



#215



Outlook

AI for Automotive Guide

TABLE OF CONTENTS



Introduction

Bird Eye View

Executive Summary

The Basics

What's New?

Analysis

Deep Dive

Future Outlook

Next Steps

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Connected Services Guide – 526

The opportunities to benefit from connectivity are rising, but so are the risks associated with implementing the wrong strategy or falling behind competitors. It's therefore important to ensure that you always have the latest, most comprehensive, and most accurate information at hand. These reports are the reference guide to OEM connected car services offerings.

Generative AI is already making significant inroads into applications spanning a broad range of use cases across consumer electronics, advertising, and many digital industries. While its initial use cases in automotive span product development, image classification, path planning, in-car personalization, and more, the technology's true impact is more likely to extend beyond applications and reach a functional level. With the rapid growth of generative AI to date, and its strong potential within automotive, it is critical for OEMs, suppliers, and start-ups to identify and forecast its impact on the automotive value chain.

This report takes a deep dive into the current and future automotive use cases for generative AI while mapping out how it will impact the industry at large. Here, it understands the functional application levels where it will deliver this impact in the next five years and highlights case studies on the technology in both upstream automotive applications and functional verticals. The report's scope extends further to account for generative AI's short, mid-, and long-term use cases in automotive while providing an extensive list of potential AI partners and identifying the different approaches being taken towards it by various players today.

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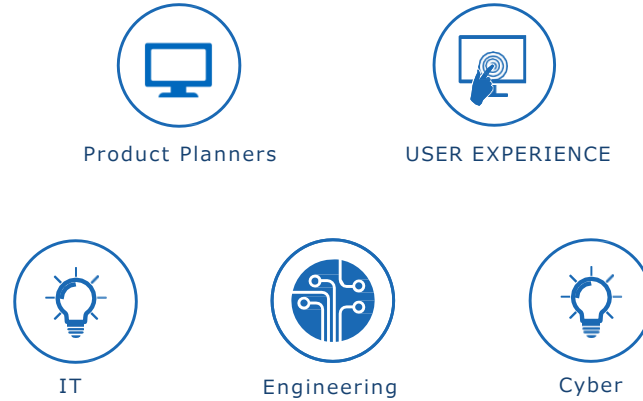
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Key questions answered

- > What are relevant functional application levels where generative AI will have an impact in the next 5+ years?
- > What are the short, mid- and long-term use cases of generative AI in the automotive value chain?
- > How will the product creation process be impacted by the use of generative AI?
- > Who is likely to lead the race in the use of generative AI?
- > What are the main case studies within automotive and how do they vary across the industry landscape?
- > What technology streams are likely to co-exist in the AI roadmap for automotive?

