



TREND RADAR **Generative AI**

A new era of innovation at your fingertips.





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01

Generative AI today

Generative AI today



Within a few years, Generative AI has established itself as a technology that can truly change the way we live and work.

By harnessing the power of advanced Machine Learning models to learn from existing data, GenAI's solutions are able to create content - including text, images, code, audio and video - that is incredibly similar to that produced by a human being.

While GenAI initially gained attention for its ability to simulate human **creativity** and transform art and communication, it has now reached a more mature stage, becoming a key tool for businesses and offering a wide range of solutions to a broad audience.

Companies have found in Generative AI and its ability to generate data-driven content a powerful tool for optimizing and **improving efficiency**.

This technology allows to address widespread difficulties such as slow internal processes and obstacles in accessing



relevant information, satisfying the need to quickly obtain answers to business questions and customer requests.

The focus is shifting from GenAI's inherent generative capacity to how this technology can be used to enhance human creativity, open new business scenarios, nurture **inclusiveness** and **social progress**.

Generative AI is a technology that can elevate **human creativity** leading to the development of new, effective and responsible solutions to business challenges.

Reflection and ongoing projects to disseminate a **Responsible AI approach** aim to ensure fairness, transparency, accountability, but also security and

reliability of the solutions made by employing this technology. Promoting and supporting inclusion and diversity during the development of AI ensures that the solutions created meet the needs of various stakeholders and that the benefits are distributed fairly.

Generative AI applications can also enable principles such as usability, facilitating **accessibility** to services in a simple, intuitive and equitable manner, regardless of level of education, experience and ability, by combining different types of communication.

The current challenge, therefore, is to learn how to use GenAI in **different scenarios** as a real driver of change in the world in which we live and work, combining **innovation, a sense of responsibility, and creativity**.

In this paper we will present several experiences in which through Generative AI we generated a positive impact by helping to improve the quality of our lives, to support economic and cultural development, and to build the future responsibly.



02

Striding towards innovation

Striding towards innovation



Generative AI is quickly evolving into a powerful tool for content creation and decision support across all sectors.

In the short term, it will progress rapidly by focusing on improving model capabilities and integration into various applications.

We are, in fact, witnessing a rapid maturation of basic models with the development of **pre-trained models** offering choices to balance size, transparency, versatility and performance. Large Language Models (LLMs) are now able to break down complex tasks into manageable **subtasks**, improving problem-solving efficiency by dividing challenges into smaller, more easily processed components.

Large **open-source** language models are rapidly emerging as significant players in AI development, offering researchers and developers unlimited access to powerful language processing capabilities and fostering innovation in various applications.

Compute needs are also increasing: there is an acceleration in the promotion of innovations in chipsets, hardware and algorithms to meet the doubling of computing demands every 3-10 months.

Generative AI will be increasingly **integrated**: the increasing accessibility through APIs and the possibility of direct integration into various industry applications is a real innovation in progress.

From an application perspective, **advanced virtual assistants** represent the most widespread use of GenAI. We are witnessing the implementation of assistants capable of understanding and generating human-like text and speech for comprehensive user assistance. Generative AI is evolving towards **multimodal** systems capable of natural and fluid **human-like interactions**, combining various forms of input and output.

GenAI is set to become increasingly accessible, with expanding deployments in sectors such as finance, healthcare, retail, public administration, energy and infrastructure for personalised marketing, customer and patient care. **Multi-sectoral expansion** will also affect the technology and education sectors, with significant value creation.

While the potential of GenAI is immense, it also presents significant challenges in terms of implementation and responsible governance. We are witnessing the definition and consolidation of **specific regulatory frameworks** to develop comprehensive governance structures to ensure a fair, responsible and privacy-compliant deployment of AI.



Key Trends

\$66 BILLION

GLOBAL GENERATIVE AI 2024 MARKET SIZE

TOP 3 DRIVERS

Advancement of AI technologies with LLM

Burgeoning demand for creative applications

Innovative AI server and storage solutions

12%

% GEN AI IMPACT ON TOTAL TECHNOLOGY SPEND IN 2032

0.1-0.6%

POTENTIAL LABOR PRODUCTIVITY GROWTH ANNUALLY THROUGH 2040 BY GEN AI

75%

GEN AI VALUE FALLS ACROSS CUSTOMER OPERATIONS, MARKETING, SALES, R&D, SOFTWARE ENG

15%

NEW APPLICATIONS AUTOMATICALLY GENERATED BY ARTIFICIAL INTELLIGENCE WITHOUT A HUMAN BY 2027

CAGR 39.6% (2024-2032)

Generative AI market estimated to grow to \$967 billion in 2032.

