# KPMG

# Navigating new frontiers

**Transforming governance with Generative AI**

# Executive summary

The emergence of Generative Artificial Intelligence (GenAI) marks a transformative era in various sectors, including healthcare, education, and government. India, recognising the potential of GenAI, has made significant strides in AI investment and policy development. This proactive engagement is evident in the creation of a comprehensive AI ecosystem, aimed at harnessing GenAI's capabilities for national development. However, this technological advancement brings challenges, such as data bias, privacy issues, and ethical concerns. Addressing these challenges effectively requires a strategic approach, focusing on robust governance, ethical AI implementation, and risk management.

## Investment
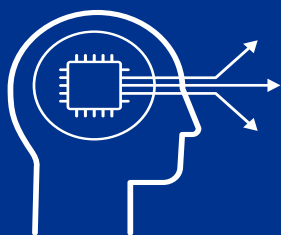
**Foster public-private collaboration:**
Encourage joint ventures between government and private sectors to drive GenAI applications and practical solutions.
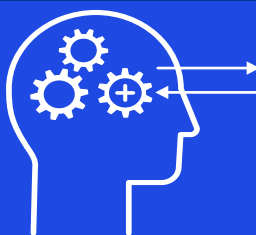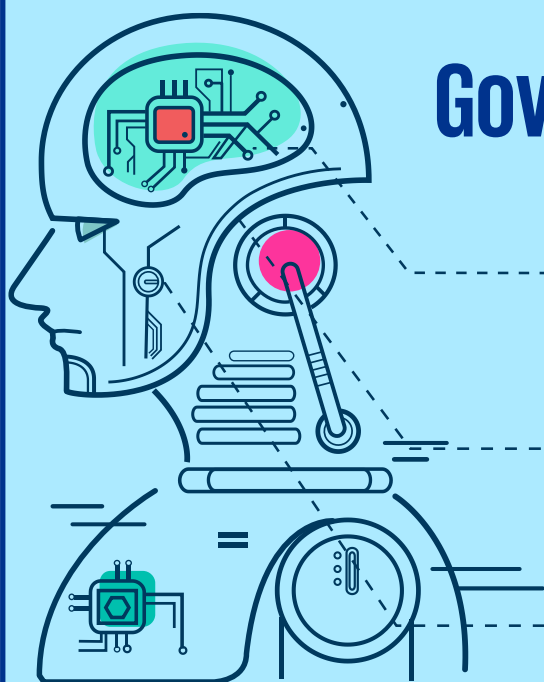
**Support AI education and training:**
Allocate resources for comprehensive AI literacy programmes across various government departments

**Increase AI research funding:**
Boost financial support for GenAI innovation in critical sectors like healthcare and education

## Governance

**Align policies with national goals:**
Ensure GenAI initiatives are in sync with national policies, customising strategies for each department

**Prioritise ethical AI practices:**
Focus on ethical AI deployment, emphasising transparency and accountability in government departments

**Ensure regulatory compliance and monitoring:**
Enforce and continually monitor compliance with national GenAI regulations.

# Manage risk

**Legal and ethical frameworks:** Develop comprehensive guidelines addressing data bias, privacy concerns, and the ethical use of GenAI

**Robust data security and privacy protections:** Implement advanced encryption and regular security audits to safeguard data integrity and confidentiality

**Combating misinformation and deep fake risks:** Address the spread of false information and the risks posed by deep fakes, including impacts on personal reputation, privacy, and national security

**Social division and trust mitigation:** Formulate strategies to reduce social disparities and maintain trust in media and institutions amidst the challenges posed by GenAI

**Financial fraud prevention and legal compliance:** Develop measures to prevent financial fraud and corporate espionage facilitated by deep fakes, ensuring compliance with legal and ethical standards.

The executive summary was generated using CHAT GPT by using following prompt:
"Please provide an executive summary in 100 words. Detailing key findings under three headers: Manage Risk, Investment, and Governance. Each header should include 3-5 bullet points, word count should not exceed 200 words."
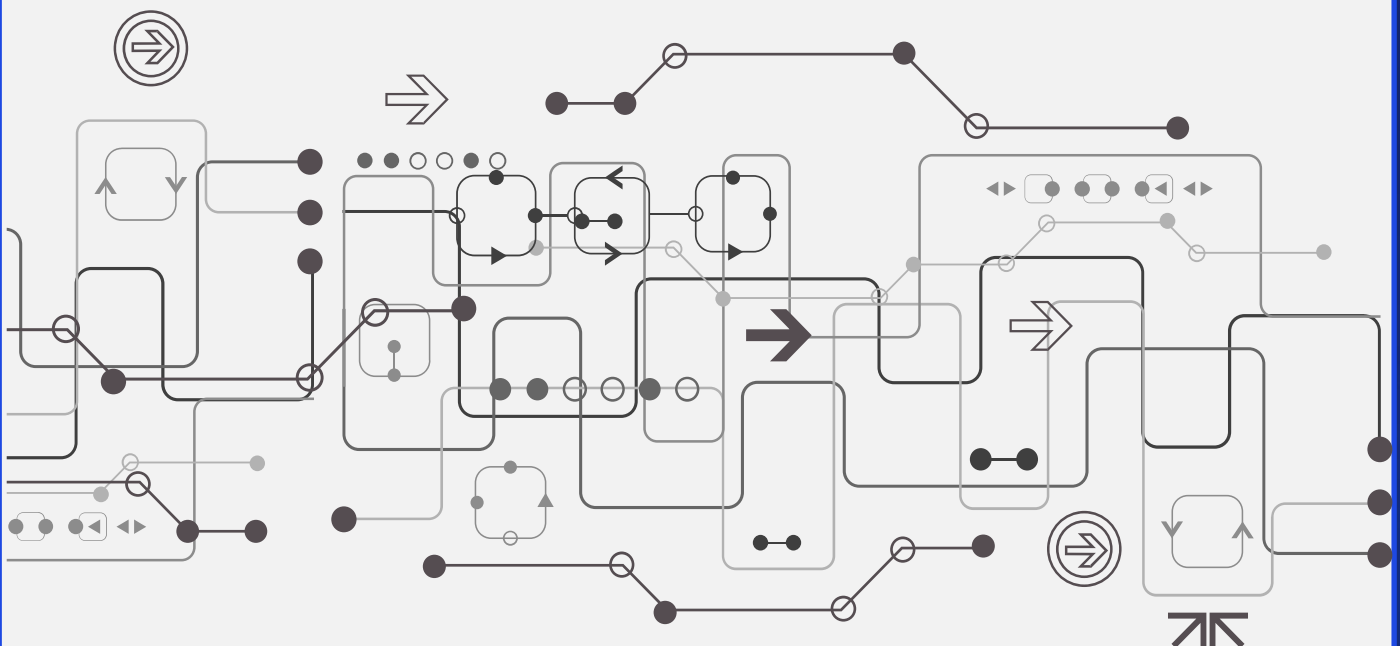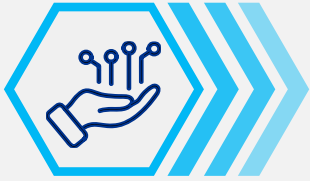
# What is inside

## What are the trends in GenAI?

The section gives a macro picture about the drivers, the trends surrounding GenAI and business value that the technology is opening for the governments.

## How India is gearing up for GenAI revolution

The section introduces the steps Indian government has taken to create an ecosystem to accommodate the new revolution, gives references of other countries preparedness and touches upon gaps that need focus for India.
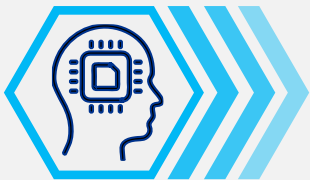
## Understanding the GenAI building blocks

This section paints the overall landscape of Artificial Intelligence, detail out technologies that are powering GenAI solutions and highlight the capabilities of different techniques used in GenAI solutions.

## How can governments take advantage

This section categorises various functions of government departments and tries to show how departments can work together with capabilities of GenAI, to enhance their efficiency in the delivery of their functions.

## What possibly could be concerning?

This section discusses about the risks and threats that governments should expect and be prepared for, to address any potential consequences that could emanate from full driven AI world.

## Governance approach

The governance approach for departments, particularly regarding Gen AI integration, focuses on developing specific frameworks that guide AI's ethical and effective use.
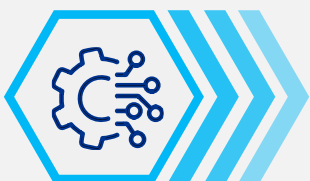
## Charting the future path

This will be the concluding section to recommend steps that government stakeholders may consider at various stages of maturity progression in the adoption of GenAI.

# Emerging trends in generative AI

Generative artificial intelligence (AI) came on to the scene in 2018 with releases of deepfakes closely followed by generative pre-trained transfor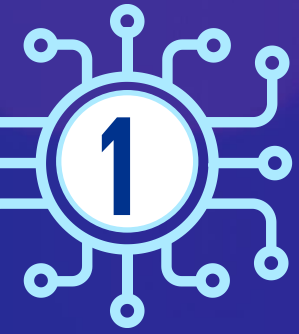mers (GPTs) and other large language models (LLMs). It gained worldwide attention in 2022 with text-to-image generators and advanced GPT models. Generative AI has the potential to revolutionise industries and society. It is part of their broader efforts to make AI more beneficial and inclusive, aiming to impact various aspects of society positively. Sectors such as education, entertainment, healthcare, and scientific research already use it to create individualised and scalable content, automate tasks, generate hypotheses, and improve productivity.
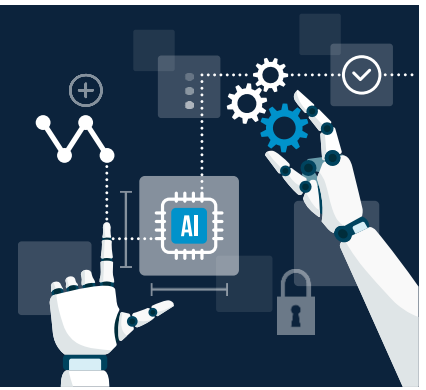
Until recently, private sector investment globally was relatively low. But especially from 2018 onwards, it has increased rapidly. Investments in 2022 were about 30 times larger than just eight years earlier. With current growth trends, the investments are estimated to grow about 1.7 times from 2022 levels to reach > USD (US dollars) 1.5 trillion.

Of the total USD3,042 billion invested globally between 2013-2022, about 10 per cent of the amount was invested in United States (USD248.90 billion). The investment in United States was roughly 3.5 times the amount invested in the next highest country, China (USD13.4 billion). India stands as sixth most preferred destination for AI related investments. During the period 2013-22, India has seen a private investment in AI of USD7.73 billion, which is the second highest among Asian countries after China.

**Figure 1: Private investment in AI by geographic area, 2013–22 (Sum)[1]**
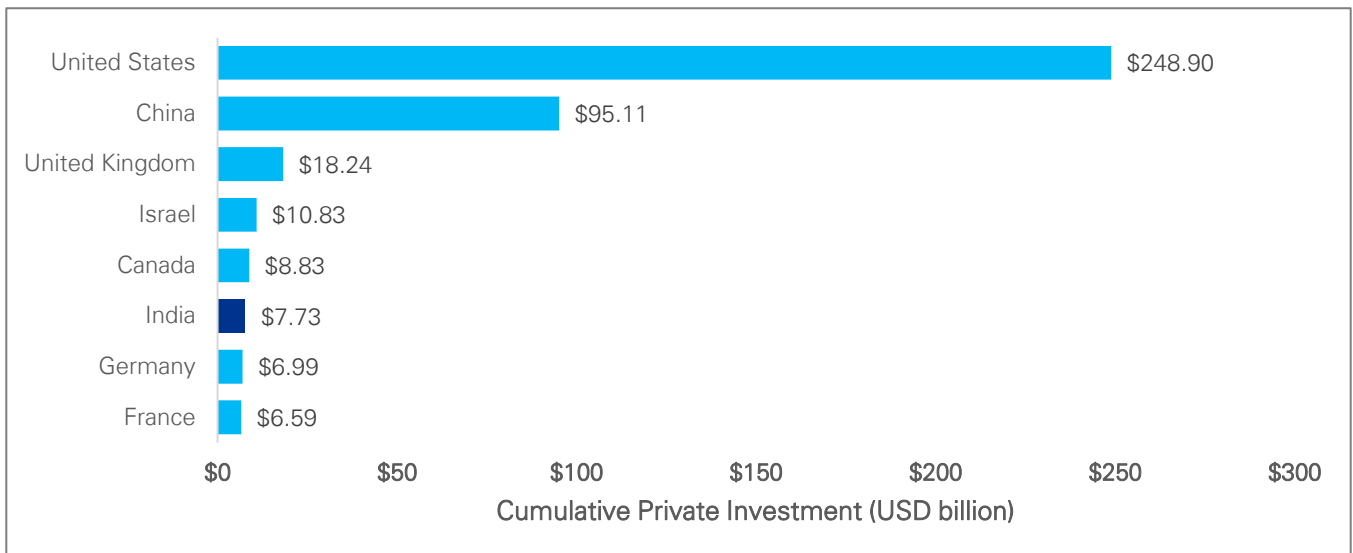


Globally, all the leading nations have a strong local ecosystem where the solutions created are consumed locally. More importantly, AI has the potential to revolutionise the public sector, which runs to serve a large population with minimal financial resources. AI can help government and public sector solve this perpetual dilemma of social good and minimal cost and effort. From the government's perspective, it is important to understand the focus areas in which investment is flowing, to appreciate the sectors that are creating demand for AI.

Between 2017-2022 based on the average quantum of investment - medical and healthcare (USD6.1 billion); data management, processing, and cloud (USD5.9 billion); fintech (USD5.5 billion); cybersecurity and data protection (USD5.4 billion); and retail

(USD4.2 billion) – were the top five focus areas that attracted investors' confidence for AI investments. The size of investment in 2025 from these focus areas is expected to increase 17 times from 2022 levels to reach USD46.27 billion.

India, though, stands sixth in terms of investments in AI, the size of investments compared to the US (United States) and China is negligible. According to a June 2022 report by NASSCOM, AI investments in India grew at a compound annual growth rate (CAGR) of 30.8 per cent, reaching USD881 million in 2021. Also, since India is in the nascent stages of AI development, it is imperative to attract companies focusing on data management, processing, cloud, cybersecurity, and data protection to strengthen our base layers in the overall AI ecosystem.

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1. NetBase Quid, 2022

Generative AI stands apart from other recent innovations for its massive leap in ability and potential breadth of impact across any industry and business function. In March, KPMG launched its global survey report on GenAI[2] to look beyond the hype and understand how enterprises are progressing toward real, meaningful generative AI results. Business leaders are highly interested in the capabilities and opportunities generative AI can unleash and believe it has the potential to reshape how they interact with customers, run their workplaces, and grow their revenue.

**Figure 2: Percentage of business leaders voted for impactful emerging technologies in the next 3 to 5 years**



| 77% | 39% | 31% |
|:---:|:---:|:---:|
| Generative AI | Advanced robotics | Quantum computing |

| 31% | 30% | 29% | 19% |
|:---:|:---:|:---:|:---:|
| AR/VR | 5G technology | Blockchain | Metaverse |

| 17% | 11% | 09% |
|:---:|:---:|:---:|
| 3D printing | Brain-computer interface | Nano technology |
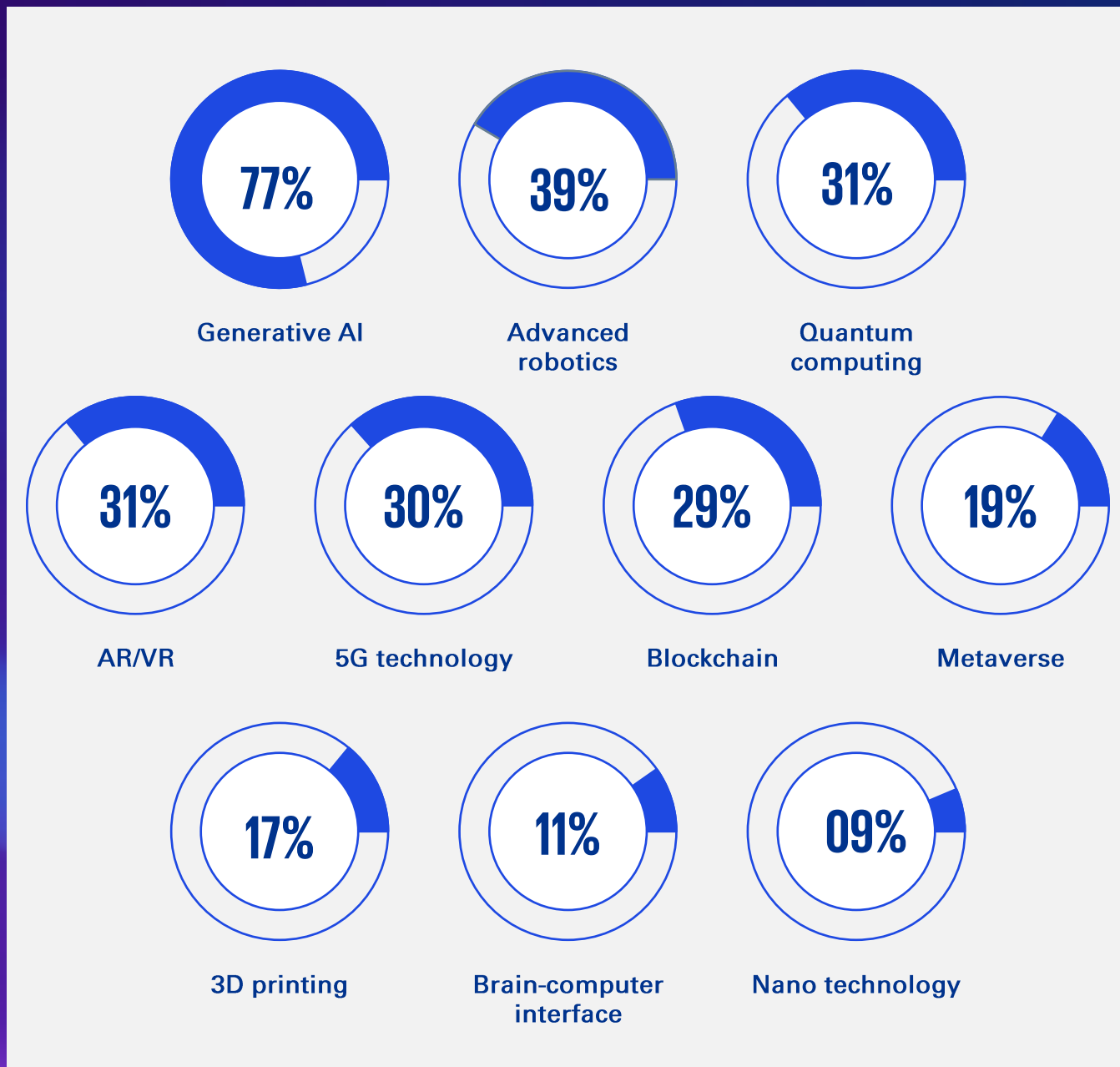
Regardless of sector or function, 77 per cent rank generative AI as the emerging technology that will have the biggest impact on the business over the next three to five years, ahead of other trending technological capabilities such as advanced robotics, quantum computing, augmented reality/virtual reality (AR/VR), 5G, and blockchain.