This research supports

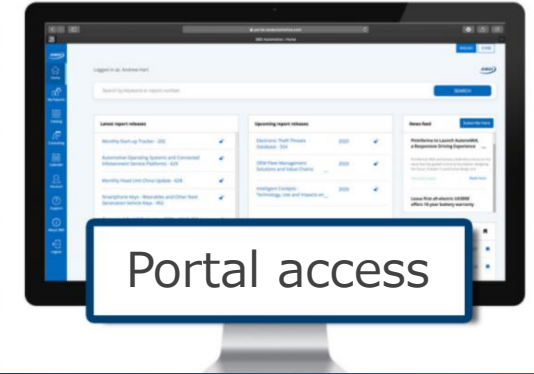


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<p><u>Introduction »</u> 4</p> <p><u>Executive Summary »</u> 6</p> <p><u>The Basics »</u> 12</p> <p><u>What's New? »</u> 26</p> <ul style="list-style-type: none"> ▪ Notable Announcements ▪ Partnerships & Acquisitions <p><u>Analysis »</u> 41</p> <p>Personas based Analysis</p> <ul style="list-style-type: none"> ▪ Operational Giants ▪ Established Technology Innovator ▪ High volume all rounders ▪ Established Vehicle Innovators ▪ Technology Disrupter <p>Ecosystem</p> <ul style="list-style-type: none"> ▪ Supplier AI Models ▪ Supplier Ecosystem 	<ul style="list-style-type: none"> ▪ OEM Group Applications ▪ OEM AI Vendors ▪ AI VPA Models <p><u>Deep Dive »</u> 56</p> <p>Vehicle Charging and Energy</p> <ul style="list-style-type: none"> ▪ Smart Battery Management ▪ Smart Charging System ▪ Smart EV Route Planner ▪ Personalized Drivetrain Optimisation <p>Driving and Monitoring Applications</p> <ul style="list-style-type: none"> ▪ Autonomous Driving • Advanced/ Intelligent Braking System ▪ Emergency Vehicle Alert/Detection ▪ Occupant Monitoring <p>Driver Support Applications</p> <ul style="list-style-type: none"> ▪ Voice Personal Assistant ▪ Owner Manual ▪ In-Journey e-commerce 	<ul style="list-style-type: none"> ▪ Infotainment ▪ Remote Control <p>Vehicle Control Applications</p> <ul style="list-style-type: none"> ▪ Smart/Intelligent Climate Control ▪ Active Cabin Lightening Control ▪ Personalization ▪ Biometric authentication <p>Vehicle Maintenance</p> <ul style="list-style-type: none"> ▪ Automotive Health Check/Scan ▪ Automotive damage assessment ▪ Automotive/ Intelligent diagnostics tool ▪ Automotive Insurance Offerings ▪ Virtual Customer Service Agent ▪ Predictive Maintenance 	<p><u>Innovation and Strategy Bird's Eye View »</u> 91</p> <p><u>Future Outlook »</u> 98</p> <p><u>Next Steps »</u> 107</p> <p><u>Contact us »</u> 114</p>
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Introduction




Introduction

The automotive industry increasingly uses AI to enhance vehicle capabilities and user experience. Understanding and anticipating AI's impact on the automotive value chain is essential. AI adoption is not limited to the automotive industry; it's also growing in consumer tech, advertising, and digital industries. Initial applications for AI in automotive applications include product development, image classification, path planning, in-car personalization, and more. This impact will likely extend to a functional level, requiring identifying the key innovators driving change and how OEMs will need to adapt. This is crucial for software functions, corporate strategy, marketing, M&A, and partnership identification divisions.

This report provides insights into the application of AI and highlights its potential impact. It identifies the key AI applications and the trends that drive them, envisions the future of these applications, and outlines the challenges the value chain may face in implementation. Additionally, the report includes a list of potential partners and discusses the various approaches industry players are currently taking toward the technology.

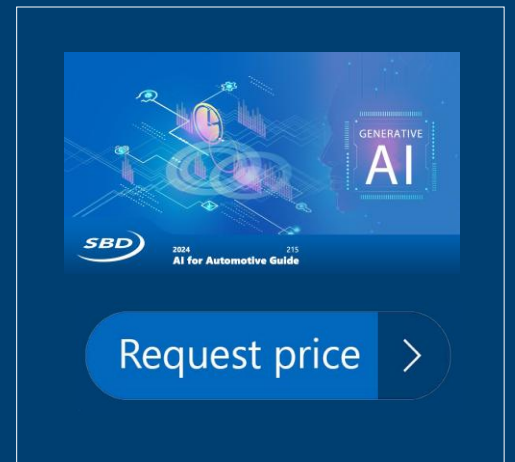
This report looks at **Six key OEM Desired AI Commercial outcomes** of AI for Automotive:

 Staying Competitive	 Quality Improvement	 Brand loyalty
 Consumer Experience	 Operational Efficiency	 Revenue streams

Layer	Section	Conclusion
STRATEGY & IMPACT	Executive Summary	ADAS and VPA are areas of significant development and automakers are taking different approaches at different rates.
LEARNING & ACTION	The Basics	How do different AI models work and summaries of the in-vehicle technology stack
	What's New?	Latest updates related to Automotive AI
	Analysis	Analysis of how automakers can use AI to achieve their desired outcomes
CORE INSIGHTS	AI applications	Summaries of different AI applications, and information related to those applications
DATA DEEP DIVE IN EXCEL	Deep Dive Markets Announcements Rankings Definitions	 View and analyze deep data in your own way
CONTEXT	Birds Eye View	An overview of the tangential trends to this topic, as identified in SBD's neighboring products
	Future Outlook	After initial hype, automakers make more effort to prioritize specific uses of AI
	Next Steps	AI model training startups providing data services and automakers data management strategy



