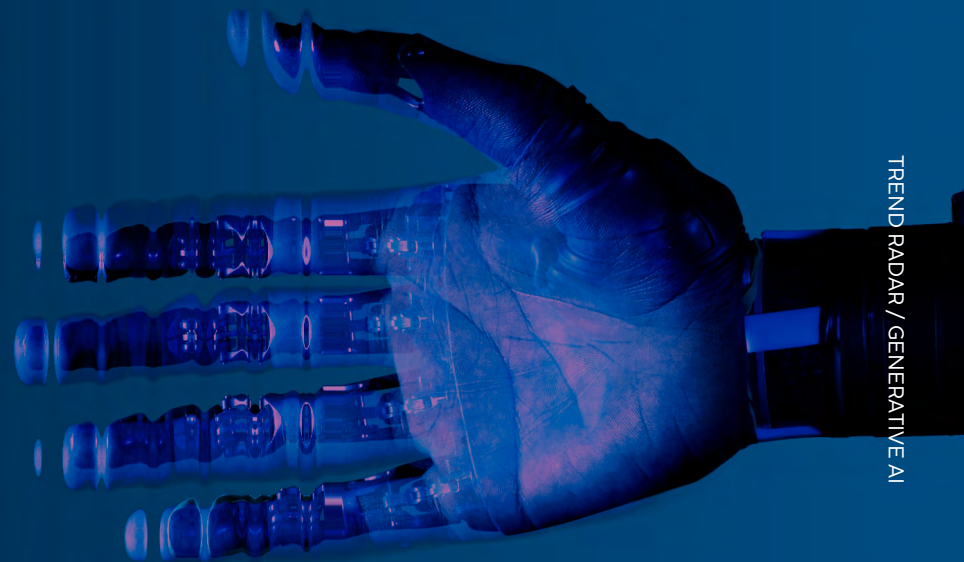




# TREND RADAR **GENERATIVE AI**

Revolutionizing industries & creativity.





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**Generative AI,  
at its core, is a  
groundbreaking  
fusion of Artificial  
Intelligence and  
creative content  
generation.**

Intro





# 01 Intro

Generative AI, at its core, is a groundbreaking fusion of Artificial Intelligence and creative content generation. It harnesses the power of advanced Machine Learning models to craft incredibly lifelike content across various mediums, including text, images, code, audio, and video.

This transformative technology marks a pivotal moment in the realm of Artificial Intelligence. It signifies a shift from traditional rule-based programming, where humans instruct machines step by step, to data-driven content generation. With Generative AI, we provide prompts, and the system uses its vast knowledge to autonomously generate authentic content.

## It's worth noting that “realistic” content doesn't necessarily mean “real”.

The significance of Generative AI lies in its integration into our daily lives in a way that AI hadn't achieved before. While AI, algorithms, and data-driven decision-making have become commonplace, Generative AI has struck a chord with us on a profound level, sparking discussions about the impact of technology. This phenomenon can be attributed to Generative AI's ability to tap into areas closely linked to human creativity - the very essence Steinbeck referred to as irreplaceable in Chapter 13 of “East of Eden”. In 2023, we find ourselves alongside a technology that seemingly “creates” much like humans do. While digital technologies have long influenced creative professions like music, art, and photography, Generative AI is encroaching upon the fundamental concept of content creation, including writing. Truth be told, currently GenAI does not create anything but it composes various pieces of content in a statistically correct manner (thus delivering “realistic” outputs).

From a business perspective, technology has traditionally focused on optimization and efficiency enhancement. However, the digital revolution has placed creativity at the forefront of our endeavors. How we compose solutions, tackle challenges, and rethink business models now hinges on creativity. Could Generative AI serve as our superpower booster in this creative landscape?

This Trend Radar aims to demystify Generative AI in simple terms - what it is, what it does - and debunk a few misconceptions while showcasing its potential impact on our work and daily lives. At the same time, it will highlight key areas that demand our vigilance as we progress, including accuracy, security, ethics, and bias.

Generative AI is currently viewed as both a tremendous opportunity and a potential challenge to the status quo, and by extension, our livelihoods. Ultimately, it has the potential to revolutionize the way we live and work, enhancing both our productivity and creativity. This marks the true paradigm shift, **where business, everyday life, and technology meet**



# 02 Generative AI basics

Generative AI refers to a specific domain within the context of Artificial Intelligence.

