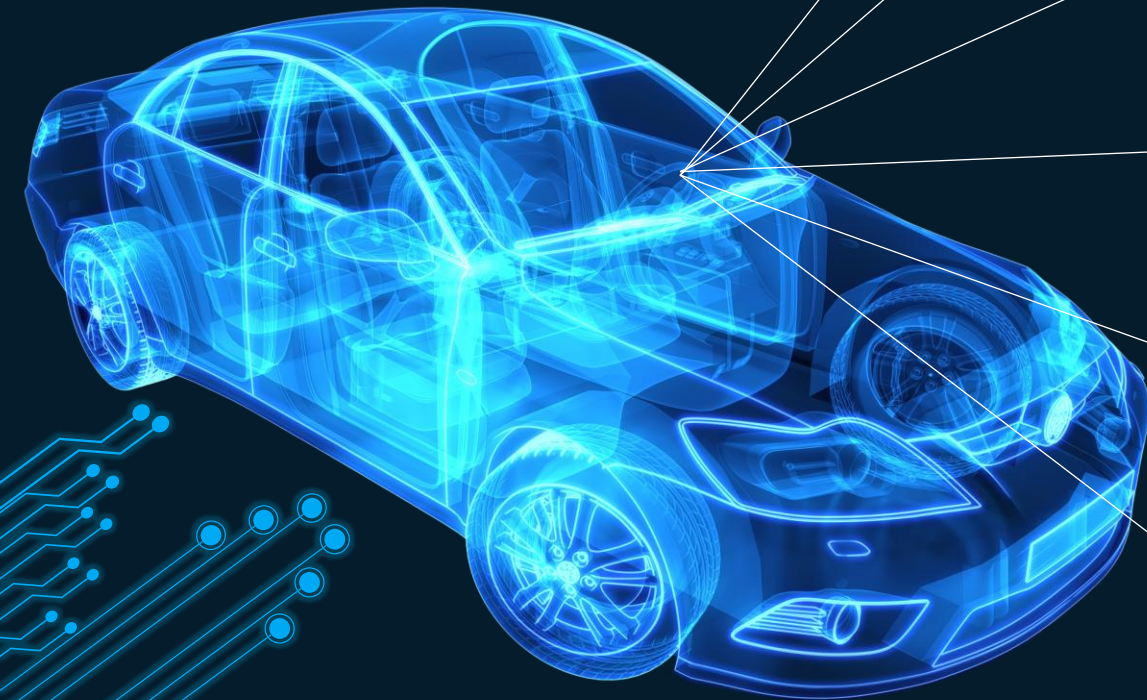
Integration & Cost Frictions

18%

Limited standardization

7%

Key success factors of End-2-End ADAS



Data Flywheel with diverse high-quality sources

Generalizable End-2-End Model

Safety Envelope around End-2-End Model

Simulation-led Validation and Verification at scale

Automotive-grade in-car AI Compute Platform

High-performance cloud for training and validation

In-Car-Compute: Key trends for in-car computing from the shift to E2E ADAS



Trends