TOP 3 BUSINESS BENEFITS

Increase revenue, reduce costs and improve productivity

Automate and accelerate task and processes

Create greater customer engagement

**Unlock new opportunities, increase efficiency
and transform business through Generative AI**

Data displayed represents our elaboration of data coming from multiple sources



Why a private GenAI

The widespread diffusion and pervasiveness in everyday life of solutions based on Generative AI requires great attention to the **collection, management and use of data** at all stages of solution development: we are not only talking about ethical aspects, but also about Data Robustness, security, privacy, Trustworthiness.

Indeed, many companies perceive the potential of Artificial Intelligence, but first of all they want to preserve their competitive advantage, which is based on full control of

available data, intellectual property, protection of sensitive data and patents. Just think of the Finance and Healthcare sectors, the PA, as well as all industries that link their revenues to creative invention.

In these and many other cases, the power of Generative AI can be harnessed through implementation on a private platform that guarantees higher levels of privacy and security. **Private Generative AI** indicates the implementation of GenAI models within a controlled and private environment, as opposed to the use of public and shared services or platforms.

Private GenAI ensures accuracy and relevance to meet specific or compliance needs, control of access, updates and data entry, differentiation in the creation of products or services, privacy and security. In detail, the advantages of Private GenAI for a company are manifold:

- **accuracy and relevance:** you can customize your Generative AI to meet specific needs. For example,

you can adapt the language model to your industry or target audience, you can train AI on specific data creating a more effective, efficient and accurate solution for your business goals, ensuring compliance with specific price lists, instructions, rules and regulations;

- **control:** you can have full control over your GenAI by deciding how to use it, who has access to it, how to update it and what data to feed it with, creating a strong competitive advantage;
- **differentiation:** you can use your Generative AI to differentiate yourself from competitors, to create unique products or services, or to provide a better customer experience;
- **privacy and security:** a private Generative AI can lead to greater security and privacy than a public one, as it is not exposed to the same risks of hacking or data breaches, and has a wider scalability, as it is not limited by the resources available in the cloud.



04

A composable approach

A composable approach



In an increasingly AI-driven landscape, ENG emerges as the strategic partner for business evolution through AI & Advanced Analytics tools. We foster a data-first culture, crucial for triggering innovation and generating value.

We support our customers with multidisciplinary teams that take a **holistic end-to-end approach** from Data Architecture and Data Management to the development of advanced data platforms, handling complex AI scenarios and ensuring a robust user experience.

We enable the extraction of hidden information from large amounts of data through **cutting-edge techniques** such as Machine Learning or Deep Learning.

Our impact goes beyond simple technology adoption through a deep understanding of business processes and stakeholder needs.

As part of our strategy, we adopt a **composable approach**, allowing companies to nimbly assemble AI & ML modules to create new solutions, responding precisely and flexibly to changing market needs.

Our proven approach allows us to go from concept design to first implementation (MVP) in a matter of weeks.

CONCEPT DESIGN

Within two weeks, we understand the business problem and identify its causes. We define the desired outcomes and lay out a high-level business case, identify the available data, knowledge base and other enablers, and then move on to planning the interventions that will be made in the redesign of the business process.

PROOF OF CONCEPT

In four to six weeks, we carry out Exploratory Data

Analysis, integrate and clean data and documents, enrich the knowledge base to improve algorithm responses, develop guardrails for model improvement and an automated performance evaluation model, explore model interpretation techniques to increase the effectiveness of responses.

MINIMUM VIABLE PRODUCT

In less than six months, we refine and test the analytical model and its answers using real data and prepare the necessary integrations with the customer's systems.

PLATFORM RUN

We automate data acquisition and production and knowledge base flows, introduce model validation steps and implement MLOps pipelines for automatic deployment in the target environment, set up monitoring tools and alarms to continue tracking model performance.



ENG GPT

EngGPT is Engineering's proprietary **Large Language Model**. Built using the best open-source technology and techniques that represent the state of the art for Generative AI to date, such as Transformer architectures, RLHF (Reinforcement Learning Human Feedback) and DPO (Direct Preference Optimization), it can be seamlessly integrated into all applications thanks to customized model specializations for specific domains. EngGPT can be installed entirely on-premise on a customer's dedicated hardware, so that its data never leaves the corporate perimeter according to the principle of Private Generative AI. It can be specialized on the customer's data through a RAG (Retrieval Augmented Generation) approach, but also through fine-tuning, i.e. a re-training of the engine dedicated solely to the customer.