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2.    Generative AI: From Buzz to business value, 2023

# 2
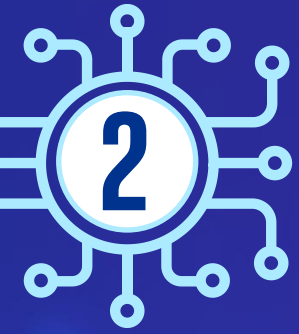
# Gearing up for gen AI revolution

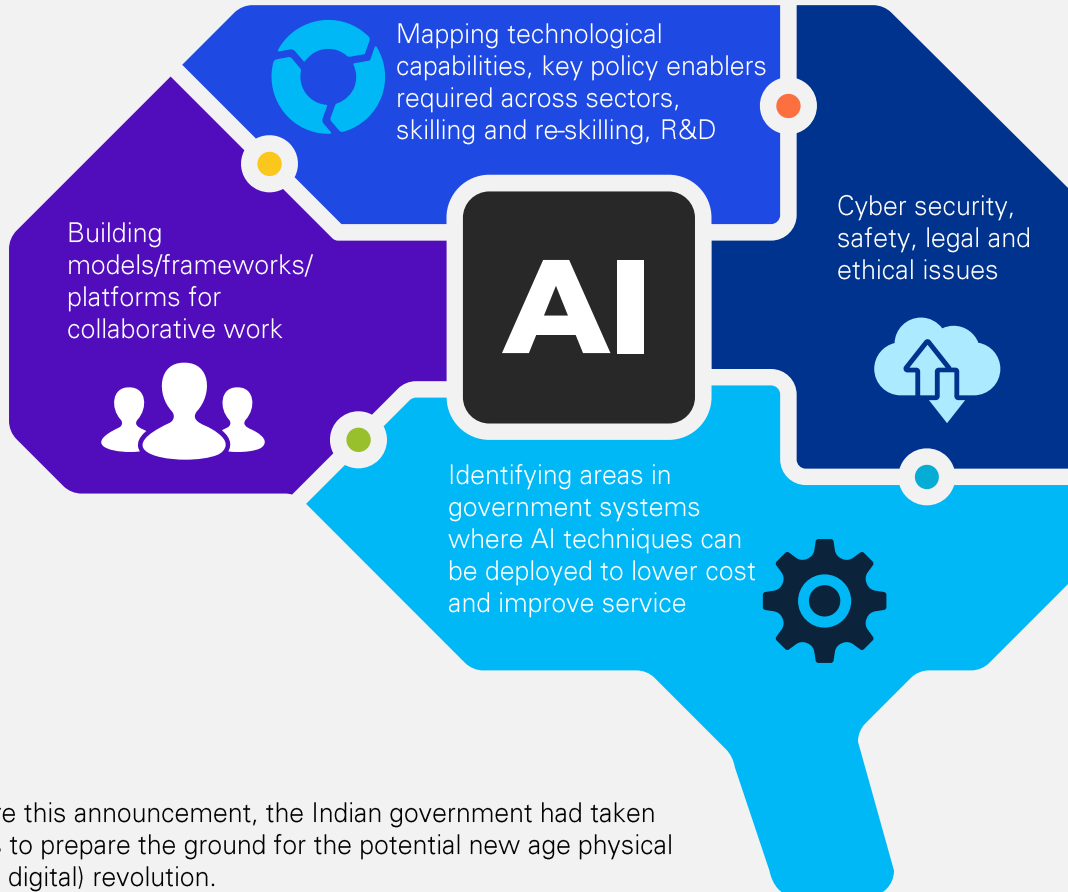According to a study report from Globe Newswire, Artificial Intelligence (AI) spending in India has increased by 109.6 per cent during 2018 to reach USD665 million. Over the forecast period (2019-2025), spending on AI was forecasted to record a CAGR of 39 per cent, increasing from USD1,176.6 million in 2019 to USD11,781.9 million by 2025.

In the 2018-19 budget, the government of India announced its intent to set up the National Programme for AI to guide the research and development of new and emerging technologies.

In view of the possible impact of AI on the economy and society and to come out with a policy framework on AI, MeitY constituted four committees in February 2018, pooling in specialists from academia, industry associations, and government departments, to explore possibilities for creating a comprehensive AI ecosystem that encompasses the following:

**Mapping technological capabilities, key policy enablers required across sectors, skilling and re-skilling, R&D**

**Building models/frameworks/platforms for collaborative work**

**AI**

**Cyber security, safety, legal and ethical issues**

**Identifying areas in government systems where AI techniques can be deployed to lower cost and improve service**

Even before this announcement, the Indian government had taken clear steps to prepare the ground for the potential new age physical (physical + digital) revolution.
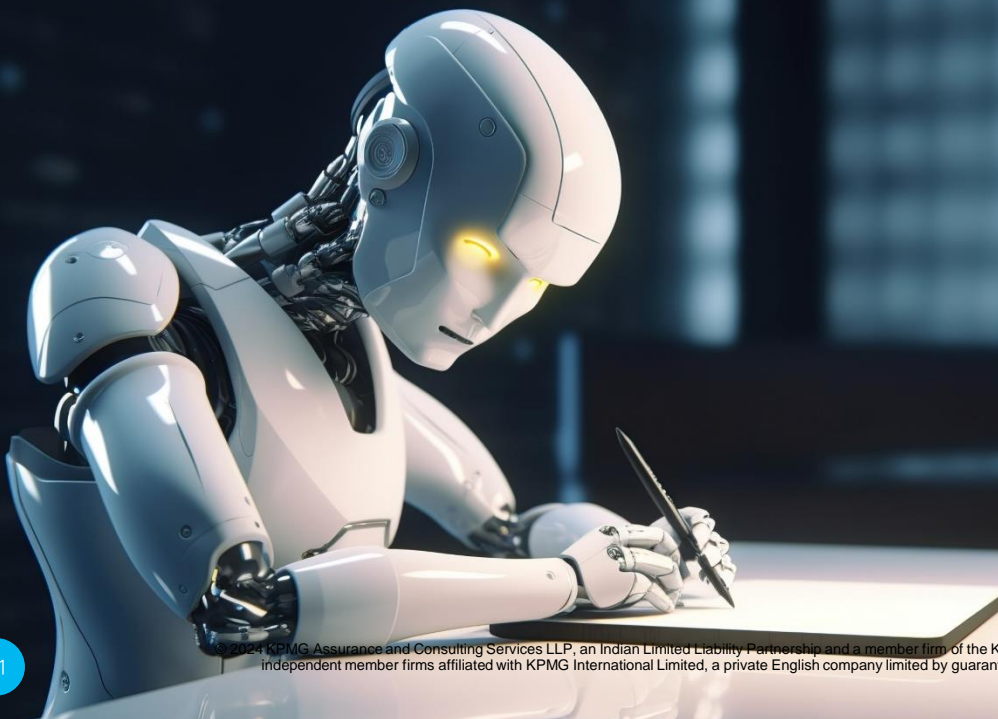
**Figure 3: Timeline of AI-specific interventions taken by the Government of India**

**Oct, 2000**
Information Technology (IT) Act, 2000

**Mar, 2012**
National Data Sharing and Accessibility Policy (NDSAP)

**Jun, 2018**
Launched National Strategy for Artificial Intelligence

**Oct, 2012**
Launched Open Government Data platform

**Mar, 2015**
Started National Supercomputing Mission

**Feb, 2018**
MeitY constituted the four committees to study AI possibilities
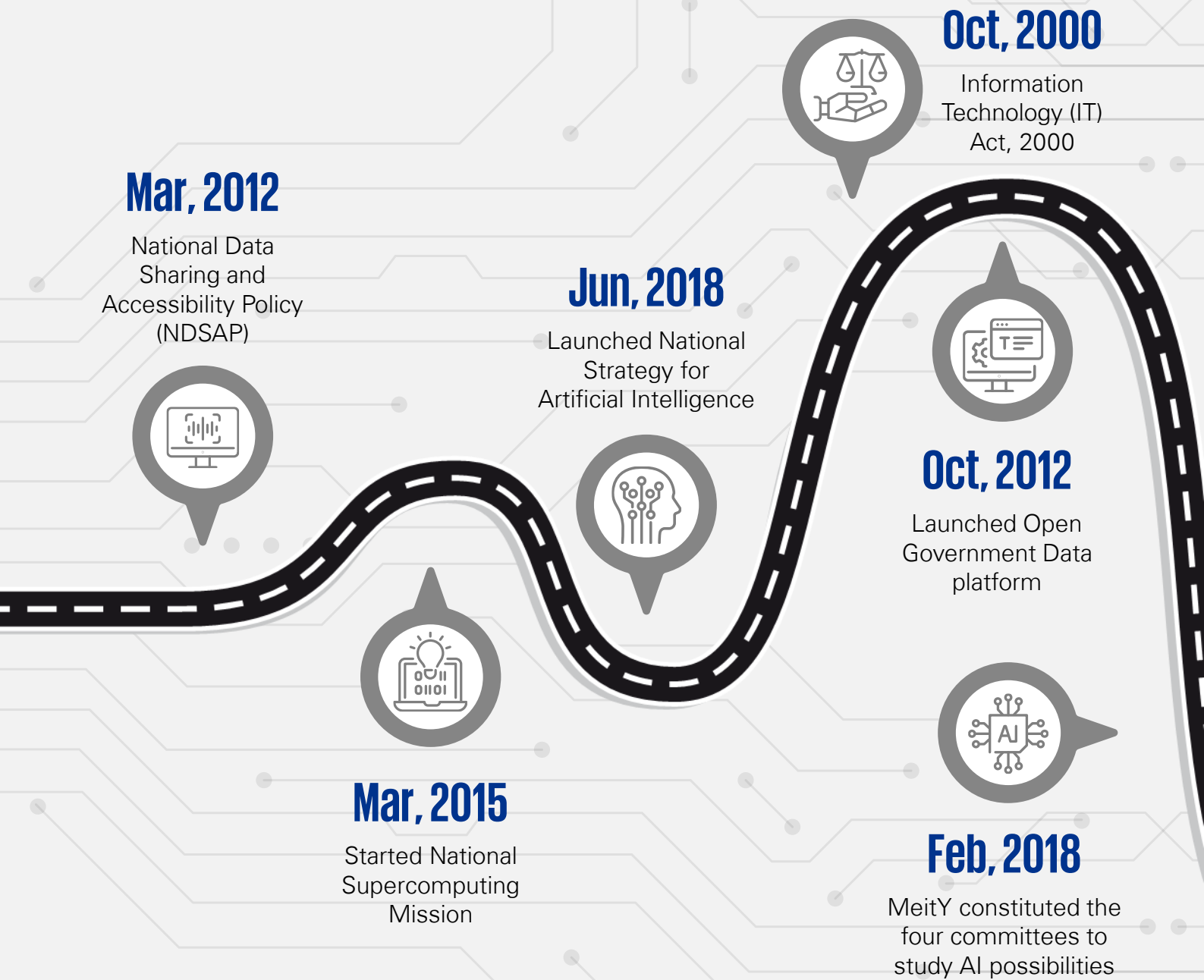
## Oct, 2023

Seven expert working groups of MeITY submitted 1st edition of India's vision for development of AI pillars

## May, 2022

released the Draft National Data Governance Framework Policy

## May, 2020

Launched National AI Portal, 'INDIAai'

## Dec, 2020

Launched National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)

## Mar, 2019

Launched Natural Language Translation Mission

India's focus on data safety, security, and standardisation early on, has led to release of IT (Information Technology) Act, 2000 notified in October 2000, followed by release of National policy on Data sharing and Accessibility policy (NDSAP) in 2012. The two policies have resulted in the launch of Open Government Data platform, which combines and expands the best features of India government's India.gov.in and the U.S. government's data.gov project.

Launched in 2015 by the Ministry of Electronics and Information Technology, the National Supercomputing Mission (NSM) aimed to set up 73 supercomputers across India by 2022, targeting a combined power of over 64 petaflops. Under this mission, C-DAC spearheaded the development of an indigenous supercomputing ecosystem, resulting in the creation of the compute server 'Rudra' and the high-speed interconnect 'Trinetra'.

In March 2019, the Office of the Principal Scientific Adviser announced nine National S&T Missions based on recommendations from the Prime Minister's Science, Technology, and Innovation Advisory Council (PM-STIAC). One of these missions, Bhashini - the National Language Technology Mission (NLTM), was officially launched by the Prime Minister in July 2022. Bhashini is a government platform designed to make Artificial Intelligence (AI) and Natural Language Processing (NLP) resources widely accessible as digital public goods, primarily to benefit Indian MSMEs, startups, and individual innovators.

The first edition of the 'IndiaAI 2023: Expert Group Report' was submitted in October 2023. This report presents a comprehensive strategy for India's AI development, focusing on infrastructure, data management, and skill enhancement, with a goal to strengthen India's position in AI through public-private partnerships. In essence, India has frameworks and policies for data standardisation, data securitisation, capabilities to develop High Performance Analytics & Computing (HPAC) infrastructure, institutional mechanisms in place to steer and drive AI related mission mode projects. The Government of India's approach to AI has been holistic and ambitious, as evidenced by the breadth and scope of government interventions under the umbrella programme – IndiaAI. The landscape of Generative AI, however, is different from general automation or digitisation efforts and hence a definitive boundary needs to be defined and specific building blocks of Generative AI systems need to be understood to create a more comprehensive ecosystem.
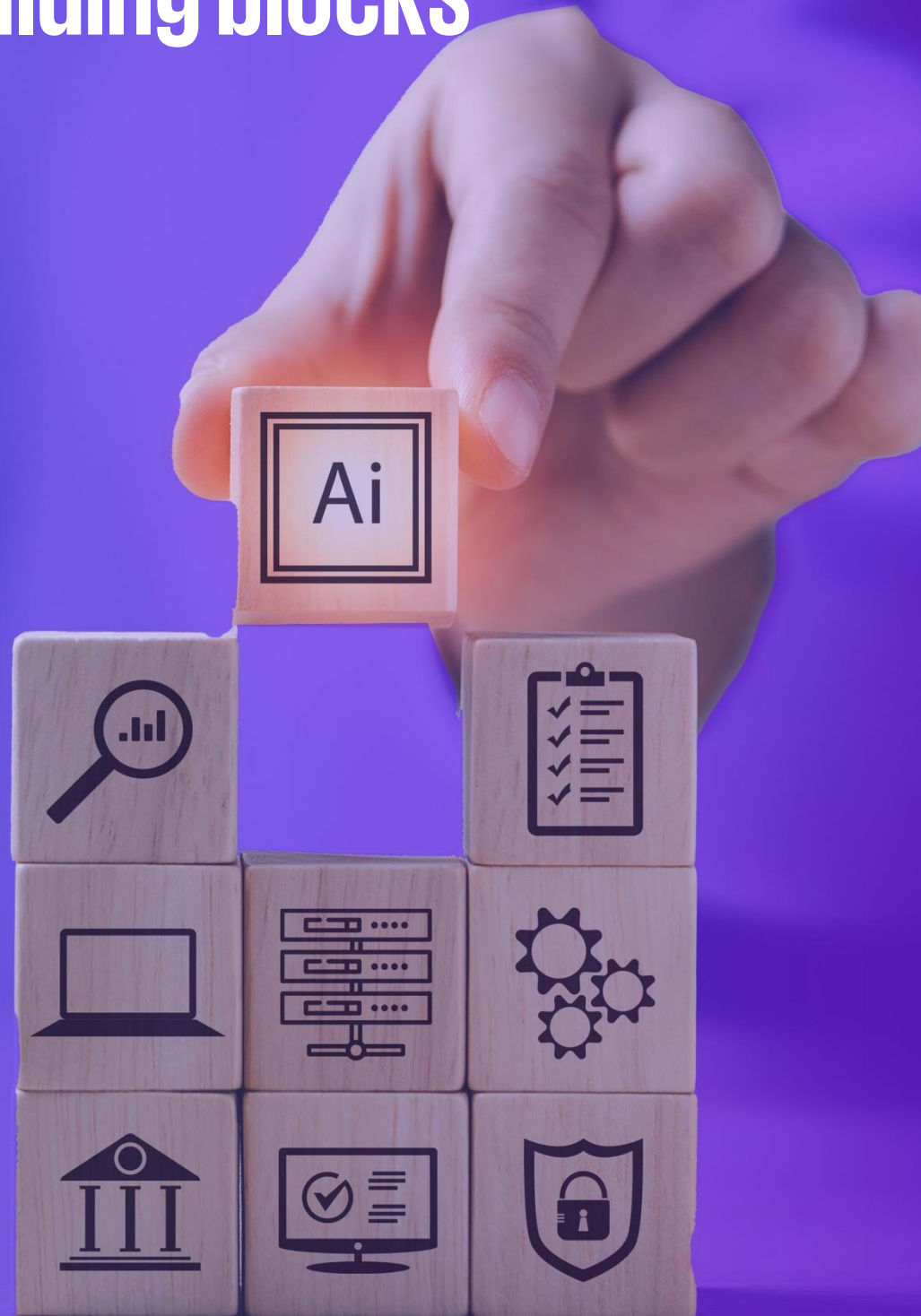
Moreover, there is also a need to evaluate the effectiveness of each of the interventions that have been started, to do a course correction based on the trends that evolved after the launch.