Example slides from the report





Don't get overwhelmed and copy others, prioritize by desired outcome

OEMs need to prioritize which applications of AI to focus upon in an overwhelming pool of opportunities. This analysis recommends priority AI applications contributing to the most important commercial outcomes that five types of OEM persona are trying to achieve

Operational Giant

OEMs like Chery and Toyota willing to follow others in favor of quality and large scale efficiencies

Why?

- Operational Efficiency
- Quality Improvement

What?

- Virtual and advanced owner manuals
- ADAS and advanced braking
- Vehicle damage and health assessment

How?

- Machine Learning
- Vehicle Development

Who?

Established Technology Innovator

OEMs like Nio and Tesla are now well established OEMs who have prioritized technology innovation

Why?

- Operational Efficiency
- Brand loyalty

What?

- VPA and in-vehicle meetings
- End-to-End ADAS
- Predictive maintenance and battery management

How?

- LLM Generative AI
- Ongoing Services

Who?

Established Vehicle Innovator

Although very different offerings, brands like BMW and Lotus identify strongly with excelling through innovation on particular elements of experience

Why?

- Staying Competitive
- Brand loyalty

What?

- Smart battery management
- ADAS visualization and augmented reality
- Virtual customer service agent

How?

- LLM Deep Learning & Generative AI
- Product Experiences

Who?

Technology disrupter

OEMs like Rivian and Seres aim to disrupt through technology products, without managing legacy complexities

Why?

- Consumer Experience
- Revenue streams

What?

- ADAS visualization
- In Journey e-commerce
- Usage Based Insurance and Predictive Maintenance

How?

- AI World Models
- Product Experiences

Who?

High Volume All Rounder

Brands like Kia and Buick are parts of large OEM group portfolios delivering across segments with a high focus on competitive margins

Why?

- Operational Efficiency
- Staying Competitive

What?

- Personalization and health monitors
- ADAS visualization
- Cabin lighting, sound, and climate control

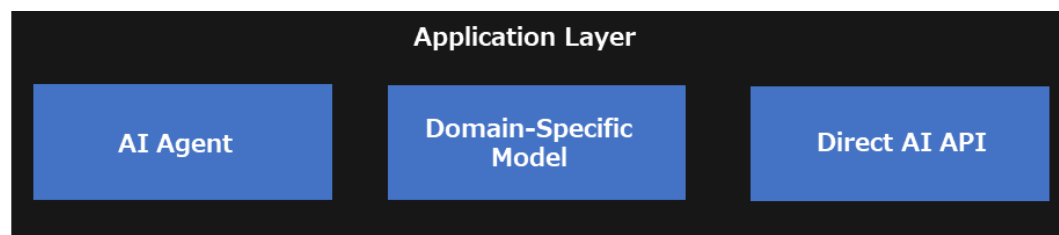
How?

- LLM Generative AI
- Products & Services

Who?