**Higher ADAS Level; urban environments;
more, high-resolution sensors**



Shift to End-2-End ADAS



Central compute with mixed criticalities



Implications on in-car semicon

① Higher compute demand

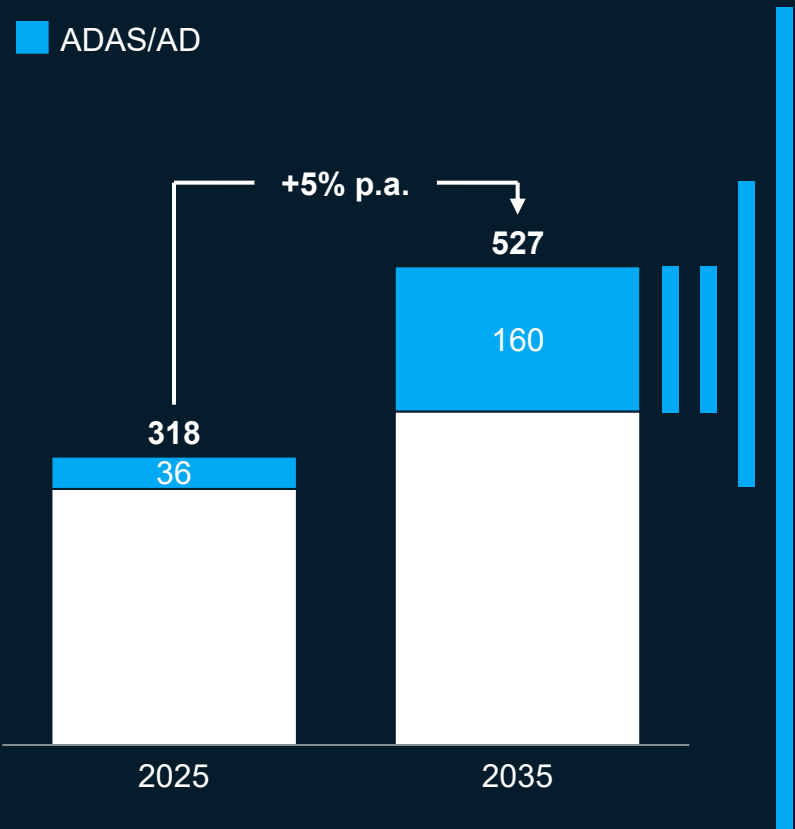
② Rise of NPUs

③ Shift to LPDDR5X and GDDR

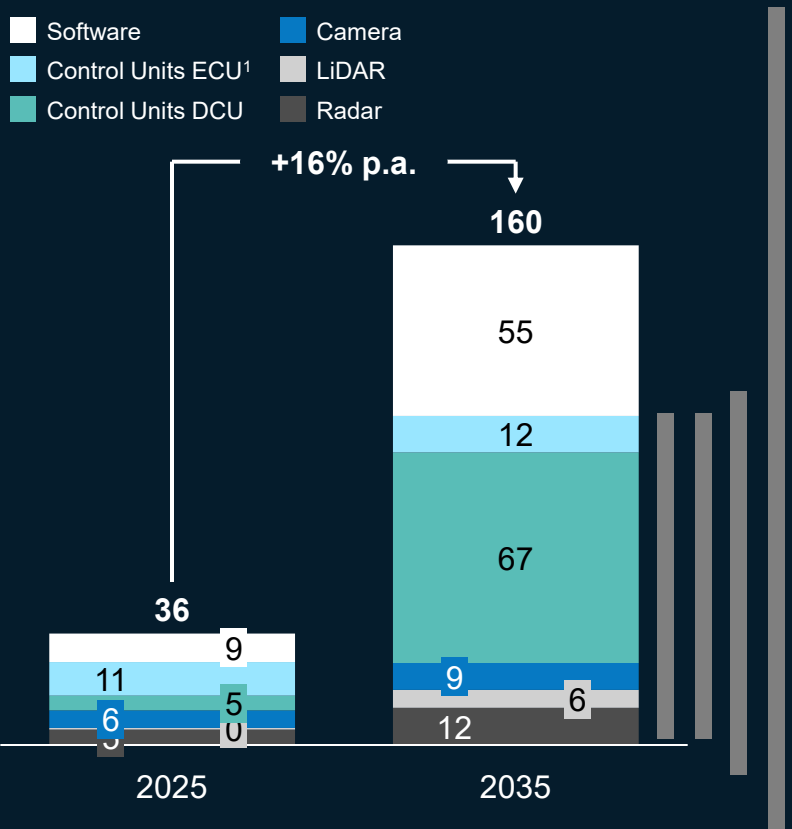
④ Chiplet-based & SiP architectures

In-Car-Compute: ADAS/AD market to grow at 16% p.a., led by DCUs and software by 2035

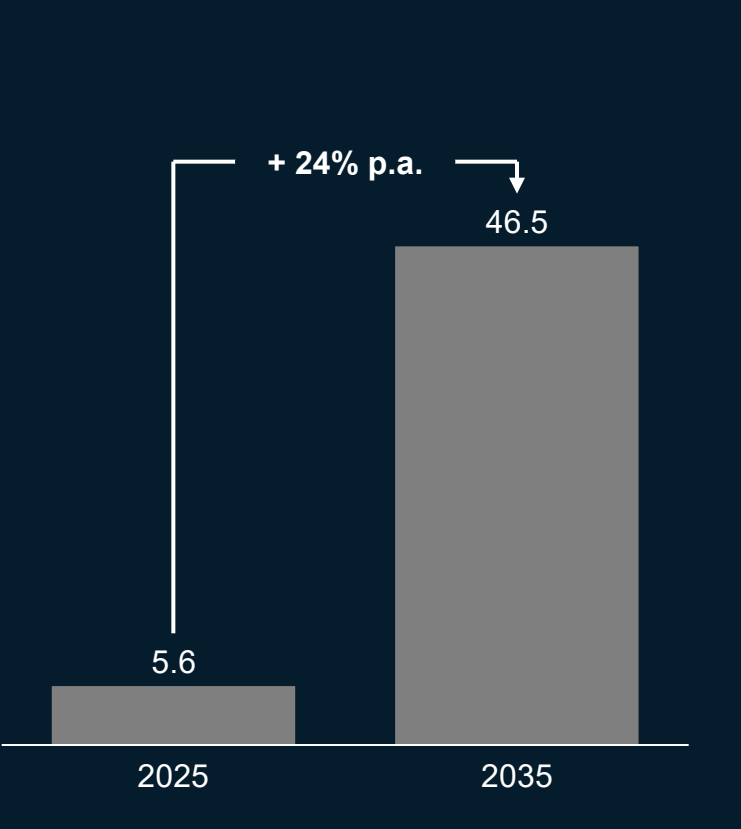
Automotive software and E/E market, USD billions