# Understanding the generative AI building blocks

As we delve deeper into the AI landscape, we must acknowledge and understand its distinct forms. In this section, we try to understand what differentiates Generative AI from traditional AI, the building blocks of Generative AI and discuss on various models of GenAI and their capabilities.

Traditional AI, often called Narrow or Weak AI, focuses on performing a specific task intelligently. It refers to systems designed to respond to a particular set of inputs. These systems can learn from data and make decisions or predictions based on it.

Generative AI, however, can be thought of as the next generation of artificial intelligence. It is a form of AI that can create something new from the information we give to it. Generative AI models are trained on a set of data and can learn the underlying patterns to generate new data that mirrors the training set.

While traditional AI and generative AI have distinct functionalities, they are not mutually exclusive. Generative AI could work in tandem with traditional AI to supply even more powerful solutions. For instance, a traditional AI could analyse user behaviour data, and a generative AI could use this analysis to create personalised content[3].
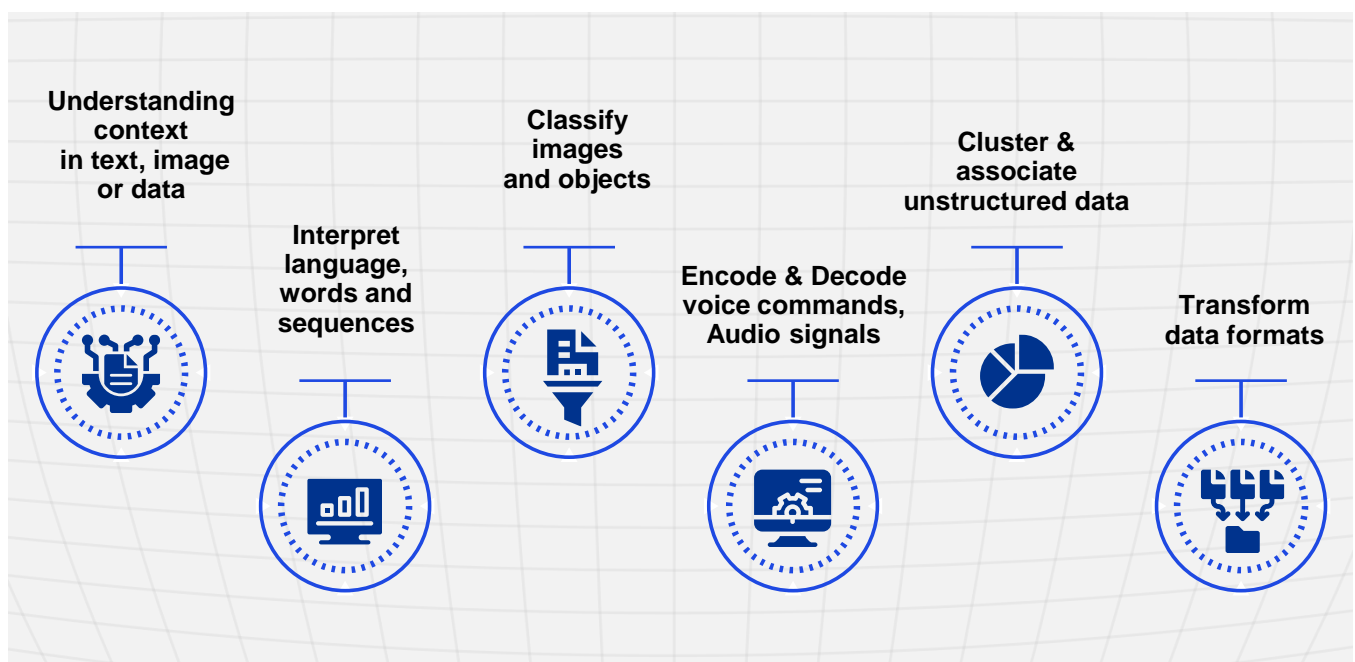
## 3.1. Capabilities of Generative AI models

1. **Interpret language:** Language-based generative models are called large language models (LLMs). Large language models (LLMs) are used not just for translation of languages, as popularly believed, but can be used for a wide variety of tasks, including essay generation, code development, translation, and even understanding genetic sequences.

2. **Generate audio/speech:** Music, audio, and speech are also appearing fields within generative AI. Examples include models being able to jot down crucial information as the users talk over call/in meeting or take voice commands from user to perform tasks. In the music and entertainment industry, models are also being used to develop songs and snippets of audio clips with text inputs, recognise objects in videos and create accompanying noises for different video footage, and even create custom music.

3. **Infer visual data:** One of the most popular applications of generative AI is images. Generative AI models can create graphs that show new chemical compounds and molecules that aid in drug discovery, create realistic images of city layouts or building structures for virtual or augmented reality, enhance or edit existing images for crime patrolling and vehicle detection.

4. **Synthesise missing data:** In AI training, synthetic data proves invaluable for scenarios lacking sufficient real data. Generative AI models efficiently reduce labeling costs, either by augmenting existing training data or by learning data representations that minimise the need for extensive labeled datasets. These models can reconstruct images, like restoring a damaged building's original structure or enhancing blurred crime scene photos to high-definition, demonstrating their potential in addressing complex, data-deficient challenges in thought leadership contexts.

**Figure 4: Capabilities of GenAI models**



Understanding context in text, image or data

Interpret language, words and sequences

Classify images and objects

Encode & Decode voice commands, Audio signals

Cluster & associate unstructured data

Transform data formats

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3.    The Difference Between Generative AI And Traditional AI: An Easy Explanation For Anyone, Forbes, Bernard Marr, 24th July, 2023

## 3.2. Understanding Generative AI landscape

As policymakers begin to regulate AI, it will become increasingly necessary to understand the value chain, stakeholders involved and their contribution in the value chain.

There are four basic elements that build the ecosystem for Generative AI landscape
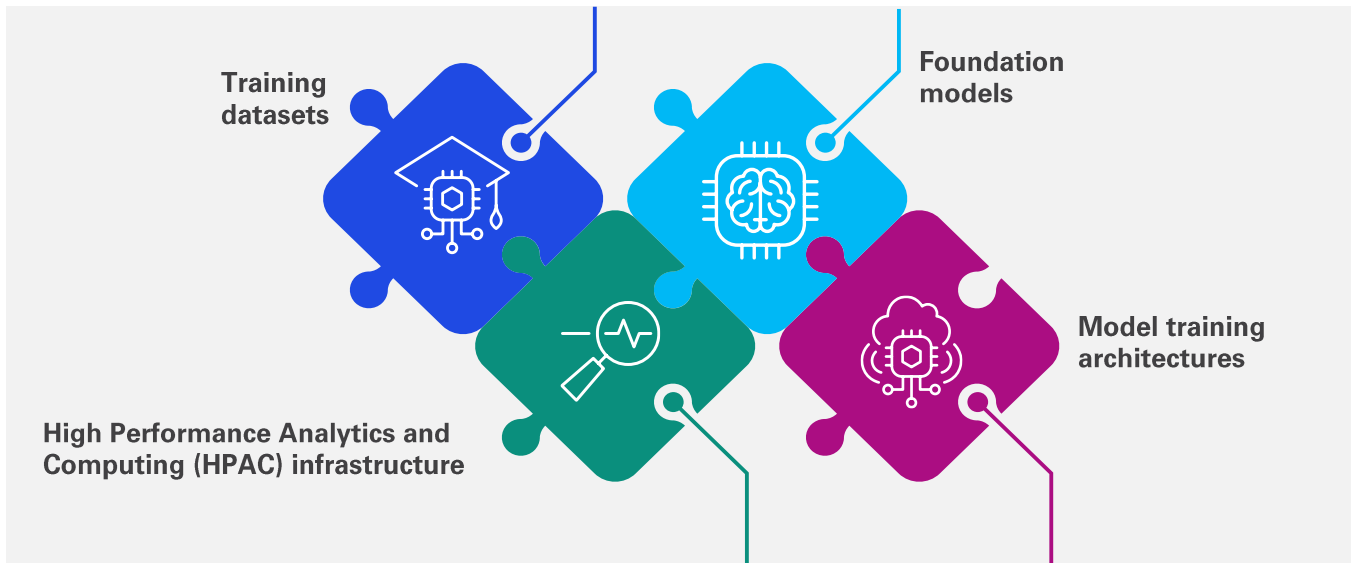


### 3.2.1. Training datasets

Data constitutes the raw material for training foundational models for GenAI. Before data can be used in AI applications, it often needs to be processed - cleaned, transformed, and structured.

#### Collecting the right data

involves defining the problem statement and identification of parameters needed to study the problem. This allows us to identify sources for data and classify data formats.

#### Accurate data annotation

involves labeling the data to make it machine-readable. Ensuring the annotation quality is paramount to ascertaining the overall quality of the training data.
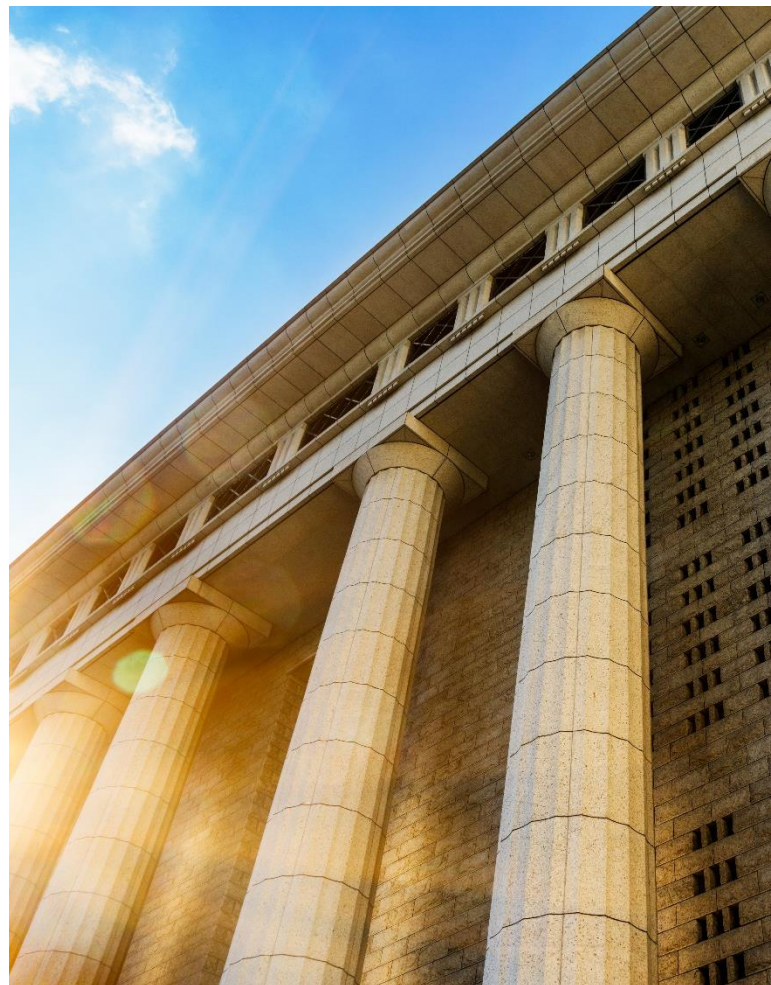
#### Data preprocessing

involves enhancing and cleaning the data to improve the overall quality and relevancy of the whole dataset. Pre-processing can be diverse in that it includes removing errors, gaps, adjusting length of data tables, etc.

Without quality data, machines and deep learning models cannot perform the required tasks and mimic human behaviour.

### 3.2.2. Foundation models

Foundation model is an algorithm, which is trained using large volumes of structured or un-structured data, to understand the properties of the data using deep-learning or neural networks techniques. The term 'Foundation Models' was coined by The Stanford Institute for Human-Centered Artificial Intelligence's (HAI) Center for Research on Foundation Models (CRFM) in 2021. CRFM describes foundation models as customised models that can perform specialised tasks such as language translation or code generation, etc.

"Any model that is trained on broad data (generally using self-supervision at scale) that can be adapted (e.g., fine-tuned) to a wide range of downstream tasks."

A unique feature of foundation models is their adaptability and self-learning capability. The size and general-purpose nature of Foundation Models make them different from traditional machine learning models, which typically perform specific tasks, like analysing text for sentiment, classifying images, and forecasting trends.

For example, 'Llama 2', an open-source large language model (LLM) developed and released in July 2023. It uses the data on which it was trained, to understand word meanings and intent, and then generates output accordingly. Its base version wasn't primarily trained for simulating human-like conversations, making it less apt for natural language dialogue.

But developers/innovators can take the base version of LLM and train it further with different languages or with code specific datasets with little tuning of parameters to create customised models that can perform specialised tasks such as language translation or code generation, etc.

### 3.2.3. Model training architectures

Generative AI is different from narrow AI, which is rule based. Instead of relying on explicit rules, Generative AI models learn from the data and generate new content by capturing underlying patterns and relationships within the data. To give this self-learning capability to AI models, developers leverage neural network-based training architecture.

There are task driven architectures that use labeled data to help AI perform certain tasks and to predict a predefined outcome. This is called supervised learning. There are data driven architectures that use unlabeled data and force AI to create its own categories based on certain trends and patterns in the data. This is called unsupervised learning. Further, there are environment-driven architectures, where AI uses interactions from environment by getting positive or negative feedback and does course correction to increase gains. In this iterative process, the model becomes better at predictions. This is called reinforced learning.

There are multiple ways to teach AI for the system to extract essence from different file formats, each with its own benefits and uses. Generative AI models are innovative tools designed to create new data, mimicking real-world examples. Among the key types are:

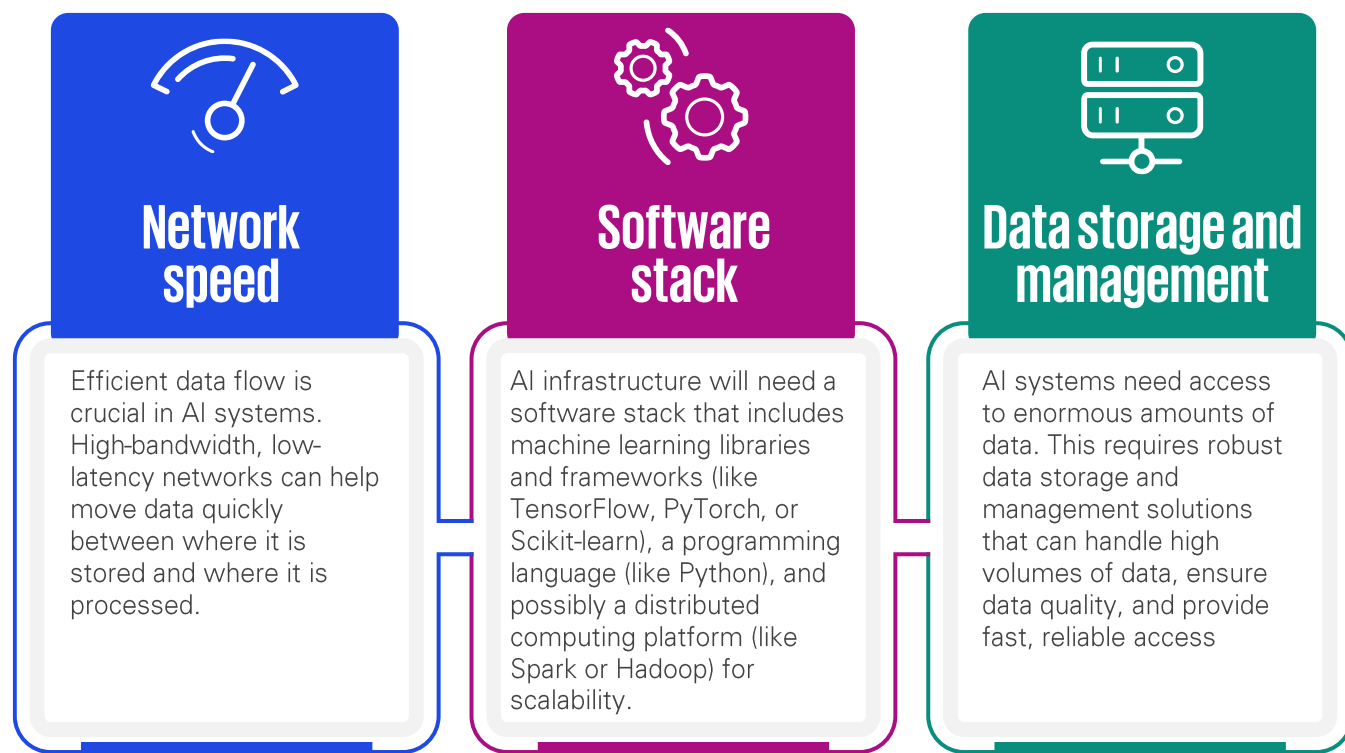| | | |
|---|---|---|
| | **01** | Generative Adversarial Networks (GANs), which consist of two parts: one generates new data and the other evaluates it, together improving to produce realistic outputs. |
| | **02** | Variational Autoencoders (VAEs) transform data into a simpler format and then reconstruct it, aiding in image generation and similar tasks |
| | **03** | Flow-based models excel in detailed data modeling with precise transformations |
| | **04** | Diffusion models are renowned for generating high-quality images and audio by gradually removing noise from data |
| | **05** | Transformer-based models like BERT and GPT are pivotal in understanding and generating human-like text, revolutionising natural language processing. |

These diverse models are instrumental in pushing the boundaries of AI capabilities. Each model's unique structure and approach to processing language data underpin their wide-ranging applications in the field of AI.