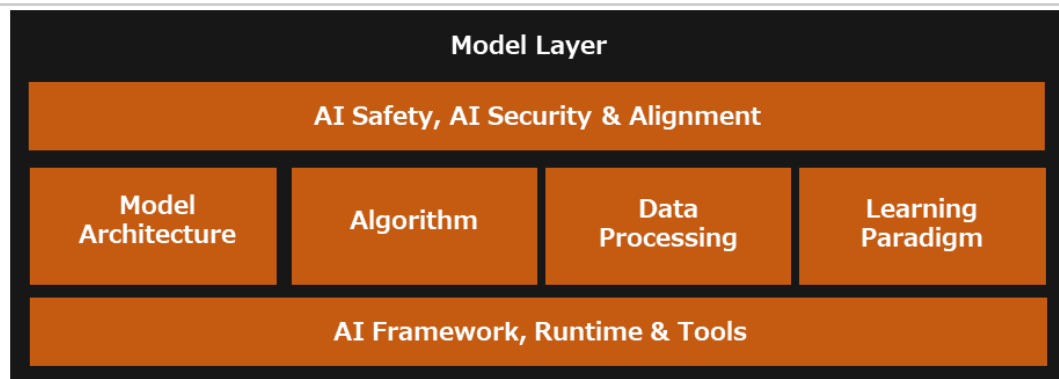


AI technology stack requires three distinct technology layers



Application Layer

This layer consists of end-user applications and services utilizing AI. It directly interfaces with users, delivering specialized or generalized AI-driven functionalities through autonomous agents, domain-specific models, and APIs.

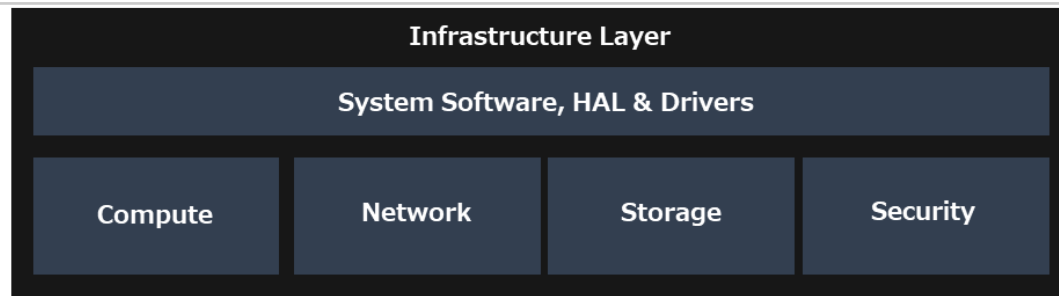


Model Layer

This is the core layer for AI systems.

It encompasses the core frameworks and methodologies that guide the creation and operation of AI models, focusing on safety, alignment, architecture, algorithms, data handling, and learning approaches.

For the latest generative AI systems or other large models, this layer represents the Foundation Model Layer.



Infrastructure Layer

This foundational layer provides the essential hardware and software resources necessary for AI operation, including computational power, networking, data storage, and security measures.



Supporting Pillars

These are the foundational elements underpinning the AI stack. They include different AI computing resources (Computing Power), the vast data that fuels AI learning (Dataset), and the skilled workforce (Talents) responsible for advancing AI technology.



Brands have prioritized technology to maintain a competitive edge

1

This slide summarizes the 'Established Technology Innovator' Persona. **Two examples of the OEMs that may align with the activities of this Persona are:**



2

Technology considerations that this Persona may apply...

I want prompt value from new technologies, so modelling corner cases, particularly ADAS and VPA, can be a challenge. I want to use a single, end-to-end, model even though it is still in its early stages and would like to run the model in-house.

3

Business considerations that this Persona may apply...

I believe that a key appeal of my line-up is the availability of technology for a modest price. I want to maintain this, so I will improve my existing technology offering while bring new technologies to market and reducing costs.

4

What?

This OEM Persona is known for having new technologies on the market and developing them over time through over the air updates. It has an agile organization and lean operations, leading to modest vehicle prices. This Persona should continue to adopt AI applications that support end-to-end ADAS, predictive maintenance and virtual personal assistants (VPAs).

1.



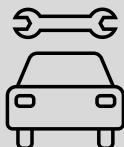
VPA and in-vehicle meetings

2.



End-to-End ADAS

3.



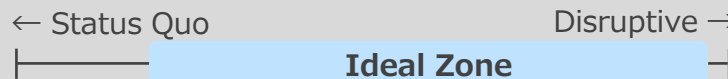
Predictive maintenance and battery management

5

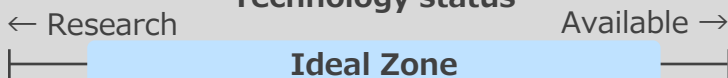
How?