This Private Generative AI solution provides enhanced security and privacy than public AI, and offers greater scalability. It also allows accuracy and relevance, i.e. you can customize your Generative AI to meet specific needs. You can have control over your GenAI by deciding how to use it, who has access to it, how to update it and what data to feed it with, creating a strong competitive advantage. Finally, you can use your GenAI to differentiate yourself from competitors, to create unique products or services, or to provide a better customer experience.

EngGPT consists of a library of **7 use cases** called the **EngGPT Suite** that enables a wide range of activities that can be combined.

EngGPT Suite is composed by seven main building blocks enabling a wide range of activities to simplify tasks and optimize user's experience.



Focus

EngGPT Docs offers the possibility of entrusting the AI with documentation of various types and in various formats (.pdf, .doc, etc.) and using EngGPT as an assistant to help explore this information base by offering summaries, explanation of contents, etc.

EngGPT Data allows users to explore, study and investigate huge amounts of data. Through a conversational interface, based on AI's ability to analyze data even from heterogeneous databases (we are talking about thousands of tables from different sources) far beyond the capacity of a human being, it is possible to quickly obtain specific information, descriptive statistics, summaries, accurate insights.

EngGPT Learning accelerates the learning process that a learner can benefit from on a given set of topics. The inherent potential of this use case is to help the learner learn, with EngGPT literally assisting the learner and, based on the answers he or she receives, offering information to improve the cognitive gap in relation to a subject.

EngGPT Vision opens up the field to everything related to image processing and analysis. In healthcare, in the study of diagnostic images, it makes it possible to read from a slide of a tissue sample whether certain singularities can be traced back to specific diseases or, again, it has the ability to analyze images and process coded information that a human being would have to process by hand.

EngGPT Data Quality leverages Generative AI to process large volumes of text and numbers, even very heterogeneous numbers, in order to identify data quality problems. It is important to consider the processing of thousands of open-ended questionnaires to search for outliers in the responses, as well as the complex analysis of recurring answers. This includes interpreting the data to propose corrective improvements.

EngGPT Coding serves to assist developers. It also serves real needs in the service of specific verticals that often require knowledge of the origin of portions of code written in languages that may no longer be used but are still vital to the smooth operation of certain critical applications. EngGPT Coding in these cases analyses millions of lines and is able to offer specific indications of how that code operates, even reproducing technical documentation that highlights step by step how specific portions of it operate.

EngGPT Avatar enables the development of three-dimensional avatars and the creation of immersive environments, thus usable with 3D viewers, as well as environments not necessarily immersive but still based on AI-animated avatars. EngGPT Avatar hides an integration of multiple elements of the suite: in addition to the document interaction theme that is provided to the Large Language Model in order to train on a specific knowledge base, it also includes speech-to-text and text-to-speech conversion capabilities, image and video management, and advanced features such as lip-syncing and voice timbre reproduction.



05

Our Case Studies

Our Case Studies



CASE STUDY / ENERGY & UTILITIES

GenAI for data extraction from technical drawings

We developed a system that, by integrating customized models and enhancing GPT4Vision models, allows analyze a technical drawing of a plant and extrapolate its characteristics by entering them into a relational DB. Given a .pdf file containing plant documents as input, the solution extracts the drawing data and the list of components using Machine Learning algorithms, validating them through GenAI models. Using an advanced customized Image Analysis model, the solution automatically recognizes the symbols in technical drawings and indicates whether they are connected.

From the detected symbols and relationships, it then uses a probabilistic system to reconstruct the features and lines that make up the individual control and measurement plant. The resulting solution has streamlined the design and modification process.



CASE STUDY / ENERGY & UTILITIES

EngGPT Data for advanced geographic data analysis

We implemented a virtual assistant based on our proprietary LLM, EngGPT, to facilitate the navigation of huge volumes of geographic and oil well production data.

The assistant was integrated into GIS data visualization dashboards to provide the user with immediate access to the data of interest, facilitating analysis and improving decision-making efficiency.

Through the virtual assistant, the user can obtain relevant information regarding the oil wells' master data, such as location, status and operational history, as well as details on their production, e.g. extracted volumes, efficiency and performance over time.