### 3.2.4  High Performance Analytics and Computing (HPAC) Infrastructure

AI applications require enormous amounts of data for training and validation. A reliable data storage and management system is necessary for storing, organising, and retrieving this data. This could involve databases, data warehouses, or data lakes, and could be on-premises or cloud-based.

AI workloads, especially deep learning, are computationally intensive and often benefit from specialised hardware. Graphics processing units (GPUs) are typically used for these tasks due to their parallel processing capabilities. Depending on application needs, developers also consider using tensor processing units (TPUs), or other specialised AI accelerators.

Infrastructure does not include just the processing capacity of super computers but also includes:

| Network speed | Software stack | Data storage and management |
|---|---|---|
| Efficient data flow is crucial in AI systems. High-bandwidth, low-latency networks can help move data quickly between where it is stored and where it is processed. | AI infrastructure will need a software stack that includes machine learning libraries and frameworks (like TensorFlow, PyTorch, or Scikit-learn), a programming language (like Python), and possibly a distributed computing platform (like Spark or Hadoop) for scalability. | AI systems need access to enormous amounts of data. This requires robust data storage and management solutions that can handle high volumes of data, ensure data quality, and provide fast, reliable access |

AI's evolution promises to reshape the workforce landscape, simultaneously phasing out certain jobs and forging new career paths in uncharted territories. Its capacity to streamline decision-making and amplify business efficacy through sophisticated data analysis is unparalleled. However, this paradigm shift calls for a workforce adept in harnessing AI's insights. Integrating Generative AI's fundamentals into thought leadership equips policymakers and advisors with a crucial toolkit. It enables them to envisage its practical implications in the public and developmental arenas, preempt challenges in its widespread integration, and discern the critical stakeholders necessary for informed decision-making and policy formulation.

# 4

# How can governments take advantage

## Possible use cases

- **Legislative analysis and policy formation:**

Text summarisation can be instrumental in analysing vast volumes of legislative documents, parliamentary debates, and policy papers. By condensing lengthy documents into concise summaries, government officials and policymakers can swiftly extract key insights, identify recurring themes, and comprehend intricate legislative language. This aids in expediting the policy formulation process, enabling a comprehensive understanding of proposed bills and debates. For instance, summarising parliamentary discussions on agricultural reforms or healthcare policies could assist in efficiently grasping diverse perspectives, thereby facilitating informed decision-making by the Indian government.

- **E-Governance and citizen services:**

In the realm of e-governance, text summarisation can enhance citizen services and accessibility to government information. By summarising complex legal texts, notifications, or official circulars into easily digestible formats, government websites and portals can offer succinct versions alongside the original documents. This empowers citizens with quick access to critical information, fostering transparency and ensuring widespread comprehension. For example, summarising legal provisions related to tax reforms or citizen entitlements enables better public awareness and compliance, fostering a more informed and participatory society.

- **Automating meeting minutes:**

In the domain of the Indian government sector, leveraging text summarisation algorithms on call and meeting recordings offers an innovative approach to streamline the arduous task of generating meeting minutes. This transformative technology swiftly distills lengthy discussions, resolutions, and action items from recorded meetings into concise and structured summaries. By automating the process of creating meeting minutes, text summarisation significantly reduces the time and effort previously required for manual transcription and summarisation. These succinct summaries ensure easy accessibility to critical information for government officials and stakeholders, fostering better understanding, alignment, and accountability. Through this implementation, the Indian government can efficiently document key discussions, decisions, and action points, promoting transparency and facilitating efficient governance across various departments and administrative levels.

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**European Union's Generative AI Adoption: Transforming text summarisation**

The European Commission within the EU has embraced generative AI for text summarisation, utilising it extensively for policy analysis[4], legal document review, and handling extensive legislative materials. This integration enables the efficient distillation of voluminous textual data into concise and coherent summaries, expediting decision-making processes and aiding in comprehensive understanding. Additionally, the Commission leverages these technologies to manage copious reports, guidelines, and public feedback[5], aligning with its commitment to leveraging technological advancements for enhanced policy development, legislative procedures, and citizen engagement across diverse operational domain.

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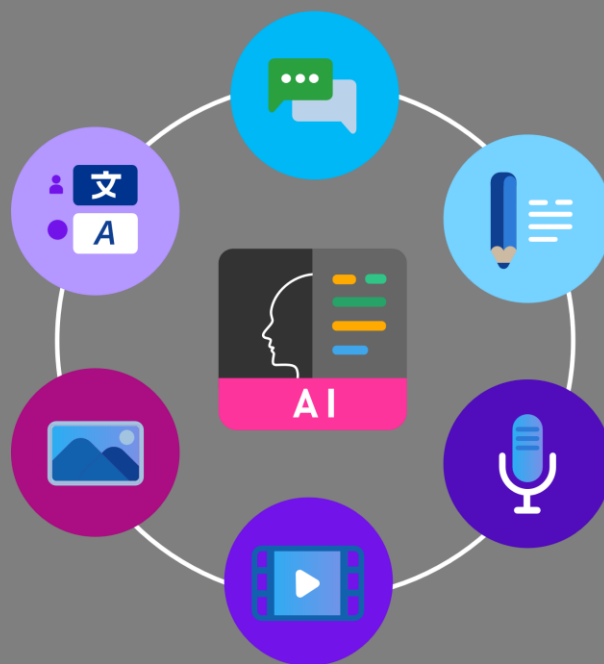
4.    Language Technologies & Multilingualism, European commission

5.    Digital Europe Programme Language Tools, European commission

Every department has a set of roles and functions such as verification/validation of beneficiaries, vigilance/inspection of anomalies, planning/preparing for uncertainty, optimising utilisation/allocation of man and material – all of which require efficiency and resources for better productivity and outcomes.

Generative AI can offer solutions in each of the functions, and the departments can exploit the use cases already in implementation or develop new pilots in areas where there is a potential for adoption. Departments hold enormous amounts of data in different file formats including PDF, images, JSON, Excel sheets, audio recording, video recording, satellite imagery.

All the file formats can be the input data for AI models in the initial training phases. Once the models get trained, departments can ask queries (called prompts) to the AI application either as a voice command, text or show image or video or even upload Excel, PDF,
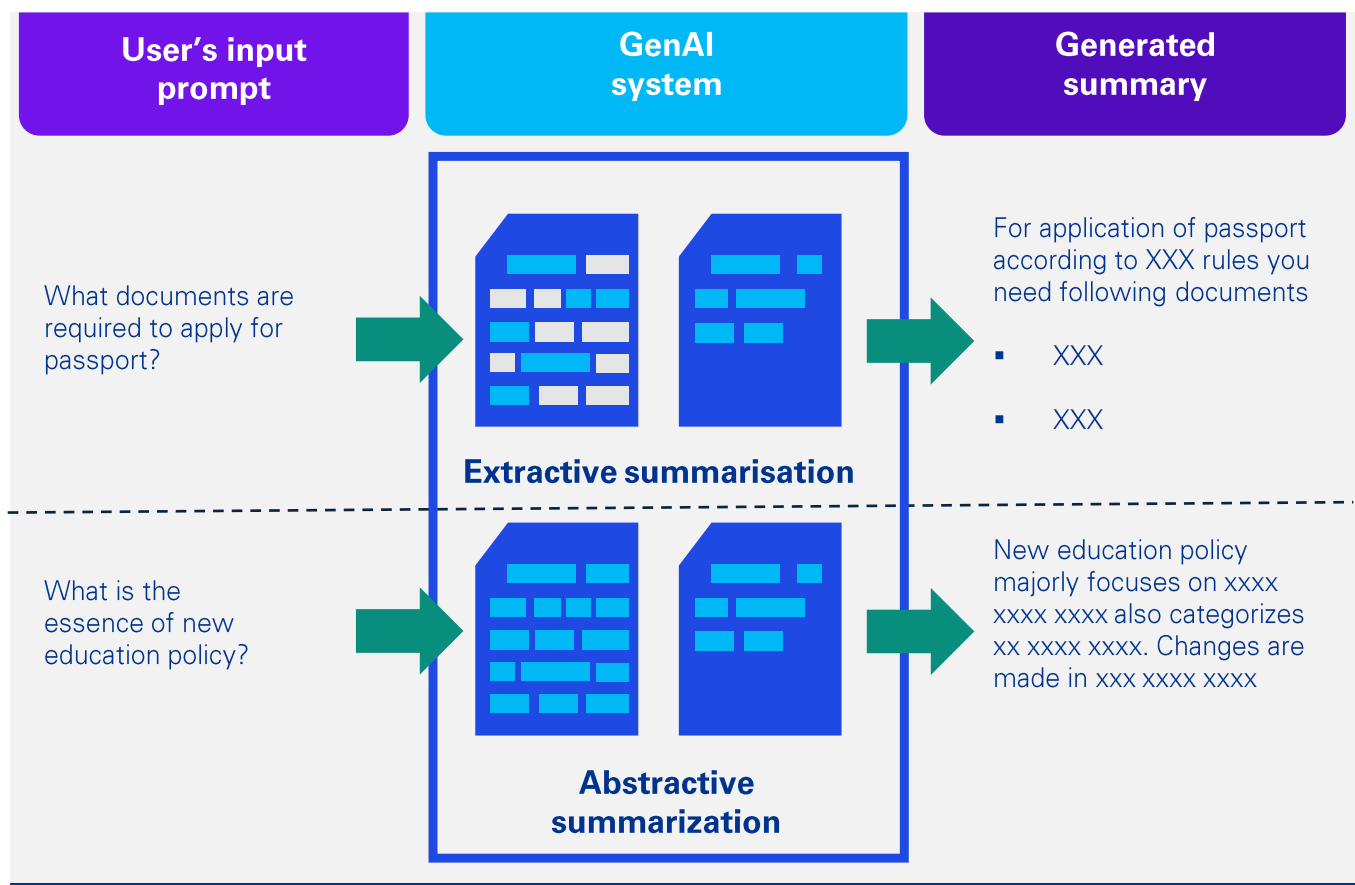
images. The application can understand the prompt and generate new content that looks like the data it was trained on.

There are different areas of application of Generative AI as detailed below and each application area can offer unique advantage to different departments in administering their duties –

## 4.1. Text summarisation

Generative AI models can generate new sentences that are not directly copied from the source text, but rather express the main ideas in their own words. When given a prompt to the system, the system fetches relevant document and based on the query type, it picks relevant sentences from the reference document and assigns weights to each sentence. Based on the output type expected whether plain summary (abstractive) or analysis-based summary (extractive), the system can re-group the sentences and output text that has highest weight.

**Figure 5: Representative model of GenAI Text summarisation function**



| User's input prompt | GenAI system | Generated summary |
|---|---|---|
| What documents are required to apply for passport? | **Extractive summarisation** | For application of passport according to XXX rules you need following documents<br><br>▪ XXX<br><br>▪ XXX |
| What is the essence of new education policy? | **Abstractive summarization** | New education policy majorly focuses on xxxx xxxx xxxx also categorizes xx xxxx xxxx. Changes are made in xxx xxxx xxxx |

## 4.2. Language translation

GenAI uses Transformer model to extract features for each word using attention mechanism to know the importance of each word in the sentence. The input need not necessarily be in the form of text command but can also be a voice command or upload of a book. The encoder and decoder combination in the AI model will help the systems to translate from one language to another. The output can also be in various forms, it can be plain display of text or read aloud audio or interactive voice.

**Figure 6: Representative model of GenAI language translation function**



| User's input prompt | GenAI system | | Translated output |
|---|---|---|---|

ENCODER

HOW
ARE
YOU
?

HOW (02)
ARE (85)
YOU (12)
? (54)

WORD TRANSLATOR

**DECODER MODULE**

आप (13)
हैं (09)
कैसे (72)
? (33)

SEQUENCE ORDER

आप
कैसे
हैं
?

| 77 | where | → | कहां | 20 |
|---|---|---|---|---|
| 12 | you | → | आप | 13 |
| 26 | bird | → | पक्षी | 42 |
| 85 | are | → | हैं | 09 |
| 37 | fly | → | उड़ | 56 |
| 92 | present | → | रहा | 28 |
| 02 | how | → | कैसे | 72 |
| 44 | What | → | क्या | 84 |

**English-Hindi Dictionary**
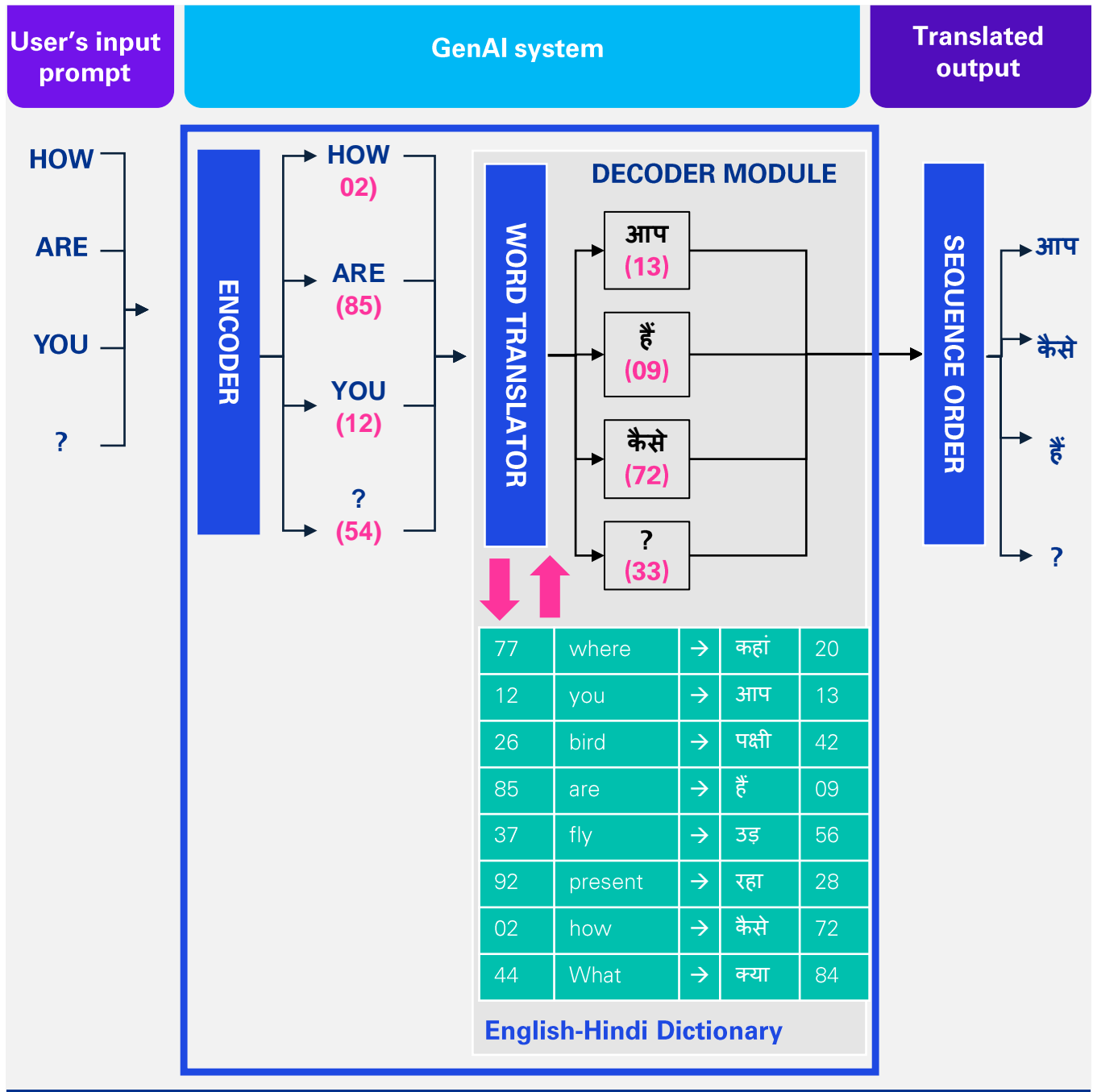
## Possible use cases

- **Multilingual governance and communication:**

India is a linguistically diverse nation with a multitude of languages spoken across its states and regions. Generative AI-powered language translation can facilitate seamless communication between government bodies, officials, and citizens who speak different languages. By employing advanced translation models, government agencies can efficiently translate official documents, public service announcements, or policies into various regional languages, ensuring broader accessibility and understanding among diverse linguistic communities. For instance, translating government welfare schemes, healthcare information, or legal documents into regional languages enhances inclusivity and citizen engagement, promoting equitable access to crucial information and services across the country.

- **Tourism promotion and information dissemination:**

Language translation plays a pivotal role in promoting India's tourism industry and disseminating information to global tourists. Generative AI-based translation tools can translate travel guides, tourism websites, or informational brochures into multiple languages, catering to international tourists who speak different languages. Moreover, providing multilingual assistance, such as translated signage, audio guides, or mobile applications, enriches the travel experience for visitors exploring India's diverse cultural heritage and attractions, thereby fostering a welcoming environment and boosting the tourism sector.

**AI-powered translation at the United Nations:**

Generative AI for language translation has significantly impacted the United Nations (UN), serving as a cornerstone for multilateral communication and diplomacy. Within the UN, these advanced translation tools play a pivotal role in bridging linguistic gaps among member nations, ensuring effective communication across diverse languages. These technologies enable swift and accurate translation of official documents, diplomatic correspondences, and multilateral discussions, fostering collaboration and understanding among nations. The UN's adoption of generative AI for translation underscores its commitment to facilitating seamless communication, diplomacy, and cooperation on a global scale, transcending linguistic barriers to achieve collective objectives and sustainable development goals[6].