**It is an innovative technology that leverages advanced machine learning models and algorithms to learn from existing data to generate new and realistic content such as images, videos, music, and text.**

While more traditional AI systems rely on programming at their core to enable tasks to be performed, Generative AI learns from extensive data sets and with that knowledge creates content starting from prompts expressed in natural language.

Generative AI models undergo extensive training with large amounts of data to understand patterns, structures, and features.

Once trained, these models can generate new content that closely resembles the patterns and characteristics of the original data. They can generate content that is similar to what they have learned, but with variations and creativity.

**Generative AI utilizes deep learning techniques, such as Generative Adversarial Networks (GANs) and Variational Auto-Encoders (VAEs), to generate content.**

**GANs consist of two neural networks, a generator and a discriminator, that compete with each other to produce and evaluate the generated content.**

**VAEs are probabilistic models** that learn the underlying structure of the data and generate new samples based on that understanding.



# CONVERSATIONAL GENERATIVE AI

The history of Generative AI in conversational domains has its roots in the fields of Machine Learning and probabilistic modeling. In fact, it dates back several years, possibly to the development of ELIZA, a chatbot simulating conversations with a therapist at MIT in 1966.

In the early 2000s, Generative AI began to gain more attention, thanks to the proliferation of Deep Learning algorithms and, in general, Artificial Neural Networks. These algorithms enabled the creation of complex mathematical models capable of learning from input data and autonomously generating highly reliable content.

Today, we stand at a juncture where artificial systems can comprehend human natural language and engage in reasoning, articulating responses in

## natural language through synchronized avatars.

The complexity of generating conversations often involves using various intricate analytical systems, sometimes in combination.

**One of the most widely used modeling architectures today is the Transformers**, a type of artificial neural network architecture used in machine learning, particularly in natural language processing (NLP). Introduced in 2017 in a paper titled “Attention is All You Need,” Transformers have since become one of the most popular architectures in the NLP field. Transformers use attention mechanisms to process input and output sequences, allowing them to consider the entire sequence simultaneously, yielding superior results compared to previous architectures like Recurrent Neural Networks (RNNs).

Specifically regarding Transformer technology, **Large Language Models (LLMs) have witnessed remarkable growth in recent years.**

LLMs are AI models employing neural networks to analyze extensive textual data and generate semantically and syntactically meaningful outputs. These **models are trained on vast amounts of data, often billions of words, using deep learning algorithms.** They create an “internal representation” of natural language, enabling the model to understand the context in which words are used. Thanks to their contextual understanding and autonomous text generation abilities, LLMs find applications in various natural language processing tasks, including automatic translation, text generation, question answering, and more.

Some of the most prominent LLMs currently available are OpenAI’s GPT (Generative Pre-trained Transformer, which rapidly moved from GPT-3 to GPT-4 and now onto Enterprise), Google’s Bard, AWS Bedrock and Microsoft introduced AI in its Bing search engine by integrating it with OpenAI’s GPT-4. Their success lies in the overall usability and accessibility of the technology and their capability to generate remarkably high-quality text, through a combination of deep learning techniques, including Transformer Neural Networks. They train on vast amounts of data, including books,

newspaper articles, web pages, and more. One of their most valuable and eye catching features is the ability to produce text that appears to have been written by a human, even mimicking the writing style of a particular author or genre.

Leveraging these conversational models can be enhanced through strategies such as **prompt construction, usage, and fine-tuning.**

The use of prompts is a critical strategy to improve the quality and accuracy of results generated by LLMs. By providing the model with specific and clearly defined context, more relevant and pertinent outputs can be obtained. Supporting prompt-based usage with an information retrieval system further enhances the accuracy of user responses.

When prompts alone don't suffice for achieving accuracy, fine-tuning comes into play, training the model for a specific domain to address unique usage needs.

At a more basic interaction level, the adoption of "speech to text" and "text to speech" solutions allows natural voice-based interactions with chatbots, enabling users to voice their queries while receiving responses in the same format.

## PRIVATE GENERATIVE AI

The power of Generative AI can be harnessed within specific fields and environments, by implementing it on a **private platform** that ensures higher levels of privacy and security (e.g. financial or legal institutions, but also businesses). **What are the benefits of private Generative AI for businesses?**

**Accuracy & Relevancy:** you could customize your own Generative AI to meet specific needs or compliance. This could include tailoring the AI's language model to your industry or target audience, or training the AI on a specific dataset of data, creating a Generative AI that is more effective, efficient and accurate for your particular purposes and can ensure compliance with respect to specific pricelists, instructions, norms and regulations.

