

# **Generative Al in Automotive**

Grape Up, Inc. 2024

# Table of contents

The newest trend in the industry	3
Generative AI in automotive	4
Short introduction to Generative AI	5 7
How LLM works?	7
Internals	7
Encoder, decoder, and embeddings	8
Chat	9
Why it works so well?	10
Data size vs quality	10
Important concepts and techniques	10
Prompt engineering	11
Fine-tuning	11
Retrieval-augmented generation	12
Mixture-of-Experts	13
Multimodal LLMs	14
Generative AI in automotive	15
BMW and Zapata AI - Generator Enhanced Optimization for manufacturing	16
Toyota Connected Services - Hey Toyota/Lexus assistant	17
Grape Up - Intelligent Travel Companion	18
Toyota Research - optimize aerodynamics by text-to-image generation	19
TomTom and Microsoft - Destination Assist	20
Mercedes-Benz and VW AG - Chat-GPT in the infotainment	21
Risks and challenges	22
Bias and Misinformation	22
Data privacy	23
Hallucination	23
Context size	24
Computational cost	24
Deep fake	25
Summary	26

## The newest trend in the industry

In the past months, the world has been captivated by the new IT revolution, which is rapidly transforming our lives, jobs, and the way we interact with the internet - Generative AI. It has been made a commodity thanks to the OpenAI initiative of opening Chat-GPT 3 to the public.

Today we can see GenAI everywhere – writing articles, creating music, drawing pictures, generating videos. For creative industries, it sped up the work significantly. But at the same time, millions of articles we can find on the internet are written partially or fully by LLM, which makes finding the unique piece of information or solution progressively harder.

The biggest problem encountered while using LLMs is verifying and validating the results of their work. Chat-GPT lacks a self-verification feature, which means it can easily lie and defend that lie as it is not aware of it. This is very often called a hallucination of a chatbot, which can make up facts, dates, information, or people. That makes the human factor vitally important.



## Generative Al in automotive

Obviously, such a breakthrough in IT cannot omit the automotive industry, as it's now very much software-defined and software-dependent. All major companies announced in one way or another the introduction of Generative AI in their workflow – starting from vehicle design, through infotainment systems, and ending with aftersales processes.

# GenAl's Impact in Automotive Economic Projections According to Precedence Research, the market for GenAl in the automotive industry is expected to generate an impressive \$2700 million in annual revenue by 2032. (1) Consumer Engagement The research also indicates that 75% of regular users of in-car voice assistants have responded positively to the integration of GenAl capabilities, showcasing the technology's acceptance and potential to enhance the user experience. (2) Cost and Time Savings Secondary analysis by Precedence Research suggests that the usage of generative Al in the automotive parts sector may result in a 10–20% decrease in the cost and time of developing new car systems and components. (1)

We can now see, in real examples of enterprises in different industries, that Generative AI can save millions of dollars by automating and improving internal and customer-facing business processes. In every department, we are finding new use cases that can benefit from the integration of Generative AI systems.

In this eBook, we will guide you through how Generative AI works internally, helping you think strategically about its capabilities. In further chapters, we will discuss the hottest possible use cases in the automotive industry right now and finally the risks and challenges that must be considered while integrating LLMs in the enterprise.

<sup>&</sup>lt;sup>1</sup>SOURCE: <u>www.precedenceresearch.com</u>

<sup>&</sup>lt;sup>2</sup> SOURCE: <u>www.soundhound.com</u>

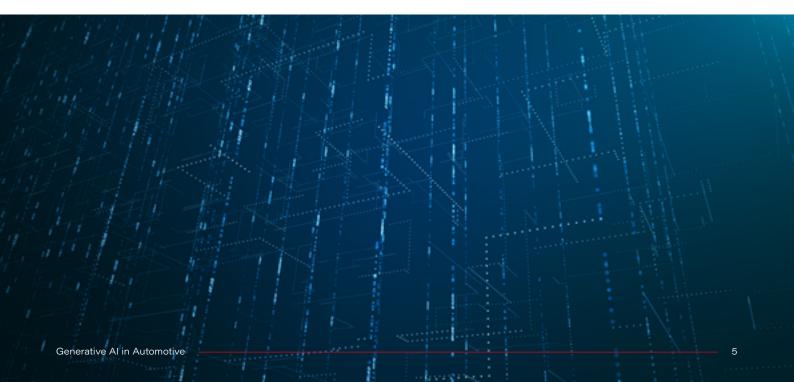
## Short introduction to Generative AI

Generative AI refers to the field of artificial intelligence focused on learning data patterns and creating new, derived content. This includes text, images, videos, music, motion, and more. The breadth of generative AI spans from assisting with simple automated tasks to handling complex creative processes.

The main idea is to generate new knowledge based on the vast amount of knowledge stored internally, which is way beyond the capacity of any human being. This information is merged, transferred, and altered in a way that produces creative or nearly creative outcomes. In some cases, the results need to be converted to a different format. For example, a common approach for controlling robots by Generative AI is to generate text/actions and then convert them to executed functions.

Although LLM text generation is the most commonly used application today, it's worth exploring all the possibilities before focusing solely on Large Language Models.

What follows is a breakdown of some key applications of Generative AI and examples of tools in the field.





Generative AI Applications	Description	Indicative Examples
Text Generation	Leveraging LLMs for creating text across various applications.	OpenAl's GPT-4, Jasper
Image and Video Generation	Combining human creativity with AI for art and practical design purposes.	DALL-E, Midjourney, Adobe Firefly, Stable Diffusion
Code Generation	Assisting in software development by generating code, creating tests, suggesting architectures, tools, or frameworks.	GitHub Copilot, Gemini Advanced/AlphaCode, OpenAl Codex/ChatGPT, Tabnine
Scheduling, Audio, Motion, Robotics	Expanding the LLM application range to schedule planning and robot control, with varied inputs such as audio, video, images and motion capture.	OpenAl Whisper, OpenAl Sora, LEO, ProgPrompt, MotionGPT
Chatbots	Providing a wide array of chatbot services for diverse tasks, from support in software development to enterprise project analysis.	OpenAl Chat-GPT, Anthropic Claude, Google Gemini, Llama 2, BERT

### grape up<sup>®</sup>

## Get the full whitepaper and see how the key automotive industry players use Generative AI for business growth!

Get the full guide