Corner cases are a challenge for this Persona. Using a single end-to-end model may help them handle corner cases more easily than traditional methods. AI technologies and models that allow it to bring new, innovative, products and services to market and undercut competition should be chosen. An example of this is using generative AI to generate alternative radar waveforms to test the potential improvements in resolution, without changing hardware.

Technology innovation level



Technology status



6

Who?

This Persona prefers to develop AI models in-house, particularly for ADAS and autonomous driving applications. They may also have a private cloud compute. If this approach is too expensive, this Persona will rely on a partner to help them build in-house capabilities before transitioning to in-house in the future. Because voice and ADAS applications require low latency, this Persona will likely look for ways to reduce the cost of transferring data, and network provider costs.

Current examples of AI Vendors used:



In-house



商汤
sensetime

Current examples of Cloud (compute) Vendors used:



KubeEdge



The latest AI Models targeting VPA use cases

Table below shows some of the latest **active** AI models **since 2024** and some of the OEMs who implemented them for **VPA** use cases, which currently are the main focus of the AI providers:

AI Model Name	Supplier	OEMs	Hosting Environment
Mistral	Mistral AI		Cloud
Doubao	ByteDance		Cloud
ERNIE 4.5	Baidu		Cloud
Flyme AIOS	MEIZU		Cloud
Gemini AI	Google		Cloud
Grok-4	xAI		Cloud
GPT-4	OpenAI		Cloud
GPT-4o			Cloud
Qwen2.5	Alibaba		Cloud
Qwen1.5			Hybrid
Qwen2			Hybrid
SenseNova 5.0	SenseTime		Cloud
SenseNova 5.5			Cloud
Xinghuo 3.5 (Spark)	iFlyTek		Cloud
Xinghuo 4.0 (Spark)			Cloud
DeepSeek-R1	Deepseek AI		Hybrid
StepAI	StepFun		Hybrid

Highlights

- Among the regions, **Chinese** companies have been highly active, consistently introducing new AI models.
- **Grok-3** is expected to be introduced in **Tesla** cars very soon. **Grok** model operates on a high-performance computing infrastructure equivalent to **100,000 GPUs** enabling advanced multimodal and reasoning capabilities. This is followed by **Gemini AI** with **57,000 GPUs** computing power.
- The low-cost, open-source model from **DeepSeek AI** has been adapted widely by Chinese OEMs and about 20 OEMs have implemented DeepSeek to enhance voice assistants, natural language understanding, and improving digital cockpit intelligence.
- **Alibaba** with its Qwen AI models is the most active company among others, having introduced **three AI models** since 2024, using **Hybrid and cloud** hosting environment .
- **Alibaba** latest AI model **Qwen2.5** has 1800 Billion tokens trained.
- Most of the AI models for **VPA** having **cloud** hosting environment



Tesla and Xpeng are leading the race in Autonomous space

Introduction

AI in autonomous driving helps vehicles navigate and operate without any human intervention. It takes the inputs from cameras, lidar, and other sensors and makes real-time decisions, enhancing its adaptability to diverse driving conditions. There are three additional AI applications related to autonomous driving: Advanced Driver Assistance Systems (ADAS), End-to-End Enabled ADAS and ADAS In-Car Visualization. ADAS focuses on improving the performance of perception software over time. End-to-end enabled ADAS is a step to higher SAE-level autonomous driving. ADAS In-Car Visualization utilizes AI to train driver monitoring and facial recognition algorithms, allowing for a more accurate assessment of a driver's alertness level.

Details

AI Technology

Data Analytics	Traditional Machine Learning	Deep Learning
Reinforcement Learning	Generative AI	World Models