**Control:** you can have complete control over your own Generative AI, by deciding how the AI is used, who has access to it, how it is updated, and which data it is fed with. This would lead to a competitive advantage over companies that use generative AIs that are not under their control.

**Differentiation:** you could use your own Generative AI to differentiate from competitors, by creating unique products or services, or by using AI to provide a better customer experience.

**Privacy & Security:** a private Generative AI would lead to a higher security and enhanced privacy with respect to public AI, as it would not be exposed to the same risks of hacking or data breaches, and more scalability, as it would not be limited by the resources of a cloud computing platform.





# The market landscape

## **The tech, media, and telecom sectors are at the forefront of pioneering Generative AI adoption.**

In the realm of technology, media, and telecommunications, renowned for their dynamism, these sectors stand at the forefront of exploring the potential of Generative Artificial Intelligence. Their proactive approach extends from automating tasks to enhancing user experiences, seamlessly integrating Generative AI into both professional workflows and personal lives. Notably, the prevalence of these AI tools in today's digital landscape becomes evident as they have become virtually ubiquitous, influencing nearly everyone's digital encounters.

## **Public sentiments surrounding AI vary widely, reflecting a complex spectrum of attitudes and expectations.**

In 2022, a comprehensive survey conducted in the United States unveiled intriguing insights into public perceptions of AI's influence on daily life. While a segment of respondents anticipated AI's impact to remain neutral, a significant cohort within the 30-44 age group held optimistic expectations, foreseeing substantial improvements in their daily experiences.

## **Conversational AI has proven to be a game-changer, revolutionizing how businesses engage with their customers.**

Conversational AI, represented by virtual agents and conversational interfaces, has gained remarkable traction as businesses sought to elevate customer interactions and support services.

These AI-driven systems facilitate highly personalized and efficient communication with customers and employees. The impressive 33% adoption rate signals a concerted effort to enhance customer engagement and support through Conversational AI, a trend that promises to continue its upward trajectory. The chatbot market's rapid growth **from 2016 at \$190.8 million to a projected \$1.25 billion in 2025** highlights AI's transformative power.

Chatbots have become essential in delivering efficient customer support, automating routine tasks, and enhancing user experiences.



## ChatGPT: a growing demand for AI-driven tools

This year witnessed a remarkable surge in user interactions with ChatGPT, particularly from Italy. In January 2023, the platform recorded an astounding nine million interactions, marking an impressive growth of over 300% compared to the previous month. This surge shows that more people want AI-powered conversational tools, and AI technology is being used quickly. By 2023, over 200 companies across various sectors embraced ChatGPT. Leading the pack were the technology and education sectors. However, certain industries, including agriculture, culture, and law, exhibited slower adoption rates for this innovative platform. This discrepancy underscores the diverse impact of ChatGPT across different fields, reflecting the versatile applications of Generative AI.

## Generative AI's far-reaching impact on B2B, B2C, and B2G

Transforming business and public administration, this technology automates tasks, enhances efficiency, improves user experiences, and provides comprehensive control over various operations through automation. The market for Generative AI is advancing rapidly, with an expected annual growth rate of approximately **24.4% from 2023 to 2030**.

This growth signifies the integration of AI into our daily lives and professional activities, paving the way for a future where it continues to reveal numerous possibilities for individuals and businesses.

# Key

**\$4.31 trillion**

### Global Generative AI potential market value

Predictions indicate an exceptionally market contribution expected from Generative AI **by 2030**.

**37% Marketing & Advertising**

**35% Technology professionals**

### Generative AI Users

In 2023, the majority of individuals across various industries had used a Generative AI tool **at least once**, with the highest adoption rates in Tech & Media.

**\$1.25 billion**

### Conversational AI Adoption

The chatbot market size is expected to experience significant growth **by 2025**, with a substantial increase in both usage and adoption. Worldwide, the adoption rate of Conversational AI is at **33%**.



## +300% growth

### ChatGPT Growth

In January 2023, ChatGPT recorded **9 million interactions in Italy**, marking a remarkable growth of over **300%** compared to the previous month.