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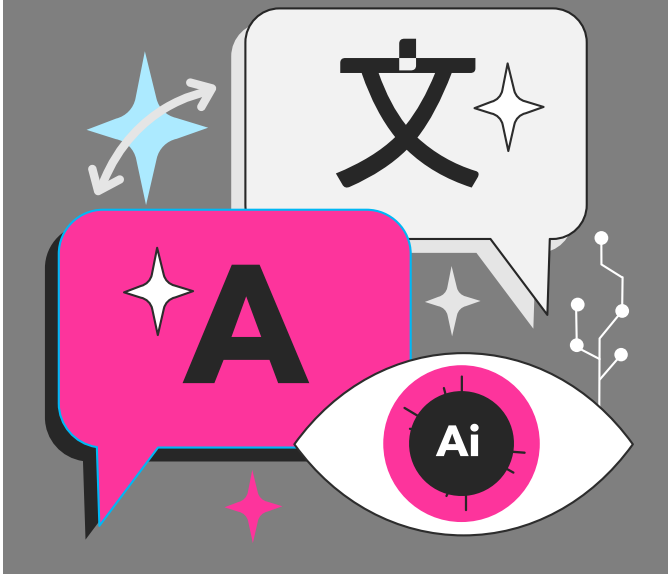
6.    Translation, Department of General Assembly and Conference Management, UN
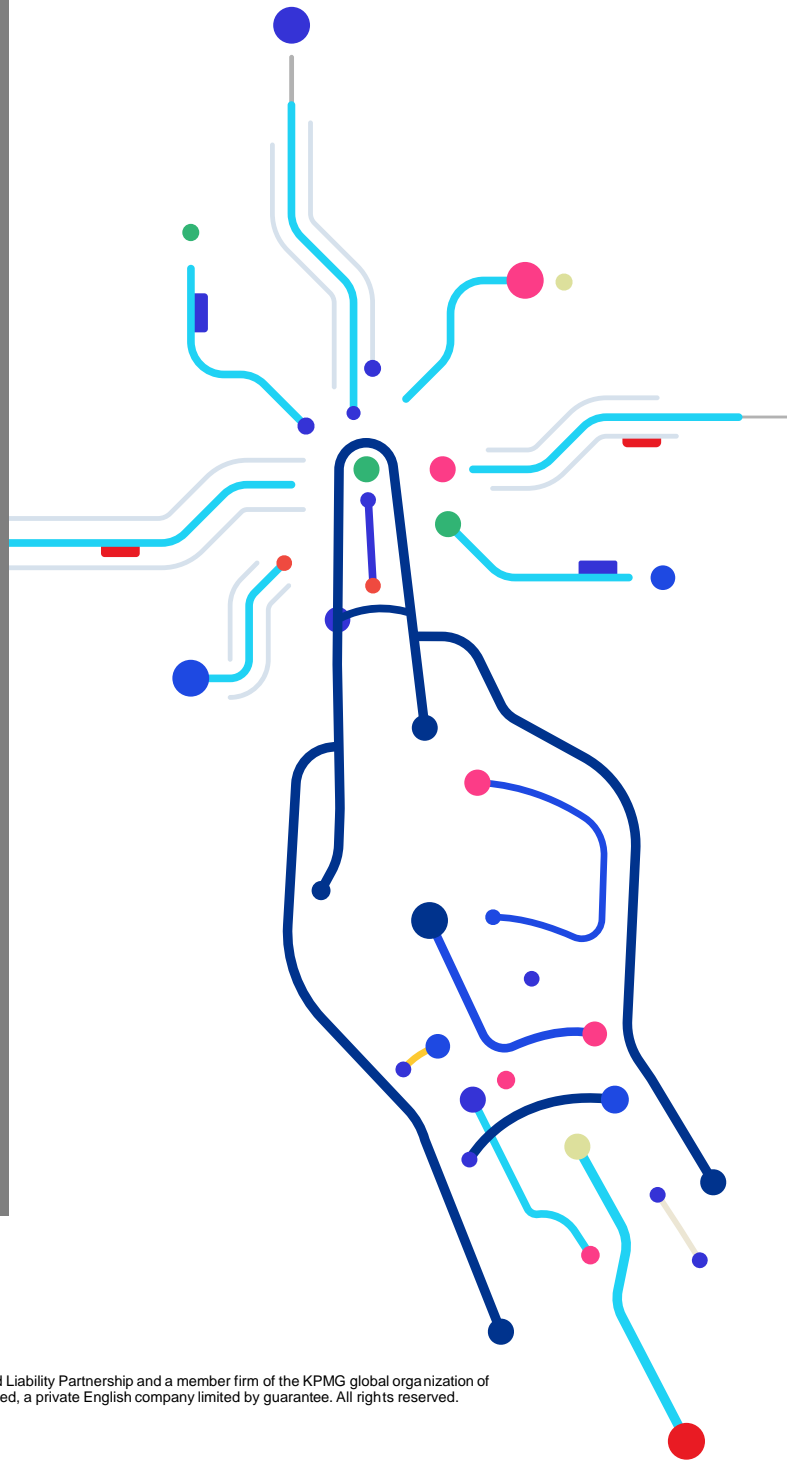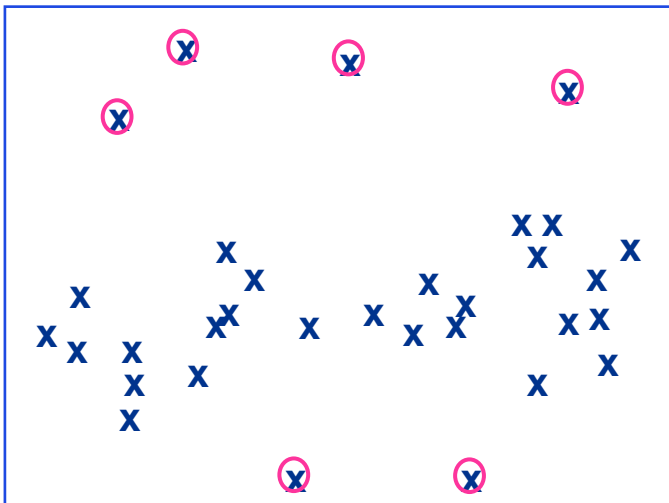
## 4.3. Anomaly detection

Anomaly detection is the process of identifying unusual events or items in a dataset that do not follow the normal pattern of behaviour. It is especially relevant in cybersecurity, fraud detection, or machine vision. GenAI models can skim through large data collected through sensors and can detect patterns and alert if detected for any anomalies or deviations.

Mechanism that looks out for datapoints that stand out from the expected pattern is called single point anomaly detection. Temperature points in a machine can be analysed with this detection mechanism to identify possible weak links. In some cases, single datapoints looked at in isolation appear normal. Unexpected patterns, behaviours, or results become clear, when looked at a group of datapoints. Such mechanisms which look out for deviations from normal patterns are called collective anomaly detection. An irregular heartbeat is an example of a collective anomaly.

Further, there are mechanisms which instead of looking at specific datapoints or groups of data, look for contextual anomalies that come from what appears to be normal activity. Bank transactions data can be used for detection of fraudulent transactions using this detection mechanism.
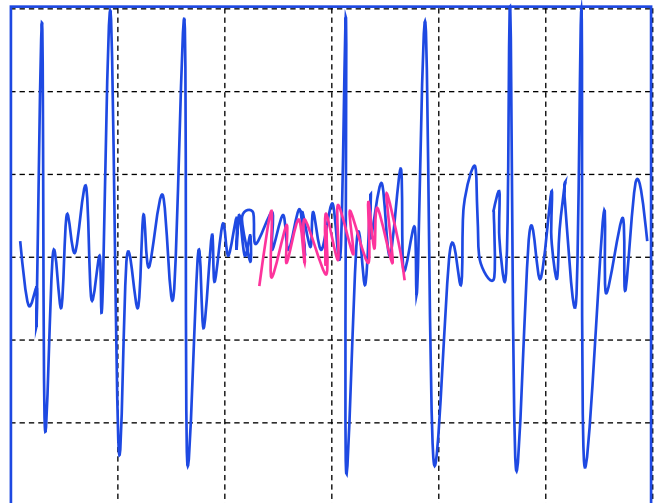
**Figure 7: Kinds of anomaly pattern detection**
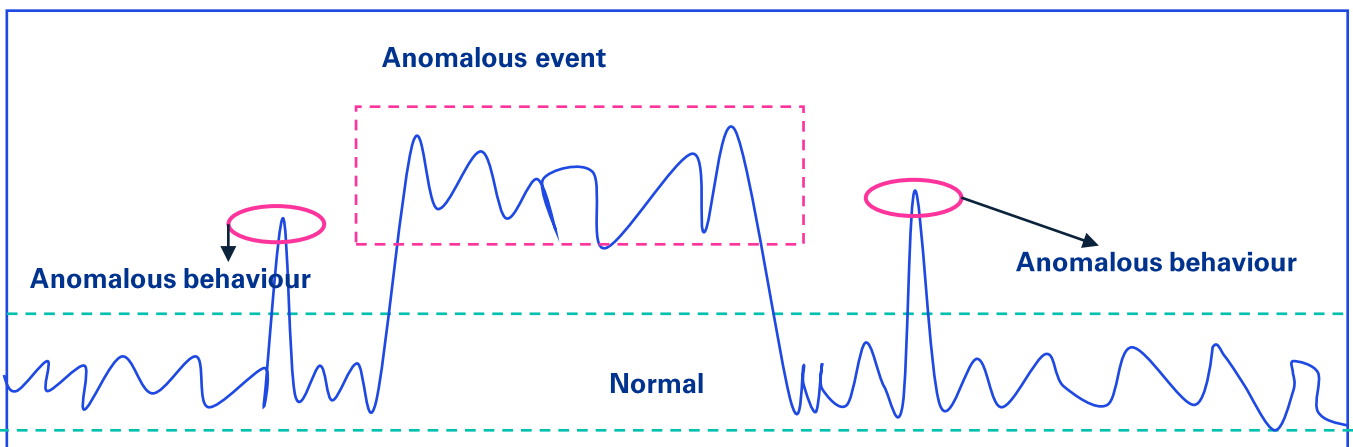
**Point Anomalies**



Temperature points in a machine

**Collective Anomalies**



Irregular heart-beat

**Contextual Anomalies**



Banking transaction activity

## Possible use cases

- **Cybersecurity and threat detection:**

Anomaly detection by generative AI plays a pivotal role in fortifying the Indian government's cybersecurity infrastructure. By leveraging advanced models, such as Generative Adversarial Networks (GANs) or Variational Autoencoders (VAEs), government agencies can detect unusual patterns or deviations in network traffic, system logs, or user behaviour that may signify cyber threats, intrusions, or malicious activities. Detecting anomalies in real-time enables proactive measures to mitigate cybersecurity risks, safeguard sensitive data, and protect critical government systems and infrastructure from cyberattacks, ensuring national security.

- **Financial fraud and compliance monitoring:**

Generative AI-driven anomaly detection techniques aid government agencies in monitoring financial transactions, identifying irregularities, and combating fraud. These models analyse vast volumes of financial data, such as transactions, taxation records, or public expenditure, to flag anomalies indicative of fraudulent activities, corruption, or financial irregularities. By detecting anomalies in financial data patterns, government entities can strengthen regulatory compliance, prevent financial fraud, and ensure transparency and accountability in fiscal operations.

**DHS, United States utilises generative AI for cybersecurity anomaly detection:**

The Department of Homeland Security (DHS) in the United States has embraced generative AI for anomaly detection as a crucial element in fortifying cybersecurity measures. Leveraging advanced algorithms, DHS employs this technology to scrutinise network traffic patterns, swiftly identifying and neutralising potential cyber threats. By utilising generative AI, DHS can proactively detect anomalies indicative of malicious activities, such as cyber intrusions or data breaches, thereby fortifying the nation's critical infrastructure and safeguarding sensitive information. This strategic integration underscores DHS's commitment to staying ahead of evolving cyber threats, ensuring the resilience of national cybersecurity frameworks, and protecting vital systems crucial for national security and public safety[7].
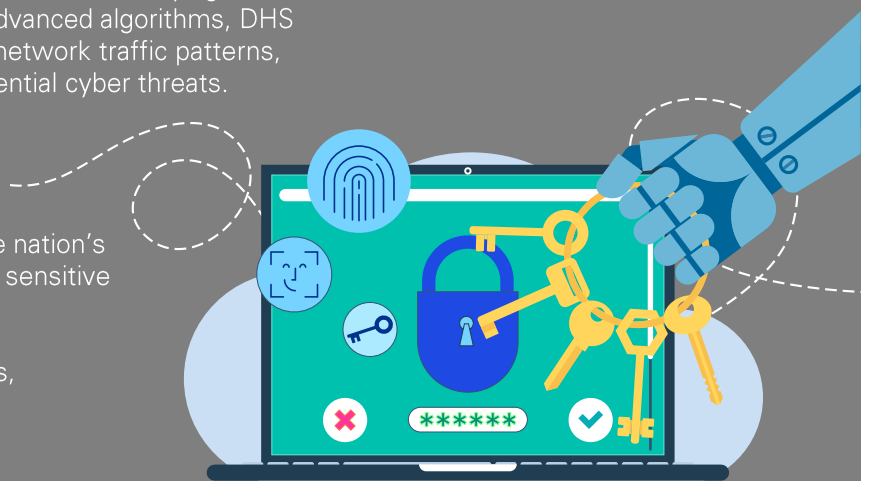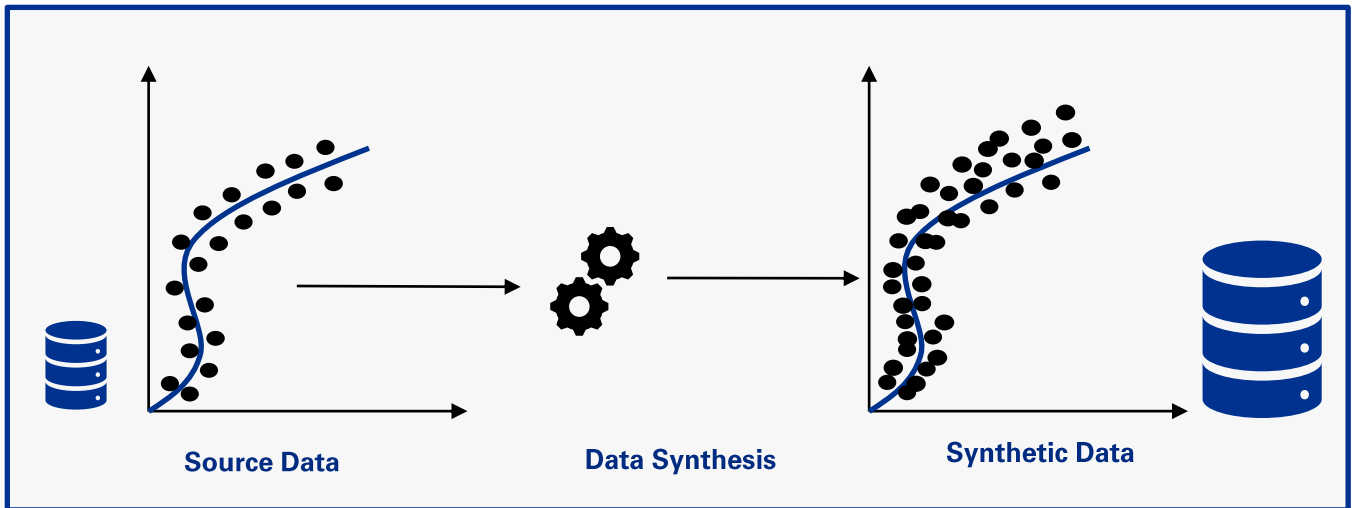
## 4.4. Data synthesis

Data synthesis using generative AI involves the creation of artificial data that closely mimics real-world data. This is particularly valuable in situations where real data is scarce, sensitive, or expensive to obtain. Generative AI models, like Generative Adversarial Networks (GANs), play a crucial role in this process. They generate synthetic data that can be used for various purposes, including training machine learning models, testing systems, and conducting research, without the privacy and ethical concerns often associated with using real data.

In practical terms, this approach helps overcome obstacles related to acquiring comprehensive or varied datasets, particularly in scenarios where data availability is restricted, or privacy concerns limit access. This synthesis of data is crucial for enhancing model performance and promoting innovation across diverse sectors, including healthcare, finance, and policymaking within the Indian government sector. The resulting synthetic data supports more effective decision-making processes and fosters the development of AI-driven solutions in areas where data scarcity or confidentiality concerns prevail.

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7.    News Release: DHS S&T Awards Funds to Arlington, MA, Startup Developing Anomaly Detection Systems for Securing Soft Targets, Science and Technology,

**Figure 8: Representation of Gen AI data synthesis function**



Source Data                Data Synthesis                Synthetic Data

## Possible use cases

• **Privacy-preserving data sharing:**

Data synthesis facilitates the creation of synthetic datasets that mimic the statistical properties of original data while preserving privacy. In the context of the Indian government, where preserving citizen privacy is paramount, synthetic data generation enables secure information sharing for research, policy analysis, or public health studies without compromising sensitive individual information. Government agencies can use these synthetic datasets to develop and test algorithms, models, or policies while upholding stringent data privacy regulations.

• **Scenario planning and policy simulations:**

Synthetic data generation supports scenario planning and policy simulations within the Indian government. By creating diverse synthetic datasets based on varying parameters, government agencies can simulate different policy scenarios, economic forecasts, or demographic trends. These simulated datasets enable policymakers to assess the potential impact of policy decisions, infrastructure investments, or social programmes across different scenarios.

**CSIRO, Australia generative AI impact: Enhancing healthcare, environment, and agriculture**

Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) strategically incorporates generative AI for data synthesis across diverse sectors. Leveraging advanced algorithms, CSIRO harnesses generative AI to synthesise and model complex datasets within healthcare, environmental science, and agriculture domains. This technology enables the creation of simulated scenarios, aiding in medical research, environmental analysis, and agricultural planning. By utilising generative AI, CSIRO achieves a comprehensive understanding of intricate data landscapes, facilitating evidence-based decision-making and innovative solutions for key national challenges. This integration underscores CSIRO's commitment to leveraging cutting-edge technologies to drive impactful advancements across critical sectors for the benefit of Australia's scientific and economic landscape[8].