Using Generative Artificial Intelligence, the assistant is able to understand complex queries and quickly return accurate answers.



CASE STUDY / TRANSPORTATION

Automatic production of documentation from source code

We realized an Artificial Intelligence-based solution to automatically generate documentation of large amounts of code of obsolete languages with the aim of understanding the functionalities and migrating several applications to newer technology.

The programming language in which the application was built, namely COBOL, made AI one of the few alternatives as the client had lost all experts with knowledge of the technology used.

The EngGPT and GenAI algorithms were used to extract relevant information such as operations, tables and reference data from various types of code. At the same time, these algorithms were used to gather contextual information from dozens of hours of videos in which an expert performed a knowledge transfer of the application.





CASE STUDY / HEALTHCARE

EngGPT Data Quality for updating pandemic plans

We implemented an AI-based solution that exploits generative and text-embedding models to contextualize the national preparedness and response plan for possible pandemics. The solution generates a comprehensive list of the topics covered in the various existing pandemic plans and evaluates each plan according to its adherence to them.

In particular, the evaluation of each draft provides feedback on the issues addressed and those neglected, a score indicating deviations from previously entered activities and textual feedback on the wording of the current one.

The solution simplifies the process of writing pandemic plans by the different territorial health agencies and facilitates the identification of key activities to be carried out during the different pandemic phases.



CLIENT STORY / MEDIA & COMMUNICATION

The Digital Twin of Maximo Ibarra: an AI-powered avatar

We have created a Digital Twin of Maximo Ibarra, our CEO, with whom it is possible to interact through a virtual reality avatar that learns and grows over time. This offers a concrete and enjoyable use case to illustrate what artificial intelligence can do and how it can evolve in the future. The avatar is powered by EngGPT and GenAI is applied by exploiting some analytical components to handle human-like voice, movements and expressions.

Thanks to Artificial Intelligence and Natural Language Processing (NLP) technologies, our avatar understands the user's natural language with whom it interacts and reasons. This combination allows harnessing both the general knowledge of a language model and domain-specific expertise, ensuring consistently coherent conversations adaptable to any context.

EngGPT has been trained on Maximo Ibarra's posts on LinkedIn and on company documentation.



RESEARCH PROJECT / MEDIA & COMMUNICATION

TITAN: fighting disinformation with Intelligent Coaching

TITAN is an EU co-funded project that aims at using novel AI techniques to fight disinformation, to support the media professionals and to stop the unintentional sharing and spread of false information.

It empowers people to arrive at their own conclusions about the factual correctness or reliability of an online statement. The intelligent coaching models for assessing disinformation are built by mining arguments to identify disinformation signals contained in the statement through advance Natural Language Processing (NLP) technology, they also incorporate micro-lessons containing media literacy material on fact-checking processes.

The coaching models monitor the progress of users to provide targeted feedback, besides assessing the impact of sharing information through advanced monitoring and news trending of the social media networks.



06 Use Cases looking forward



In Engineering, we believe that creativity is the real driver of change, the ability to imagine new solutions to current challenges and then implement them by combining technological and business skills. We look at what could be done next and not only at what has already been done.

With our customers we are designing several use cases in all sectors to exploit the benefits of GenAI, many of which will soon be consolidated into high-impact projects.

In the Public Administration, GenAI will first of all simplify and improve the relationship with the citizen: for instance, an avatar will facilitate the identification of the most suitable **job offers** for the candidate, help to find even faster the necessary information for a procedure, and access many services without using counter staff.

This technology will greatly boost the **simplification of**



the updating and management of files and documents, saving organizations a lot of time and resources reducing inefficiencies and errors.

Similarly, GenAI will also be able to generate and evaluate multiple **urban development** scenarios, simulating the long-term impacts of infrastructure planning decisions, optimizing public transport routes and timetables based on real-time and forecast demand.

Active citizen participation in political life can be stimulated and supported with multiple solutions, through AI-powered **platforms** that will be able to collect, analyze and synthesize large volumes of input received, providing decision-makers with insights and simulations of potential impacts of proposed policies.

In healthcare, we are developing projects using **synthetic data** that can be used by research, especially rare disease

research, to train AI models and test software without jeopardizing patient privacy. GenAI will also help fill the shortage of diverse medical **imaging data**, increasing the accuracy of diagnostic tools.