## +56.67% efficiency

### Human + AI Coding Efficiency

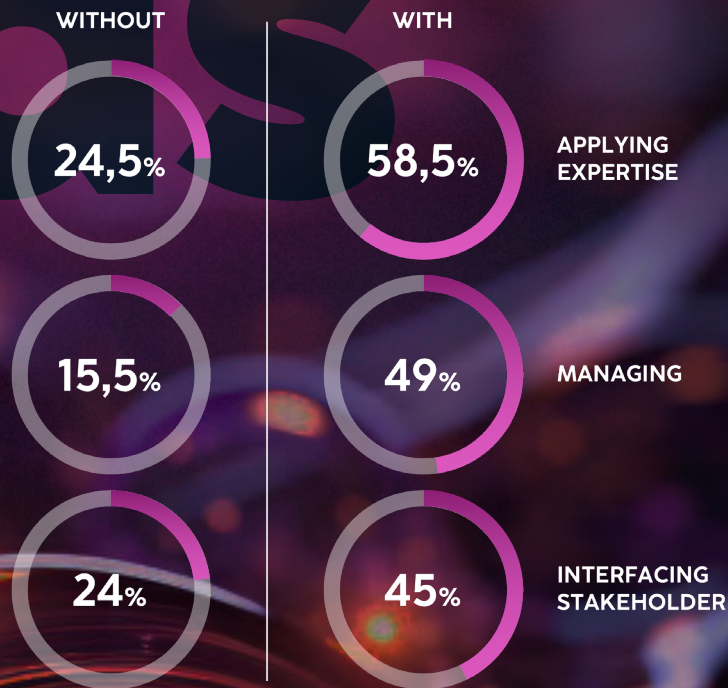
Combining human and AI coding improved efficiency by about **56.67%**, reducing the task time **from 150 to 65 minutes**.

## x2 productivity

### Generative AI for Productivity & Revenue

Business leaders are twice as likely to **prioritize increasing employee productivity** over reducing headcount.

### Enhancing Productivity in Management through Generative AI:



The market landscape

Data displayed represents our elaboration of data coming from multiple sources (for example: STATISTA)



# Our approach 4

Our approach

Generative AI is expected to impact all types of sectors and industries in the long run but we can already see how it is being used today to **improve our Quality of Life, ensure Economic and Cultural Development, and pave the Way for Sustainability**. Generative AI enables better **Public Services**: developing digital services accessible to all citizens, including those with disabilities (from speech recognition to text-to-speech applications), assisting in cultural preservation and promoting **tourism** by translating cultural heritage into multiple languages or enhancing the visitor experience at museums and historical sites. It also makes urban **mobility** smoother and more efficient by processing real-time data from traffic sensors to predict traffic patterns, optimize routes, and reduce congestion, monitoring and managing **energy** consumption in real-time

(buildings, public lighting, etc.), supporting the transition to a circular economy by optimizing product design for reuse, recycling, and resource efficiency, reducing pollution and waste. In the **Healthcare** domain, Generative AI enables remote patient monitoring, optimizes diagnosis processes, and improves patient care and outcomes.

**Harnessing the potential of Generative AI is pivotal in advancing technology-driven progress.** In the realm of technology-driven progress, there are various frontiers where Generative Artificial Intelligence is making remarkable strides. One crucial battlefield is the fight against **fake news**, which it diligently sifts through vast amounts of information, be it text, audio, or video, identifying discrepancies and assessing the credibility of sources. Simultaneously, Generative AI empowers real-time **environmental monitoring**, allowing governments to issue timely alerts on air quality and natural disasters. **Precision farming**, another boon of Generative AI, optimizes crop yield, minimizes resource wastage, and fosters sustainable agricultural practices, thereby curbing costs and environmental impact. Moreover, Generative AI plays a pivotal role in **crime prediction and prevention**, enhancing facial recognition capabilities and aiding in solving cases through image processing. It doesn't stop there; this transformative technology is the guardian of **infrastructure security**, diligently inspecting critical structures for safety concerns. It also delves into the **financial domain**, analyzing

market trends, managing investments, and optimizing financial strategies for economic growth and stability. Generative AI also makes a **higher Customer Experience**: personalizing customer journey, driving brand loyalty and maximizing the effectiveness of online initiatives. It ensures **economic growth and business continuity**: drives revenues (e.g. accelerating product development and the exploration of new revenue channels) and optimizes costs (e.g. augmenting worker capabilities and talent utilization, improving overall processes).

Of particular relevance is the application of Generative AI in the field of Conversational AI, with surprising results. An example is the speech delivered at Palazzo Madama on May 31, 2023, by a senator, supported by a group of our experts, and entirely developed by GenAI.