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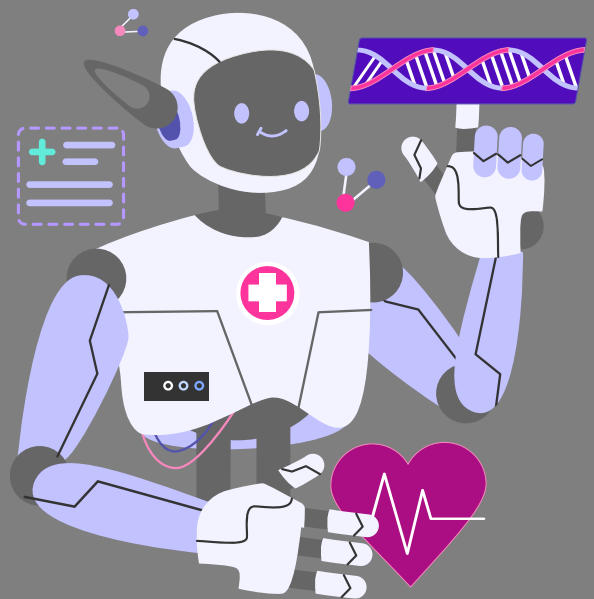
8.    Data - CSIRO

## 4.5. Speech to text

Implementing AI-driven virtual assistants, such as chatbots utilising models like DialoGPT, enables 24/7 citizen support, handling queries, and providing essential information. A virtual assistant refers to an AI-powered system designed to interact with citizens, offer information, and assist in various government-related queries or services. These assistants leverage Natural Language Processing (NLP), machine learning models, and conversational AI to understand and respond to user queries or requests.

These systems are built on technologies like chatbots, voice assistants, or integrated platforms that employ sophisticated algorithms to comprehend natural language inputs. They utilise vast datasets to learn and improve interactions, offering personalised and efficient services to citizens.
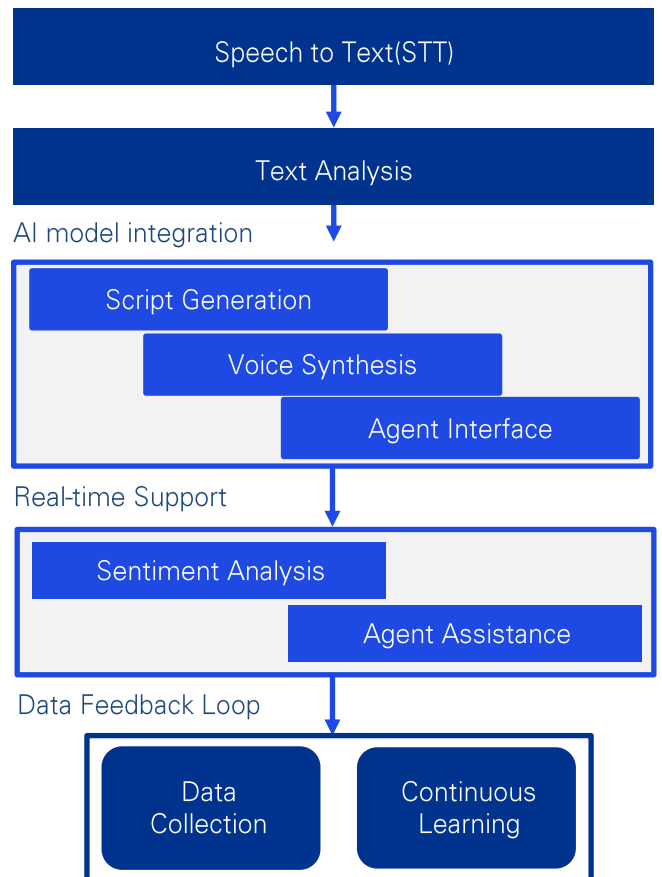
The objective is to enhance accessibility to government information and services. They assist citizens in tasks like obtaining information on government schemes, filling out forms, paying bills, or scheduling appointments, improving the overall citizen experience with government services. These AI-driven assistants streamline processes, reduce response times, and provide accurate information, thereby fostering transparency and efficiency in citizen-government interactions. They serve as a vital tool in advancing digital governance and improving public service delivery.

**Figure 9: Representation of Gen AI virtual assistance for citizen services (call centre) function**

### Possible use cases

- **Call centre automation and service enhancement:**

Implementing speech-to-text technology, powered by generative AI in government call centres, streamlines interactions between citizens and government agencies. This technology transcribes incoming calls into text in real-time, enabling automated analysis of citizen queries, complaints, or service requests. It enhances call centre efficiency by providing agents with accurate transcripts, enabling quicker issue resolution, and improving overall service quality. Additionally, these transcriptions serve as valuable data for government agencies to identify recurring citizen concerns, analyse service trends, and enhance public service delivery based on citizen feedback and needs.

- **Law enforcement and judicial process enhancement:**

Speech-to-text technology powered by generative AI assists law enforcement agencies and the judicial system in transcribing legal proceedings, police interrogations, or court hearings accurately. This technology converts spoken statements, witness testimonies, or interviews into written transcripts, ensuring the verbatim documentation of legal interactions. These transcripts serve as crucial evidence, aiding legal professionals, judges, and investigators in analysing and referencing case details. Moreover, the availability of accurate transcriptions streamlines case management, improves accuracy in legal records, and accelerates the judicial process, thereby promoting efficiency and accountability within the Indian legal system.

## 4.6. Image generation

Image generation involves creating new images using algorithms like Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and autoregressive models like PixelCNN. These models learn from existing datasets to generate novel images with diverse features and structures.

Generative Adversarial Networks, or GANs have two parts: one part makes the image, and the other part judges it. The image-making part keeps trying to make better images based on the feedback from the judging part. Another type is called Variational Autoencoders, or VAEs. These work by taking images and converting them into simpler forms. Then, they use these simpler forms to make new images that are similar but not the same. The third type, autoregressive models like PixelCNN, works by building an image pixel by pixel, each time looking at the pixels it already placed to decide what to put next.

All these methods enable synthetic images that exhibit diverse visual characteristics like real images. 'Generator' is a component that creates new and realistic data, such as images, text, or sound, from scratch. Its goal is to produce outputs that are indistinguishable from real-world data. On the other side, the 'discriminator' is a counterpart that evaluates the data generated by the generator. Its task is to determine whether the data is real (authentically created by humans or natural processes) or artificial (created by the generator). It finds applications in art, design, entertainment, and medical imaging. It enables synthetic images that exhibit diverse visual characteristics like real images. These synthesised images support innovation, analysis, and decision-making across multiple fields, expanding possibilities for creative expression and problem-solving.

**Figure 10: Representation of Gen AI image generation function**
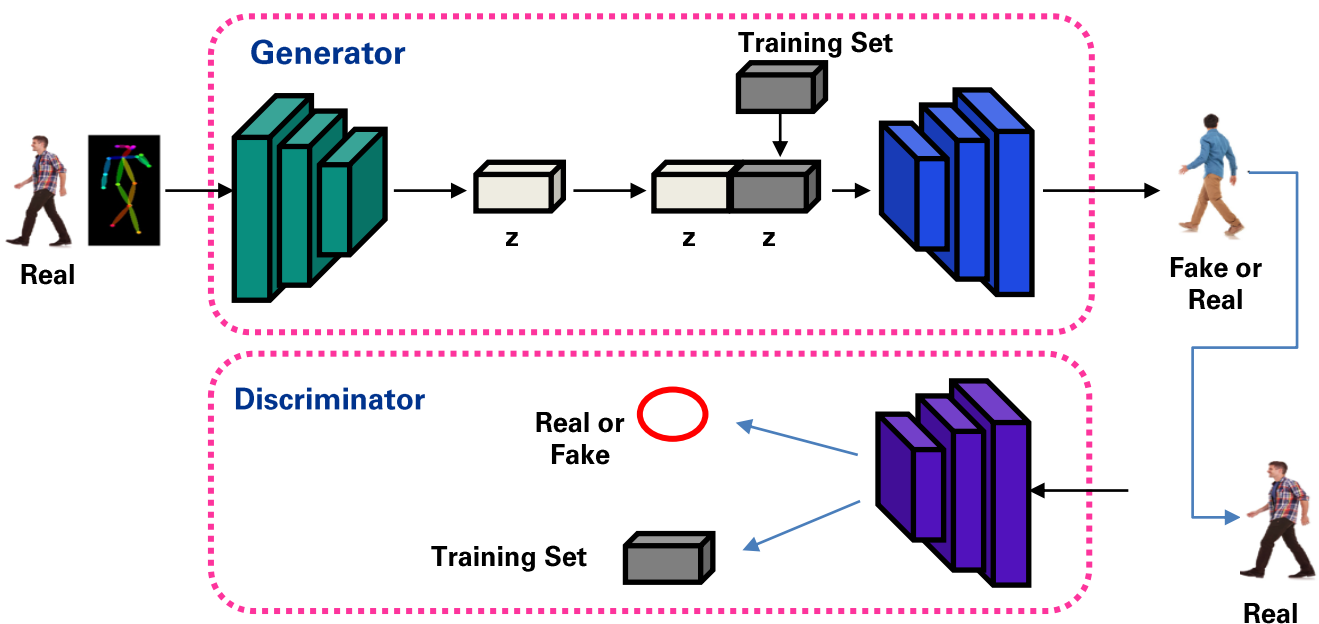
## Possible use cases

- **Urban planning and infrastructure development:**

Image generation using generative AI techniques facilitates the creation of synthetic images to simulate urban landscapes, architectural designs, or infrastructure planning. Within the Indian government, this technology assists urban planners and policymakers in visualising and evaluating proposed urban development projects or infrastructure expansions. By generating realistic images of potential cityscapes or architectural models, decision-makers can assess the visual impact, feasibility, and functionality of proposed projects before implementation. This aids in informed decision-making, optimising resource allocation, and ensuring sustainable urban development tailored to India's evolving needs.

- **Disaster management planning and preparedness:**

In disaster management planning, generative AI aids in creating synthetic images to simulate potential disaster scenarios. Within the Indian government's disaster management initiatives, these synthetic images represent simulated disaster events, such as floods, earthquakes, or wildfires, in specific geographic regions. By generating realistic disaster scenario images based on historical data and predictive models, government agencies can simulate and evaluate disaster response strategies, evacuation plans, and resource allocation. This proactive approach enhances disaster preparedness, allowing for more effective and timely responses to potential calamities, thereby mitigating risks and minimising the impact on communities.

- **Healthcare imaging and medical research:**

Image generation using generative AI contributes to healthcare imaging and medical research within the Indian government's healthcare sector. This technology assists in synthesising medical images, such as MRI or CT scans, to augment limited datasets for training medical imaging models. By creating diverse and realistic synthetic medical images, researchers and healthcare professionals enhance the accuracy and generalisability of AI-based diagnostic tools, enabling improved disease detection, treatment planning, and medical research advancements.

**NASA, United States, generative AI for earth observation:**

NASA, the United States' space agency, employs generative AI for image generation in satellite data simulation, crucial for Earth observation and environmental monitoring initiatives. Leveraging advanced algorithms, NASA utilises generative AI to create simulated satellite imagery, aiding in mapping, monitoring natural disasters, and studying environmental changes. This technology enables the generation of synthetic visual data that supplements real-time satellite observations, facilitating more comprehensive analysis and understanding of the earth's dynamic systems. By harnessing generative AI for image generation, NASA enhances its capabilities in studying and monitoring the planet, contributing to vital scientific research and informed decision-making for global environmental stewardship[10].
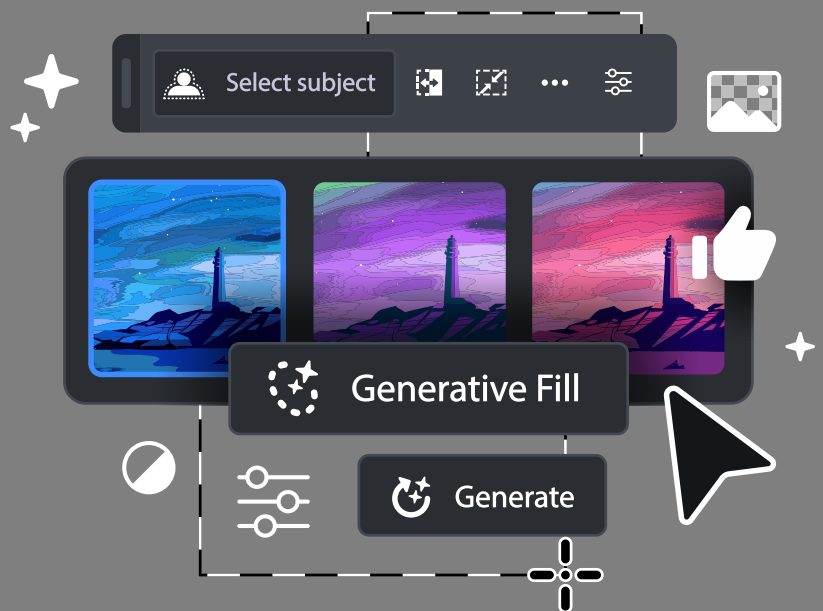


10. IBM and NASA Create Open-Source AI Model for Analyzing Satellite Data, PetaPixel, Jeremy Gary, 3rd August 2023
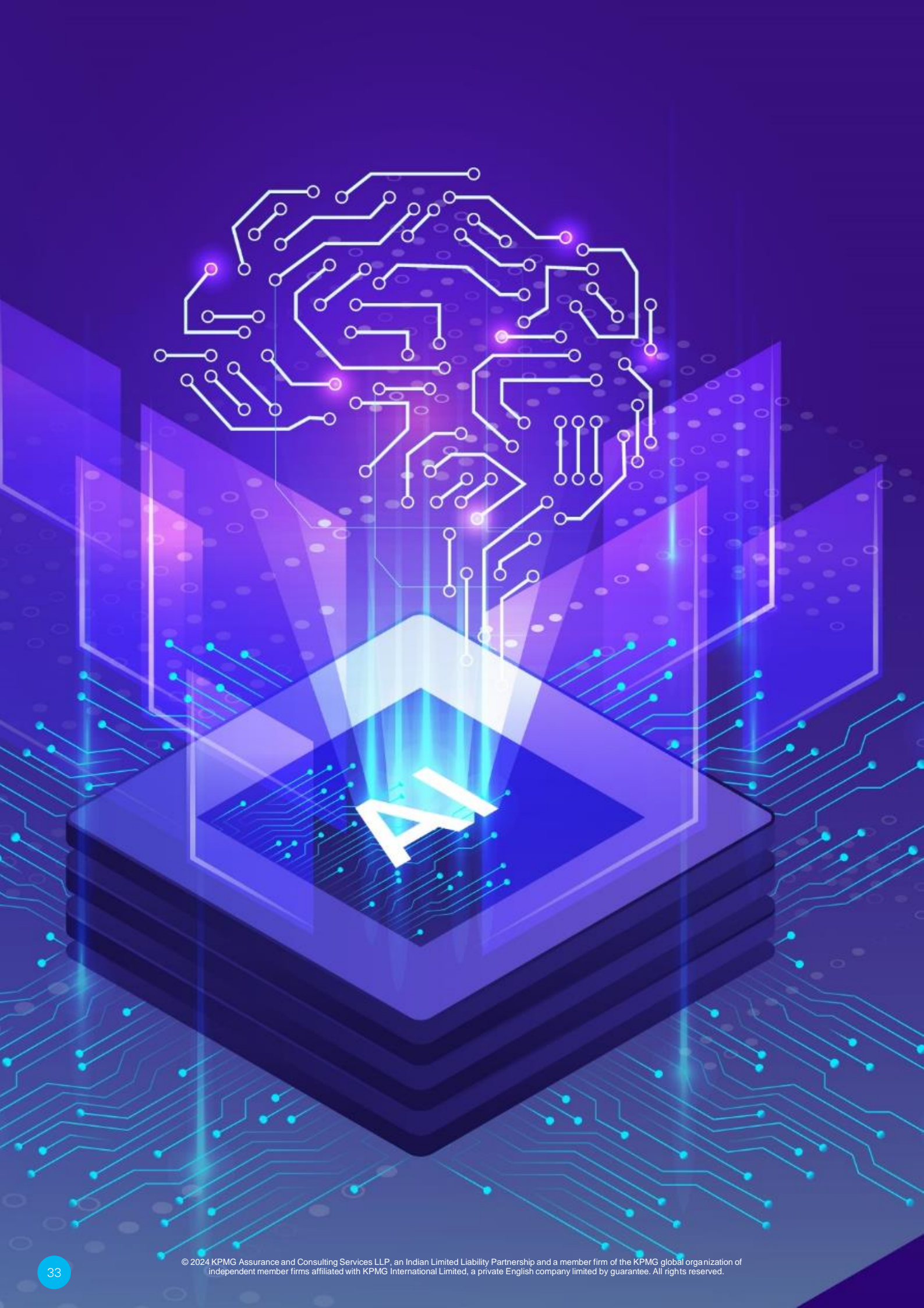
# 5 What possibly could be concerning

As we enter the fifth industrial revolution, Generative Artificial Intelligence (GenAI) technologies openwith advanced LLM models are revolutionising various sectors, including business and public services. These AI models, capable of tasks like search engine optimisation, enhancing office productivity, coding, and virtual tutoring, mark a significant societal shift due to their efficiency and human-like output. However, this technological advancement also presents complex ethical, legal, and societal challenges. The rapid evolution of GenAI surpasses the current pace 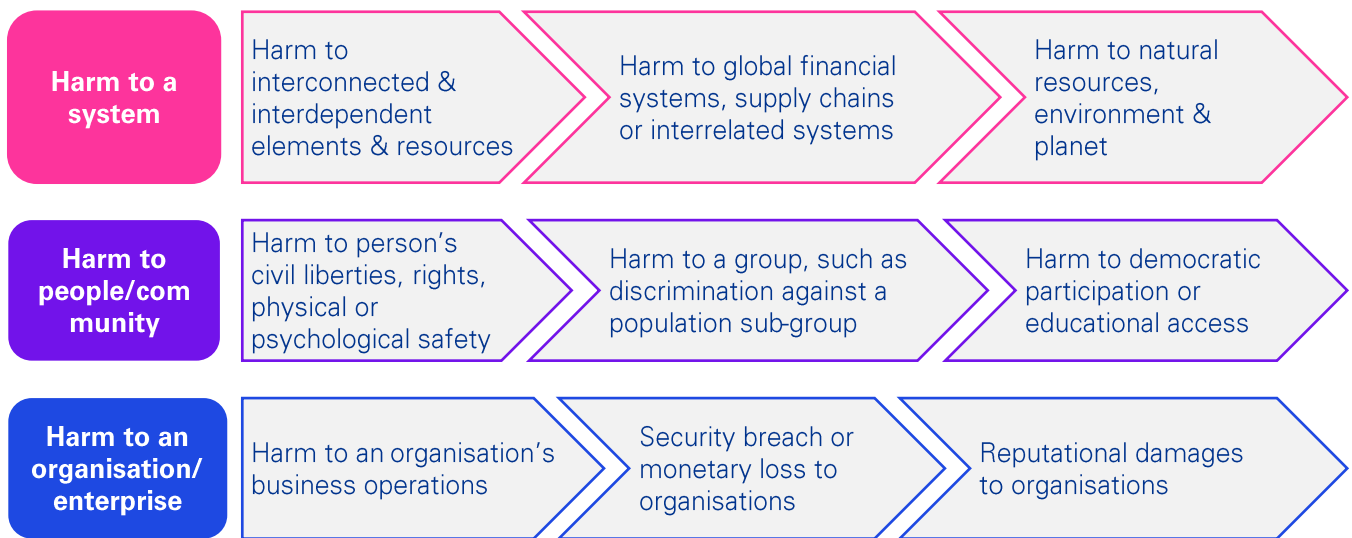of regulatory adaptation, raising pressing concerns about moral and legal integrity. The impact of AI systems is multifaceted, potentially offering both benefits and risks. Therefore, identifying, mitigating, and minimising potential harms is crucial for the responsible development and widespread acceptance of AI technologies. This approach is vital in harnessing AI's potential to improve quality of life while addressing its inherent challenges.