Finally, an advanced Generative AI system will be able to develop **precision medicine protocols** that consider the vast complexity of human biology and the ever-growing body of medical knowledge, improving treatment outcomes of complex diseases and identifying new therapeutic approaches for some cases that do not respond to standard therapies.

In the Energy & Utilities sector, the end customer will directly benefit from the advantages brought by GenAI through highly customized **energy saving reports**. Artificial Intelligence will analyze individual energy consumption data, compare it with similar households and incorporate factors such as local weather patterns and

energy prices, generating tailored recommendations and savings forecasts, increasing customer satisfaction and reducing the use of call centers.

Companies in the energy sector, and beyond, will be able to use GenAI-based solutions to facilitate the updating of **compliance documentation**. By analyzing regulatory texts, company policies and operational data, it will be possible to automatically modify these documents according to regulatory changes and generate training material for staff on new compliance requirements, reducing the risk of fines.

In the near future, GenAI will support the design of **energy infrastructures** that are efficient, sustainable and adaptable to emerging needs (power plants, distribution networks and smart grid systems) by analyzing data on emerging technologies, climate projections and energy consumption patterns.



07

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. For over 40 years, through technological innovation, we have been helping to improve the world we live and work in, as described in our case studies, use cases and research projects. We support the constant evolution and growth of all our stakeholders. Every day we devote all our efforts to generating a positive impact on society. 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 center of excellence provides a holistic approach, addressing challenges and opportunities in various sectors, facilitating transformation paths towards a **brighter future.**

OUR LABORATORY R&I DATA&ANALYTICS

Our **R&I Data&Analytics Laboratory**, with more than 100 researchers, faces daily research challenges in the field of AI, advanced data management and complex analyses within distributed and federated digital ecosystems, aiming at the development of the data-driven economy through coordination and participation in numerous national and European research projects.

Research in Eng addresses technological, methodological, engineering and analytical issues typical of big data analysis in an exploratory, predictive, simulative and generative sense. We use heterogeneous and varied sources, with the aim of ensuring the **sovereignty, quality and integrity of data**, protecting it from cyber threats and privacy violations. We study and develop optimal architectural and infrastructural solutions to ensure **efficiency** and **sustainability**.

Our approach puts people and their fundamental rights at the center to realize accountable, transparent, reliable and secure AI solutions in sectors such as Industry, Agriculture, Health, Transport and Critical Infrastructure, Physical Security, Cybersecurity and Defense.

The laboratory works in synergy with the Centers of Excellence and Delivery of the Data & Analytics Business Line and with the company's market structures, in a continuous, two-way process of valorization and transfer of technology, knowledge and relationships. At national and European level, the R&I Data & Analytics Laboratory participates in the main cooperation and governance initiatives, including GAIA-X, IDSA, BDVA-DAIRO and the National HPC Centre. In the context of these collaborations, Engineering brings its experience and expertise in the development of Artificial Intelligence and the data economy.





Challenges and new opportunities

In the coming years, the technological landscape of Generative AI will continue to evolve significantly.

Enterprises will increasingly equip themselves with **GenAI models specific** to a sector or business function, taking advantage of the increased availability of high-performance, commercially usable opensource LLMs.

The ability to easily integrate these models into currently deployed systems will be an accelerator in the digital transformation journey.

New revenue streams will be generated through the creation of specialized software, services, and infrastructure products that foster growth and competitiveness. We will see a significant increase in highly **personalized and proactive AI-based services** in various aspects of life and business. The offering evolution will be linked to significant changes in the **employment landscape**, requiring

investment in workforce and corporate culture reskilling.

The fundamental architectures and capabilities of Artificial Intelligence systems are likely to evolve far beyond our current models, pushing the boundaries of what is possible with it, potentially leading to systems that can generate increasingly complex and nuanced results. In medicine and physics in particular, this technology has the potential to drive important discoveries and lead to **scientific breakthroughs** that will generate positive impacts in the world we live and work in.