Furthermore, Generative AI is paving the way for AI-based strategies and testing, enabling more efficient and effective software development processes. Generative AI is poised to revolutionize web and app design through generative design techniques. Leveraging its ability to comprehend and replicate design patterns, it can automate significant portions of the design process, speeding up development times and reducing costs.

These are just a few examples, but there are numerous other applications waiting to be explored.



At Eng, we have a center of excellence with hundreds of researchers and data scientists working on Artificial Intelligence since the 1980s and on GenAI since 2022. Today, some of these initiatives are already being applied in institutions and organizations, and we anticipate implementing many more in the future through collaborations with major technology partners like Microsoft and Amazon Web Services.

We firmly believe that AI should combine **ethics** and **legality** by incorporating these principles by design. For this reason, we approach each design and development phase with rigorous self-assessment measures, aiming to guide the ethical and sustainable adoption of AI-based solutions. For several years, **Eng has been involved in various European and national institutional discussions** to promote an ethical and socially sustainable approach to Artificial Intelligence.

Furthermore, we are convinced that the ethical approach should not only be imposed from the top but also demonstrated concretely through initiatives and projects that operationally showcase its use for social good, **“AI for Good.”** In this direction, for the past decade, we have been experimenting with the use of AI **to improve digital accessibility for people with disabilities, promote energy sustainability, counteract climate change, and combat misinformation.**



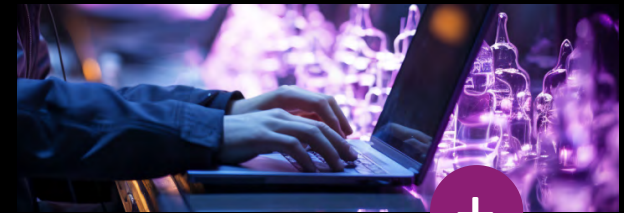


# Our 15 use cases

## USE CASE

### EngGPT: our AI-driven assistant for your business

It is a large language model developed by Engineering. It constitutes the core of the GenAI solutions we develop for our clients and is built using cutting-edge techniques such as Transformer architectures, Reinforcement Learning Human Feedback and Direct Preference Optimization. EngGPT offers performance that falls within the comparability range of ChatGPT (GPT3.5-turbo), while addressing concerns about data privacy according to the principle of Private Generative AI; it can be fully installed on-premise, ensuring that data never leaves the corporate perimeter. EngGPT can be customized on client data through the RAG approach (Retrieval Augmented Generation) or through fine-tuning, which involves retraining the engine for the client. Additionally, EngGPT has multimodal capabilities and can perform a vast array of different tasks including: text content generation, natural language data analysis, data quality assessment, customer support, image analysis and more, all with the aim of providing our clients with a powerful, versatile, and customizable solution.





USE CASE

**AI-generated identikits for forensic activity**

We leverage Generative AI techniques, specifically GANs applied to images, to support the work of forensic artists. Traditionally, forensic artists rely on verbal descriptions to create stylized drawings of subjects based on witness accounts. We enhance this process by utilizing machine learning (ML/DL) and Generative AI. By training the model on large sets of real images, it learns the characteristics of facial evolution, including the effects of aging, changes in appearance, and surgical modifications. When applied to images of subjects under investigation, the Generative AI model generates more realistic and accurate representations, closely resembling reality. These generated images can be reproduced as photographs, making them more easily recognizable and usable for identification and matching purposes.

The project not only benefits forensic artists but also provides a tool for users without artistic skills to create photorealistic identikits.



USE CASE

**AI Virtual assistants for Customer Care**

We adopted Generative AI, in particular ChatGPT with Azure platform services, to enhance customer service for a bank. Our aim is to develop a more effective system for interaction and classification of customer requests compared the as-is condition. By leveraging ChatGPT's natural language processing capabilities, our solution can interact with customers in a human-like manner, understand the content of conversations, derive intents, and classify requests based on the bank's domain-specific information. Our solution enhances conversation quality, problem-solving abilities, routing accuracy, and response quality of existing bots. As a result, the deflection rate (reduction in the need for human operators) increases, sentiment scores for customer assistance improves, and the availability of 24/7 support contributes to higher Net Promoter Scores (NPS) and improved app ratings for the bank. Generative AI empowers the virtual assistant to provide personalized and efficient customer care, enhancing the overall customer experience.