Breakdown of ADAS/AD market for 2025 and 2035, USD billions



Processing Semicon market size for automotive ADAS/AD, USD bn

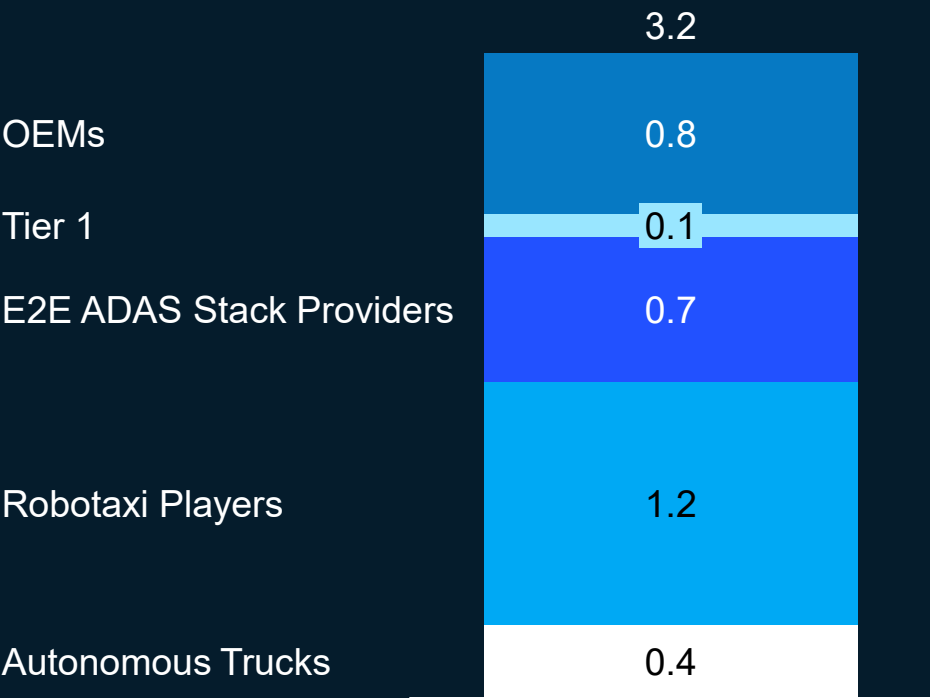


1. Safety & ADAS/AD
2. Only processing semicon, excluding housing, memory, PCB, etc.

Data-Center: Full stack E2E ADAS/AD ownership requires high compute costs for training and simulation

For discussion Not exhaustive

Estimated annual compute spent for E2E ADAS/AD globally today, USD bn



Leading players with >10k H100 for training of End-2-End Models and Validation

Compute capacity normalized to NVIDIA H100s per player



>35k

Total capacity of Tesla, expansion planned to 90k H100



14k equivalent²

Current AV data center capacity, expected to reach 20k H100-equivalent by the end of 2025



15k equivalent²

Current capacity, with planned increase to above 20k H100-equivalent in 2026

1. Only includes Tesla due to its significantly higher expenditures in compute capacity
2. Conversion via theoretical compute performance measured in FLOPs

Industry dynamics: The move towards E2E ADAS brings up several themes across the ADAS value chain

Not exhaustive

New partnerships across the value chain

OEMs, Tier-1s, and AI platforms are **co-developing E2E stacks**

New market entrants

E2E models **enable new AI-native players** to enter the market with software instead of traditional ECUs

OEM moving towards own SW & chip development

OEMs are moving to **custom AI silicon** and **in-house ADAS/AD SW**, putting AI first

SoC companies moving up to SW development

SoC suppliers are **expanding beyond hardware** to offer full E2E platform