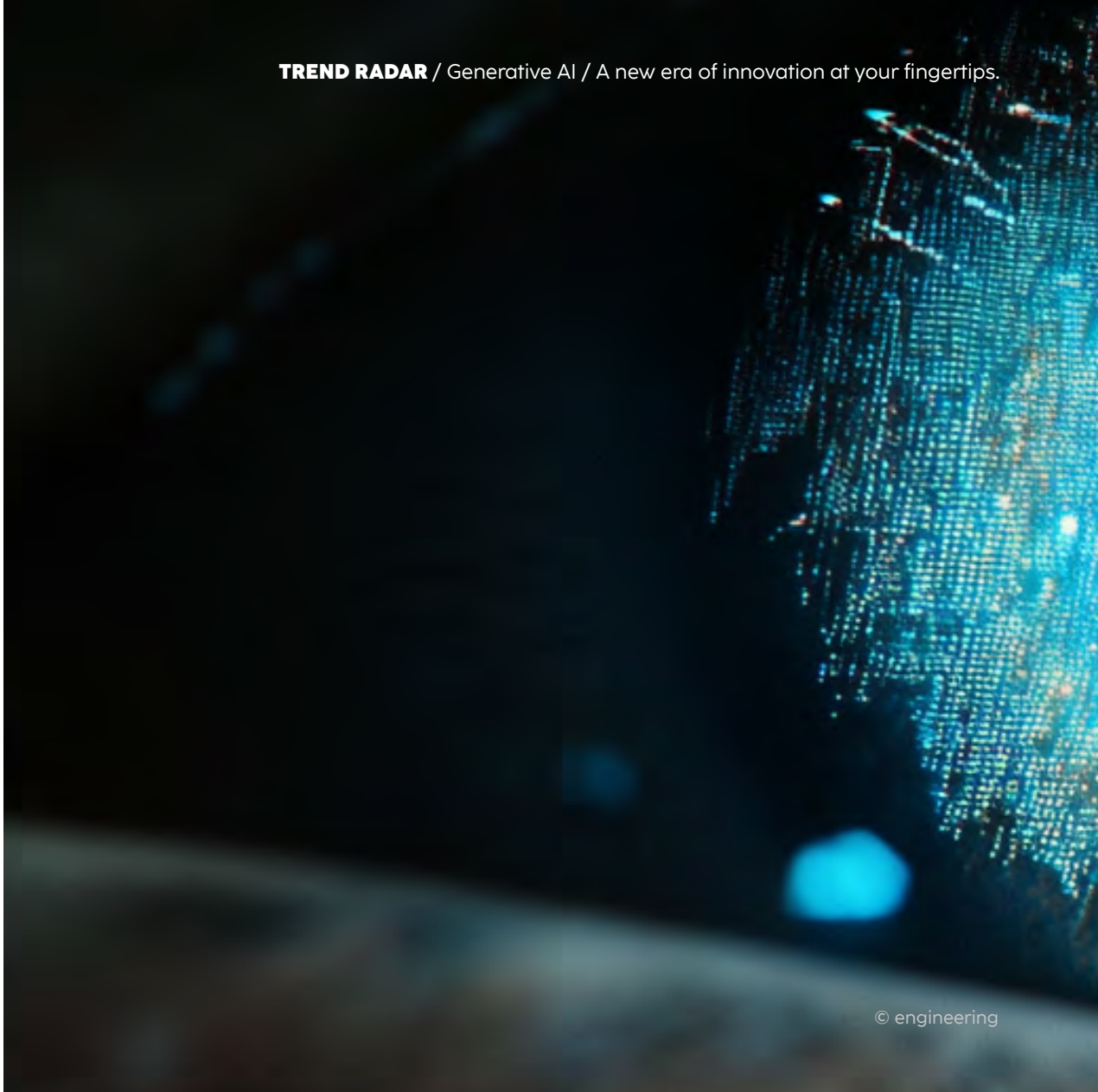
For AI to become a successful engine for organizations, it will remain imperative to address challenges such as inaccurate **data**, lack of maturity in data management capabilities, and difficulty in integrating disparate sources. The quality, management, and fairness of data for AI become crucial issues, requiring a special commitment to the accuracy and relevance of information, by highly skilled teams.



The use of **synthetic data** will steadily increase, enabling information needs to be filled while protecting sensitive data and privacy, reducing bias, and increasing the fairness of algorithms.

To accompany the widespread and pervasiveness of Generative AI solutions in daily life, the priority will remain to ensure **transparency in decision-making systems** and increase interest in **education on AI Ethics**. Issues of managing the risks associated with Artificial Intelligence will remain central, with interventions focused on mitigating bias and promoting good practices in its use aimed at preventing misuse.

Generative AI implementations will also need to be optimized with a view to **environmental sustainability**: incorporating principles of responsible production from the earliest stages of AI model development can significantly reduce the computational resources required and consequently the environmental impact of AI.







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