USE CASE

**Generative AI in Asset Management**

The integration of Natural Language Processing (NLP) into our Artificial Intelligence-based portfolio management platform marks the dawn of a new era in personalized, user-centric investment solutions. This cutting-edge technology empowers us to provide tailored solutions to specific needs, enabling data-driven decision-making and portfolio optimization to maximize returns in alignment with investors' goals and preferences. Specifically, the creation of a user interface utilizing generative AI technologies allows users to develop intricate portfolio strategies, even without an in-depth understanding of financial algorithms. Additionally, this interface facilitates hypothesis validation through evidence-based results, thanks to the support of Generative AI modules.

Our solution is committed to making investment accessible, even for those with limited expertise in quantitative finance.





# 06

## Why choose us

**Eng is a strategic partner that adds value throughout the entire innovation process by providing comprehensive consulting, implementation, and management services, promoting sustainable development in global markets.**

What sets us apart in the field of AI goes beyond mere knowledge. We possess a deep understanding of the market, ranging from business processes to stakeholder needs.

Our expertise spans both traditional and cutting-edge technologies, allowing us to offer **tailored services and solutions** in ever-evolving ecosystems. We empower your organization to fully harness the creative potential of AI, generating content, insights, and solutions that go beyond the ordinary.

Our end-to-end data-driven scientific methodology is further enriched by the transformative capabilities of Generative AI, unlocking new dimensions of innovation and efficiency. Thanks to our Academy providing continuously updated training programs, we remain at the forefront of technology, ensuring that our solutions remain innovative.

Furthermore, our cross-industry competence center provides a holistic approach, addressing challenges and opportunities in various sectors, **facilitating transformation paths towards a brighter future.**





**1**  
Our first AI research center was founded in Northern Italy in 1987.

**2**  
We have been collaborating with EU institutions, discussing issues surrounding AI and Ethics to ensure responsible development and use.

**3**  
We have working use cases across all industries, from Agriculture to Finance, Healthcare, Manufacturing, Transportation, and so on.

**4**  
We have been developing our own GenAI for the past few years, EngGPT, both for images as well as text.

**5**  
We are capable of combining our own capabilities with those of our partners, such as MS and AWS, to deliver solutions tailored to your organization's needs.

**6**  
We are using AI to future-proof our internal processes, leveraging Generative AI to optimize our delivery costs.

Why choose us

# 6 things you DON'T know about Eng and AI



# 07

## Looking ahead

Looking ahead



**Generative AI represents a significant leap forward in the realm of AI and technology, poised to enhance productivity across various domains.**

Its refinement and sophistication are on a continuous trajectory, yet its essence remains rooted in learning, extracting, and seamlessly integrating human-created content. Steinbeck's concept of the "Spark" remains unaltered. The notion that AI, including Generative AI, will develop independent agency remains a distant prospect.

**From concealed processes like coding to customer interactions, Generative AI will exert a profound impact, augmenting the capabilities of individuals and organizations alike.**

However, as we advance, we must address critical concerns such as transparency, bias, and ethical usage to ensure responsible and equitable deployment.

Transparency is a paramount concern. Generative AI relies on existing data, but the selection and interpretation of this data remain concealed from users.

**Ensuring accountability and explainability is pivotal for ethical and responsible utilization.** Consequently, we observe a surge in projects focusing on Generative AI with specific data sets, promoting transparency.

Bias, an inherent aspect of human-generated content, can inadvertently seep into the generated material.

Effectively addressing these issues is vital to promote fairness and equity, addressing challenges that persist in society. Ethics looms large in discussions concerning a technology that simulates and fabricates reality (bearing in mind that "realistic" is distinct from "real").

We have already witnessed the potential harm caused by deepfake videos and documents, which underscores the importance of ethical considerations.

Within the realm of business applications, we anticipate the increasing integration of Gen AI into enterprise solutions.

This spans learning/training systems, user assistance, simulations, testing, design, and coding. Such integration is poised to advance the democratization of digital technology, making coding and technology accessible to businesses of all sizes.

In an era characterized by relentless acceleration and proliferation of digital capabilities, **Generative AI is set to become an integral part of our daily toolkit.** It holds the potential to revolutionize content creation, tech development, and our overall approach to learning, work, production, and life.

Every journey commences with a single step. Therefore, we recommend initiating tests of this frontier technology in specific areas of your business.

**Allow us to assist in developing tailor-made use cases that can scale, evolve, ensuring security, responsibility, and ethical use as we step into the future. Together.**



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