While AI benefits and some AI risks are well-known, the AI community is only beginning to understand and classify incidents and scenarios that result in harm. Figure below provides examples of potential harms from AI systems.

**Figure 11: Layers of risk from AI systems**

| Harm to a system | Harm to interconnected & interdependent elements & resources | Harm to global financial systems, supply chains or interrelated systems | Harm to natural resources, environment & planet |
| --- | --- | --- | --- |
| **Harm to people/com munity** | Harm to person's civil liberties, rights, physical or psychological safety | Harm to a group, such as discrimination against a population sub-group | Harm to democratic participation or educational access |
| **Harm to an organisation/ enterprise** | Harm to an organisation's business operations | Security breach or monetary loss to organisations | Reputational damages to organisations |

### 5.1. The bias problem in Generative AI

In the expanding field of Generative Artificial Intelligence (GenAI), government bodies face a major challenge: data bias. This issue, though technical, significantly impacts equity, fairness, and the effectiveness of public services. As AI models like ChatGPT increasingly integrate into government functions, addressing and reducing data bias is essential, representing not just a technical necessity but also a moral and ethical obligation.

| Categorisation of risks | Mitigation measures |
| --- | --- |
| • Feeding of skewed data: AI's reliance on biased data in sectors like healthcare and criminal justice can lead to systemic inequalities. For instance, predictive policing tools with skewed data can reinforce racial biases, and welfare algorithms can unfairly distribute resources.<br>• Impression of human bias in AI models: AI models often reflect biases from their training data, compromising the neutrality essential in government applications.<br>• The risk of AI hallucinations and misinformation: Generative AI can produce factually incorrect 'hallucinations', posing risks in government settings where misinformation can critically impact judgment and policymaking. | • Strategies for reducing bias: Diverse data collection, regular AI system audits, and multidisciplinary development teams can help mitigate biases.<br>• Creating checks and balances: Oversight mechanisms within government departments can ensure AI models remain fair and effective.<br>• Collaborative approach: Partnerships with academia, civil society, and tech experts can provide diverse perspectives, reducing biased outcomes. |

By recognising the risks of skewed data and implementing comprehensive strategies to counteract bias, government ministries and departments can harness the potential of GenAI while upholding the principles of equity and justice. This proactive stance is not just about leveraging technology; it's about safeguarding the trust and welfare of the citizens these technologies serve.

## 5.2. Data privacy risks

Data privacy risks in GenAI are complex, encompassing unauthorised access, misuse, and challenges in data storage, processing, and transfer. The opaque nature of AI algorithms complicates tracking data usage and protection. Recognising these risks is crucial for creating strategies that ensure responsible use of personal data in GenAI, maintaining public trust, and meeting legal standards.

| Categorisation of risks | Mitigation measures |
|---|---|
| • Inadequate consent mechanisms: AI systems often process data without proper consent, risking privacy rights violations.<br><br>• Data profiling and automated decision making: AI's detailed profiling can lead to unfair automated decisions.<br><br>• Data breaches and cybersecurity threats: GenAI's vast data pools are prone to cyberattacks and breaches.<br><br>• Third-party data sharing and control: GenAI involves multiple parties, raising concerns over data usage and control.<br><br>• Long-term data storage and accessibility: Prolonged data storage by AI poses risks of misuse and security issues.<br><br>• Cross-border data transfers and jurisdictional issues: Globalised GenAI data transfer faces varying international privacy laws. | • **Enhancing consent and transparency mechanisms**: Develop explicit consent mechanisms and clear privacy notices.<br><br>• **Implementing robust cybersecurity measures**: Implement advanced encryption and regular security audits.<br><br>• **Establishing ethical guidelines for data use**: Establish guidelines addressing fairness, privacy, and non-discrimination.<br><br>• **Regulating third-party data sharing:** Define clear policies for data sharing and protection with third parties.<br><br>• **Developing policies for long-term data storage**: Focus on data minimisation, integrity, and secure deletion practices.<br><br>• **Navigating cross-border data transfer challenges**: Adhere to international data protection frameworks and local laws.<br><br>• **Promoting data privacy awareness and education**: Educate all stakeholders about data privacy risks and best practices. |

Addressing the data privacy risks in GenAI demands a multifaceted and vigilant approach. By combining enhanced solutions, we can create a secure and trustworthy environment for GenAI applications

## 5.3. Social division risks

The advent of General AI (GenAI) in various sectors holds immense potential but also harbours the risk of exacerbating social divisions. These divisions manifest as disparities in access, impact, and benefits derived from AI technologies, potentially deepening existing societal inequalities. The risks of social division in the context of GenAI are multifaceted, encompassing economic, educational, and digital divides. It is essential to recognise these risks to ensure that the deployment of GenAI contributes to social cohesion rather than disparity.

| Categorisation of risks | Mitigation measures |
|---|---|
| • **Economic disparities:** GenAI may increase the economic gap, affecting job opportunities based on AI literacy.<br><br>• **Educational divide:** Uneven access to AI education risks creating a workforce unprepared for an AI-driven future, especially impacting lower-income communities.<br><br>• **Digital inclusion and access:** Inequalities in digital infrastructure and connectivity can disenfranchise large population segments in a digital-centric world.<br><br>• **Representation and inclusivity in AI development:** AI often lacks diverse representation, leading to biases and exclusion, and perpetuating stereotypes.<br><br>• **Impact on vulnerable populations:** Marginalised groups are more at risk from AI-driven decisions, lacking resources to understand or challenge negative outcomes. | • **Promoting economic inclusivity**: Implement policies for equitable GenAI benefits, supporting AI access for all economic levels.<br><br>• **Expanding educational opportunities**: Integrate AI literacy into curricula, focusing on accessibility for underprivileged communities.<br><br>• **Enhancing digital infrastructure**: Improve connectivity, especially in rural areas, with tailored local content and applications.<br><br>• **Fostering diverse and inclusive AI development**: Ensure AI development teams are diverse and inclusive to create unbiased systems for all societal groups.<br><br>• **Empowering vulnerable populations**: Develop legal aid, awareness programmes, and AI applications addressing specific needs of vulnerable groups.<br><br>• **Stakeholder engagement and policy development**: Involve diverse stakeholders in crafting inclusive GenAI policies and guidelines.<br><br>• **Monitoring and evaluation mechanisms**: Establish continuous assessment systems to address GenAI's social impact and adjust strategies for social cohesion and equity. |

While GenAI offers transformative potential, it is imperative to proactively address the risks of social division it poses. Through comprehensive strategies that promote inclusivity, accessibility, and representation, we can steer the development and application of GenAI towards reducing social disparities and fostering a more equitable and cohesive society.

## 5.4. Social repulsion risks

The concept of social repulsion in the context of Generative AI (GenAI) encompasses the societal discomfort, distrust, and backlash that can arise from the rapid integration of AI technologies. As AI systems become more prevalent in everyday life, there is a growing concern that these technologies might lead to alienation, ethical dilemmas, and disruption in traditional social and work structures. Understanding these risks is crucial for ensuring that GenAI is integrated in a way that is harmonious with societal values and norms, thereby preventing resistance and fostering acceptance.

| Categorisation of risks | Mitigation measures |
|---|---|
| **Workforce displacement and job insecurity:** AI risks replacing human jobs, potentially leading to unemployment, economic instability, and social unrest.<br><br>**Ethical and moral dilemmas:** AI decision-making in areas like military, healthcare, and bias management raises ethical concerns and potential social opposition.<br><br>**Cultural and human disconnect:** Over-reliance on AI for social interactions might erode human connections and cultural norms.<br><br>**Invasion of privacy and surveillance:** AI in surveillance and data collection can be seen as privacy invasion, causing distrust.<br><br>**Dependency and loss of skills:** Increasing AI reliance risks human dependency and skill atrophy in critical thinking and problem-solving**.** | **Developing and implementing AI ethics guidelines**: Establish ethical guidelines focusing on fairness, transparency, and human rights to align AI with societal values.<br><br>**Fostering AI literacy and public engagement**: Educate the public on AI, addressing fears and misinformation through engagement and involvement.<br><br>**Creating AI oversight and regulatory bodies:** Create bodies to oversee AI development, ensuring safety, ethics, and public concerns are addressed.<br><br>**Promoting human-centric AI design**: Focus on AI as a human-assisting tool, not a replacement, to alleviate obsolescence fears.<br><br>**Ensuring responsible use of AI in surveillance**: Implement strict regulations and transparency in AI surveillance to respect privacy and civil liberties.<br><br>**Encouraging skill development and adaptation**: Offer reskilling and upskilling to help the workforce adapt to AI changes.<br><br>**Maintaining human connection in AI interactions**: Ensure AI applications balance with human elements, particularly in healthcare, customer service, and education. |

Addressing the risks of social repulsion in GenAI requires a multifaceted approach that balances technological advancement with ethical, societal, and human considerations. By adopting these strategies, it is possible to integrate GenAI into society in a way that is accepted and valued, ensuring that the benefits of AI are realised while maintaining the integrity of social structures and values.

## 5.5. Confronting the challenge of deep fakes

Deep fakes, emerging from General AI (GenAI), pose significant risks in the digital age with their ability to create highly realistic audio and video manipulations. These AI-generated fabrications can deceive, manipulate, and spread misinformation, undermining societal trust and truth. The rise of deep fakes brings urgent concerns about information authenticity and challenges in politics, security, personal privacy, and social norms. Recognising and understanding these risks is vital for devising strategies to mitigate the harm caused by deep fakes.

| Categorisation of risks | Mitigation measures |
|---|---|
| • **Misinformation and propaganda:** Deep fakes can spread false information, influencing public opinion, and potentially swaying elections or inciting violence. <br><br> • **Personal reputation and privacy:** Deep fakes risk unauthorised use of individuals' images and voices, harming reputation and privacy, especially for public figures. <br><br> • **Financial fraud and corporate espionage:** Deep fakes enable sophisticated financial fraud and corporate espionage, threatening personal and corporate security. <br><br> • **Legal and ethical implications:** Deep fakes create legal and ethical challenges regarding consent, copyright, and the validity of audiovisual evidence. <br><br> • **Social trust and cohesion:** Their prevalence undermines trust in media and institutions, leading to social skepticism and fragmentation. <br><br> • **National security concerns:** Deep fakes pose threats to national security through falsified evidence and misinformation campaigns. | • **Advanced detection technologies**: Develop AI algorithms to detect deep fakes, continuously updating them to match evolving techniques. <br><br> • **Legal frameworks and regulations**: Establish laws penalising the creation and distribution of deep fakes, including updates to copyright and defamation laws. <br><br> • **Public awareness and media literacy campaigns**: Educate the public on deep fakes and promote media literacy to discern digital content authenticity. <br><br> • **Collaboration between tech companies and governments**: Foster collaboration between tech companies and governments for effective deep fake detection and response. <br><br> • **Ethical guidelines for AI development**: Create ethical guidelines for AI development, ensuring transparency and consent in AI-generated content. <br><br> • **Digital watermarking and content authentication**: Implement watermarking and authentication tools to verify audiovisual content authenticity. <br><br> • **Supporting research and development**: Fund interdisciplinary research in AI, cybersecurity, law, and social sciences to combat deep fake implications. |

The menace of deep fakes, propelled by the advancements in GenAI, presents a complex and urgent challenge. A coordinated and multi-faceted response that includes technological innovation, legal measures, public education, and ethical AI development is crucial for mitigating the risks associated with deep fakes. By adopting these strategies, society can better equip itself to confront and overcome the challenges posed by this emerging and potentially destabilising technology.

## 5.6. Protecting intellectual property in the era of Generative AI

The integration of Generative AI (GenAI) in creative sectors is reshaping traditional concepts of authorship and IP rights, as AI creates original content like art, literature, and music. This evolution prompts crucial questions about IP rights allocation in AI-generated works and potential infringement on existing IPs, presenting significant challenges for creators, businesses, and legal frameworks in adapting to the AI-transformed IP landscape.

| Categorisation of risks | Mitigation measures |
|---|---|
| • **Ambiguity in authorship and ownership:** GenAI blurs authorship lines, raising questions about whether the AI creator, user, or the AI itself should be credited.<br><br>• **Infringement of existing copyrights:** AI systems risk creating content similar to copyrighted material, potentially causing legal disputes.<br><br>• **Exploitation of loopholes in IP laws:** Current IP frameworks may not fully address GenAI complexities, allowing legal loophole exploitation.<br><br>• **Impact on creative industries:** AI's mass production of creative content could devalue human creativity and disrupt traditional industries.<br><br>• **Patenting AI-generated inventions:** The role of AI in innovation prompts questions about patent eligibility for AI-generated inventions.<br><br>• **Global disparities in IP law:** Varying IP laws worldwide create inconsistencies in protecting and enforcing AI-generated content rights. | • **Revising and modernising IP laws**: Update IP frameworks to define authorship and liability in AI-generated works, setting legal standards for AI's role in creativity.<br><br>• **Creating specific guidelines for AI-generated works**: Develop guidelines for AI use in creative processes, including AI contribution crediting and copyright eligibility.<br><br>• **Promoting transparency in AI usage**: Encourage disclosing AI's role in creative work to track origins and ensure proper attribution.<br><br>• **Establishing international IP standards for AI**: Harmonise global IP laws for consistent AI-generated content protection and cross-border rights enforcement.<br><br>• **Fostering ethical practices in AI development**: Advocate ethical AI use in creative industries to balance innovation with human creativity protection.<br><br>• **Incentivising human-AI collaborative works**: Promote human-AI partnerships in creativity to preserve human creativity value and leverage AI capabilities.<br><br>• **Building IP awareness and education**: Educate creators and the legal community on AI's IP implications, providing resources for navigating related issues. |

In conclusion, protecting intellectual property in the era of General AI requires a dynamic, multi-faceted approach. Updating legal frameworks, establishing guidelines, promoting ethical practices, and fostering international cooperation are key to creating an environment where AI bolsters creativity and innovation while safeguarding the IP rights of creators. This balanced strategy is crucial for optimally utilising GenAI in a fair, equitable way that supports ongoing creative and technological progress.
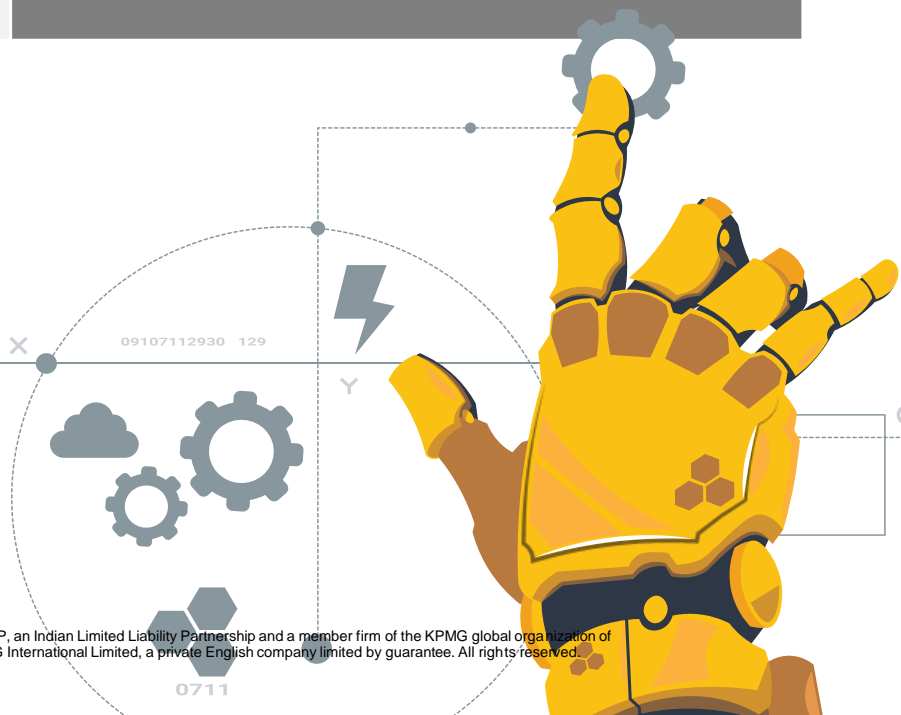
## 5.7. What needs to be evaluated to minimise risks?