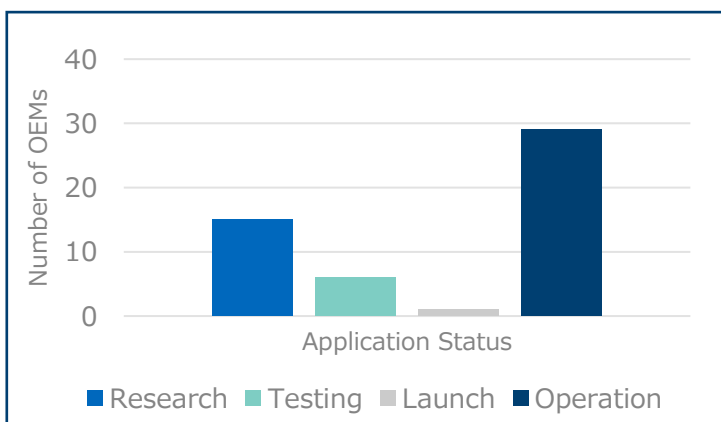
Application to Software Defined Vehicles

Low SDV application. Nice feature to have	Supports Features-as-a-Service	Virtual simulations of features and components
Provides data for developing software updates	Enables use of centralized E/E platform	Automated and digitized process

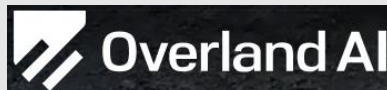
Enabler

Introduce Additional in-vehicle memory storage	Ensure Additional processing power across multiple domains	Put in place data security safeguards
Establish data partnership with cloud provider	Create OEM database to use for AI model training	Integrate with third party services, like charge providers

Status



Startup to consider



Overland AI develop and have made available on the market an autonomy stack for off-road vehicles. The system can function without an internet, or other type of, connection and does not require in-built detailed maps. Employees of Overland.AI will have built up skills in developing vehicle agnostic autonomy solutions that are modular. These skills could be valuable if the company considers expanding to the road vehicle market.

Automaker examples



Lotus is using Ambarella's Oculii AI imaging radar technology. The radar technology likely uses deep learning to manage transmitted radar waveforms. The use of AI to help design waveforms gives a high angular resolution for relatively low antennae count. A low antennae count reduces complexity. [\(Link\)](#)



XPENG launched its XOS 5.1.0, Tianji, in-car OS integrating **end-to-end large** model technology. XPENG utilized three models: XNet, a neural network that processes visual data to create a 3D representation of the environment. XPlanner, a planning and control model that optimizes driving strategies and XBrain, a large language model that enables the system to understand complex driving scenarios. [\(Link\)](#)



The new-generation dual-system intelligent driving solution end-to-end + VLM (Visual Language Model), the first of its kind in the industry, was pushed with the OTA6.4 version of the car system, marking the official entry of Ideal Automobile's intelligent driving into the era of the AI large model. [\(Link\)](#)

Maintaining the quality is necessary to drive meaningful improvements

Vehicle 4.0 Benefit 2 — Quality Improvement

Delivering Software enhancements improves efficiency and overall functionality



Operation Giants

High Volumes
High Legacy



Investing in AI infrastructure and data generation tools will leverage AI support to reduce human error and improve overall quality significantly

Reduced downtime

Established Vehicle Innovator

Medium Volumes, High Margins
High Legacy



Automated visual inspection and Quality control metrics and many more upgrades to it

Advance support to deliver high quality service

Established Technology Innovator

Medium Volumes
Medium Legacy



Invest in scalable data solutions like synthetic data to manage and maintain high-quality data for AI

Scalable Data solutions

Technology Disrupter

Through start-up or resetting for BEV have leapt straight to Vehicle 2.0 but some struggle to deliver the full value



Data Quality and Quantity to train the AI model, Model deployment, and cybersecurity risks



High-quality, robust data strategies are needed to avoid hurdles in innovation

Processes are needed to maintain good quality data

High Volume all rounders

High Volumes
High Legacy



Focusing on specific applications that enhance efficiency and reduce costs increases productivity and quality within the organization

Modular strategy to implement AI



Outcome




Barriers



Solutions



Request the price



The image shows the cover of a report titled "AI for Automotive Guide". The cover features a futuristic, digital-themed background with glowing blue and purple lines and nodes. The text "GENERATIVE AI" is prominently displayed in the upper right. The SBD logo is in the bottom left corner. Below the logo, the text "2024 AI for Automotive Guide" is visible. Below the cover image is a blue button with the text "Request price" and a white right-pointing chevron symbol.



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