Risk tolerance – the level of risk or degree of uncertainty that is acceptable to organisations or society – is context and use case-specific. Therefore, risk thresholds should be set through policies and norms that can be established by AI system owners, organisations, industries, communities, or regulators (who often are acting on behalf of individuals or societies).
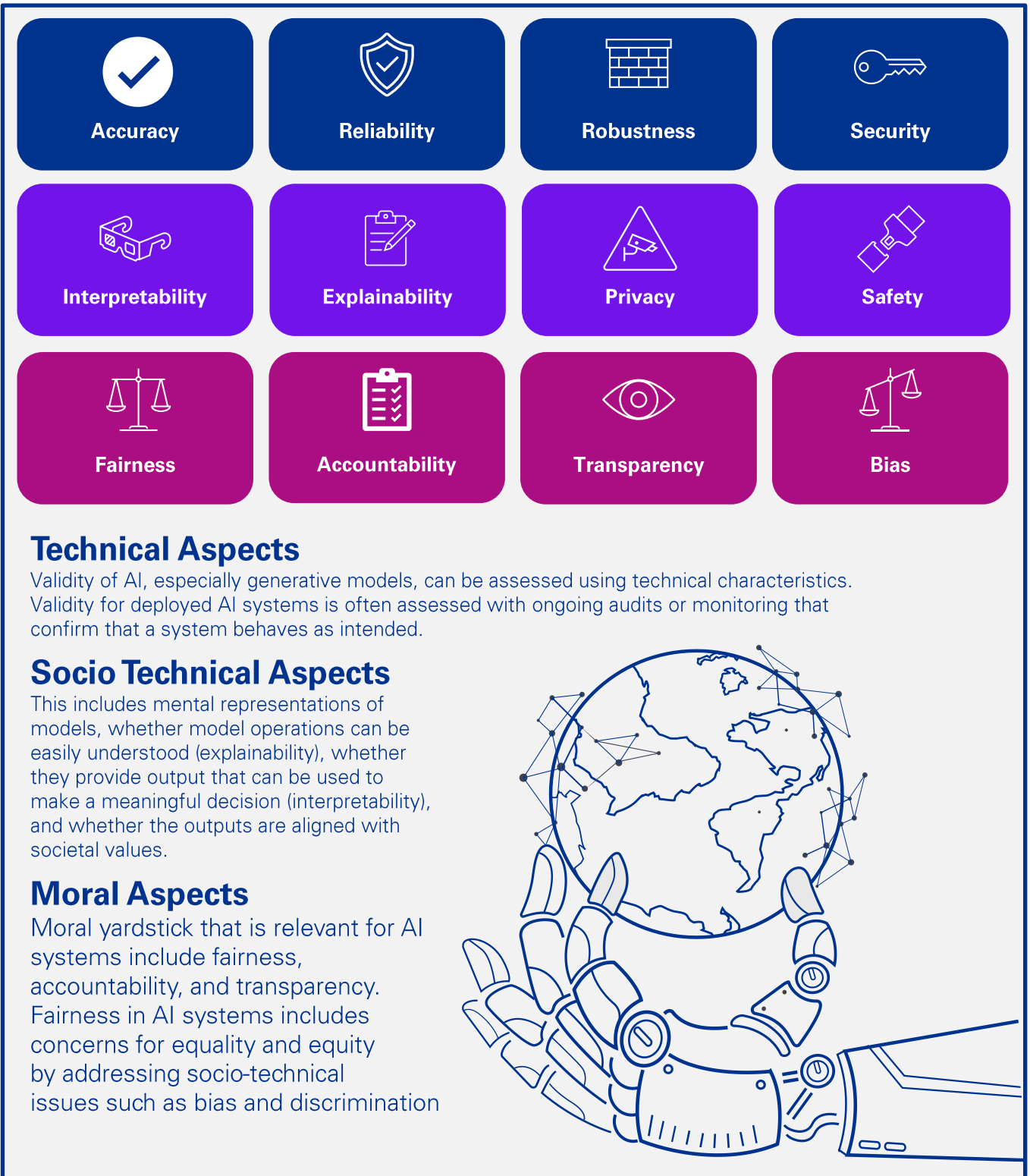
Several non-government organisations and government organisations have made attempts, for example Organisation for Economic Co-operation and Development (OECD) in their Recommendation on AI, the European Union (EU) Artificial Intelligence Act, and United States Executive Order (EO) 13960, to define characteristics of trustworthy AI systems.

**Figure 12: Characters of trustworthy AI systems defined by government/non-government organisations**

| OECD AI Recommendations | European Union AI Act | United States EO 13960 | |
|---|---|---|---|
| ❖ Robustness<br>❖ Security | ❖ Technology Robustness | ❖ Purposeful & performance driven<br>❖ Accurate, reliable and effective<br>❖ Secure & resilient | **Technical characters** |
| ❖ Safety<br>❖ Explainability | ❖ Safety<br>❖ Privacy<br>❖ Non-discrimination | ❖ Safe<br>❖ Understandable by subject experts, users & others as appropriate | **Socio-Technical characters** |
| ❖ Traceability to human values<br>❖ Transparency & responsible disclosure<br>❖ Accountability | ❖ Human agency & oversight<br>❖ Data governance<br>❖ Transparency<br>❖ Diversity & fairness<br>❖ Environmental & societal well being<br>❖ Accountability | ❖ Lawful & respectful of Nation's values<br>❖ Responsible & traceable<br>❖ Regularly monitored<br>❖ Transparent<br>❖ Accountable | **Moral Characters** |

The characteristics can be broadly categorised into three aspects – technical, socio-technical, and moral. Since AI trustworthiness and risk are inversely related, approaches that enhance trustworthiness can contribute to a reduction or attenuation of related risks.

**Figure 13: Three aspects of risk evaluation**



| Accuracy | Reliability | Robustness | Security |
|---|---|---|---|
| Interpretability | Explainability | Privacy | Safety |
| Fairness | Accountability | Transparency | Bias |

## Technical Aspects

Validity of AI, especially generative models, can be assessed using technical characteristics. Validity for deployed AI systems is often assessed with ongoing audits or monitoring that confirm that a system behaves as intended.

## Socio Technical Aspects

This includes mental representations of models, whether model operations can be easily understood (explainability), whether they provide output that can be used to make a meaningful decision (interpretability), and whether the outputs are aligned with societal values.

## Moral Aspects

Moral yardstick that is relevant for AI systems include fairness, accountability, and transparency. Fairness in AI systems includes concerns for equality and equity by addressing socio-technical issues such as bias and discrimination

In April 2023, the Indian Council of Medical Research (ICMR) released guidelines for ethical AI use in biomedical research and healthcare. These guidelines are aimed at technology developers, healthcare professionals, and research institutes using health data with AI. This initiative marks the beginning of India's broader need to establish similar guidelines across various departments, especially those directly serving citizens.
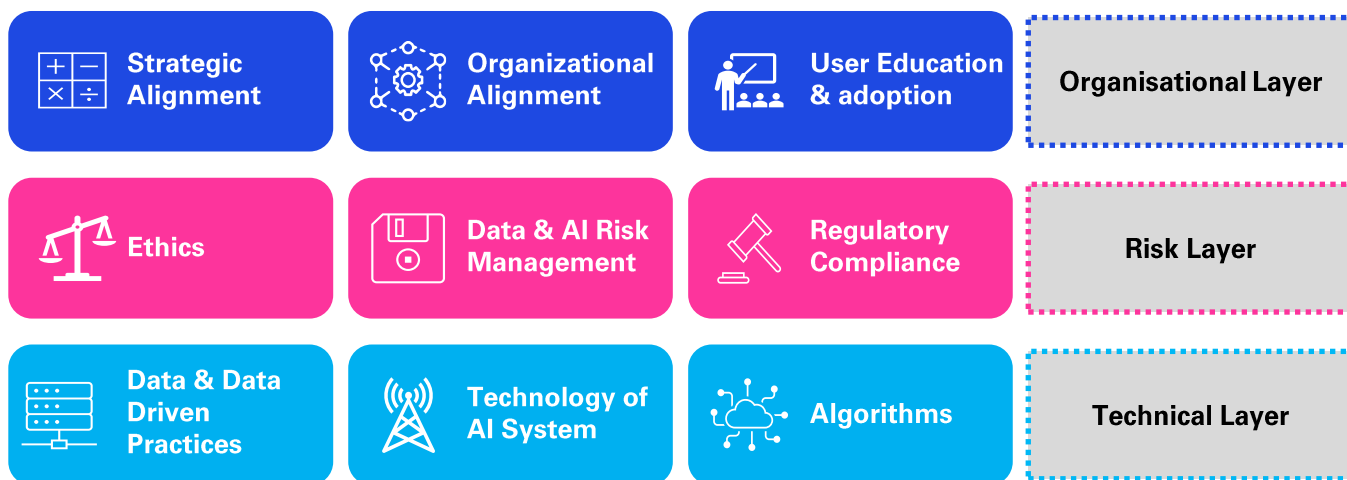
# 6

# Governance approach for AI in government

The governance approach for departments in the Indian government, particularly regarding Generative Artificial Intelligence (GenAI) integration, focuses on developing specific frameworks that guide AI's ethical and effective use. This approach requires each department to tailor its AI governance to meet its unique operational needs and objectives, ensuring AI applications align with both departmental goals and broader national policies.

It's not merely about adopting technology but also about building an AI-literate workforce and ensuring AI-driven decisions are transparent and align with societal goals. This approach is crucial for leveraging AI's potential in public administration, enhancing service delivery, and advancing national development. In March,2023 'From Promise to Practice' [11], the risk and governance approach was published by was published by KPMG, offering a comprehensive survey of organisational culture. This delves into the strategic approaches and practices essential for shaping and evolving the culture within organisations.

**Figure 14: Governance approach for organisations**



| | | | |
|---|---|---|---|
| Strategic Alignment | Organizational Alignment | User Education & adoption | **Organisational Layer** |
| Ethics | Data & AI Risk Management | Regulatory Compliance | **Risk Layer** |
| Data & Data Driven Practices | Technology of AI System | Algorithms | **Technical Layer** |

An organisational layer stems from the nature of AI governance that would have to ensure the alignment of a department's use of AI technologies with its ministry's strategies and principles of ethical AI and educate its adopters.

Risk layer covers the requirements that departments should consider in order to mitigate data and AI risks, i.e., normative regulation, principles and guidelines (self - regulation), and stakeholder pressure.

Technical layer describes what is necessary to manage the life cycle of algorithm/AI applications and safeguard the quality of the data and technology used.

## 6.1. Strategic alignment

In the context of the Indian government, strategic alignment in the realm of AI governance involves tailoring AI initiatives to align with national policies and strategic objectives, while addressing specific risks and challenges pertinent to the Indian scenario. This strategic alignment necessitates the definition of a clear organisational strategy for AI usage, setting a general direction and managing expectations about the AI systems' purposes and goals within government functions.

To ensure strategic alignment in AI governance, departments within the Indian government should adopt distinct strategies. For instance, a clear AI strategy should be defined, tailored to the specific functions and challenges of each department.

Training and education in AI literacy become crucial, with each department focusing on equipping its personnel with AI knowledge relevant to their field. This approach is particularly vital in a diverse country like India, where the technological landscape varies greatly.

Moreover, updating policies and guidelines for ethical AI use is essential, considering India's complex socio-cultural fabric. Departments like Agriculture can employ AI in predictive analytics for crop production, soil health, while Urban Development might integrate AI into urban planning and management.

Each department must manage AI-related risks, such as data privacy, and ensure AI applications balance innovation with ethical considerations and public welfare. Overall, the focus should be on aligning AI's potential with the specific needs of each department, ensuring it serves as a tool for inclusive and sustainable departmental development.

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11.    From promise to practice, KPMG UK, August 2023

## 6.2. Organisational alignment

In the context of individual departments within the Indian government, the implementation of Generative AI necessitates the formation of specialised governance teams. These multidisciplinary teams should consist of experts in AI, legal frameworks, ethics, privacy, and change management. Their role is to ensure that Generative AI applications in each department comply with national policies, ethical standards, and legal requirements.

Take, for example, the Ministry of Health and Family Welfare. Here, the integration of Generative AI in managing patient data or predicting disease outbreaks demands rigorous data privacy measures and ethical oversight. The department-specific governance team would be instrumental in establishing clear reporting structures and accountability mechanisms, ensuring decisions balance technological innovation with regulatory compliance and public welfare.

Such a governance approach ensures that each department leverages Generative AI responsibly and transparently, in alignment with India's socio-cultural values. This structural governance framework becomes essential in navigating the complex intersections of technology, law, ethics, and public administration, tailored to the distinct needs and challenges of each department.

## 6.3. User education and adoption

For successful adoption of Generative AI in Indian government departments, focused training and education for employees are essential. Tailored training programmes should address the specific needs of each department.

For instance, in the Ministry of Agriculture, training could centre on using AI for crop yield optimisation and climate impact assessments. In the Ministry of Urban Development, emphasis might be on AI applications in urban planning and sustainable city management. Similarly, for the Ministry of Finance, the focus could be on utilising AI for economic forecasting and fraud detection. Effective communication strategies, including regular briefings and workshops, are vital to inform and prepare all stakeholders for changes due to AI integration.

Training must be adaptive, catering to varying AI literacy levels across departments, and should elucidate not only AI functionalities but also their relevance to specific roles. Additionally, aligning training materials with India's diverse linguistic and cultural contexts will enhance understanding and acceptance.

In summary, a comprehensive and culturally sensitive approach to training and communication is key for the efficient and purposeful implementation of AI in different government departments, ensuring it aligns with the goal of improving public service delivery and governance.

## 6.4. Ethics

The ethical integration of Generative AI into various departments of the Indian government calls for a framework that addresses unique ethical challenges and business risks, in line with national values. Each department faces issues like data privacy, security, misinformation, and the potential impact on employment, which are critical in India's diverse context.

Departments should adopt AI ethics principles that reflect societal values such as transparency, justice, fairness, non-maleficence, responsibility, and privacy. For example, when managing data privacy, departments could learn from India's experience with Aadhaar to implement strong data protection in AI applications. In combating misinformation, departments like the Ministry of Information and Broadcasting should establish protocols to regulate AI-generated content, particularly in sensitive areas like news.

Additionally, as AI might replace certain job roles, departments must proactively pursue workforce retraining and redeployment. This is especially important in India, where employment is both an economic and social issue.

Each department should articulate its AI ethics principles and foster dialogue with stakeholders, including technologists, ethicists, and the public, to ensure adherence to these principles in AI systems. For instance, the Ministry of Electronics and Information Technology could lead in implementing AI governance frameworks, setting a precedent for other departments.

In summary, operationalising AI governance in individual government departments necessitates a balanced approach that not only leverages AI for efficiency and innovation but also guards against ethical pitfalls, aligning with India's socio-cultural diversity.

## 6.5. Data and AI risk management

Incorporating Generative AI into the operations of individual departments within the Indian government calls for a thorough enhancement of existing risk management frameworks, focusing on the specific challenges posed by this technology. The implementation of Generative AI introduces new algorithmic risks that need to be meticulously assessed and managed within each department's context.

Crucial to this process is the involvement of ethical and legal experts, particularly for high-risk applications. For instance, in the Ministry of Home Affairs, where AI might be deployed for security and surveillance, stringent ethical and legal reviews are necessary to protect citizens' rights and privacy. Each department must identify both internal and external risks associated with Generative AI applications. This requires rigorous testing during development and continuous monitoring after deployment. For example, in the Ministry of Environment, Forest, and Climate Change, AI used for environmental monitoring must be regularly evaluated for accuracy and biases to ensure informed policy decisions.

Developing a risk minimisation plan is also crucial. This plan should encompass a comprehensive analysis of the potential impacts of AI systems on users, affected parties, and the environment. In the Ministry of Education, for instance, where AI could develop personalised learning tools, understanding and minimising potential negative impacts on students' learning experiences and privacy is key.

By adopting such a detailed and careful approach, each department in the Indian government can harness the benefits of Generative AI while ensuring its alignment with national values, legal standards, and risk tolerance, thereby maintaining the integrity of government operations and public trust.

## 6.6. Regulatory compliance

The integration and regulation of AI systems, including Generative AI, must be carefully navigated within the country's unique regulatory landscape. Indian government departments must ensure that their AI systems adhere to national regulations, which may influence design choices, functionalities, and potentially the viability of certain use cases or business models.

For instance, the Ministry of Electronics and Information Technology, responsible for formulating and implementing policies and guidelines for electronics and IT in India, would need to conduct a thorough legal analysis of AI systems under its purview. This analysis should assess regulatory risks associated with different design options, pinpoint key design constraints, and explore the regulatory implications of various design areas. This is particularly important in a scenario like India'sDigital Personal Data Protection Act which emphasises data privacy and could significantly impact AI functionalities that rely on personal data.

Such regulatory focal points must be clearly communicated to all teams involved in developing or deploying AI systems within the government. This ensures that everyone is aligned and working within the legal framework.

Moreover, as AI regulations evolve globally, like the EU's AI Act or the UK's policy paper on AI regulation, it's imperative for Indian government agencies to stay informed about these developments. This not only helps in aligning with international standards where appropriate but also aids in preempting and addressing any compliance issues that may arise as the global regulatory landscape evolves.

This approach ensures that the Indian government not only leverages AI for improved governance and public service delivery but also does so in a manner that is legally compliant, ethically sound, and in line with the nation's policy framework and socio-cultural values.

## 6.7. Data and data-driven practices

In managing data and data-driven practices for Generative AI within individual departments of the Indian government, a strong emphasis on data governance, quality, and security is critical. Each department faces unique challenges given the diverse nature of data they handle, requiring tailored data management protocols.

For instance, a department like the Ministry of Statistics and Programme Implementation, which deals with a plethora of data for policymaking and programme implementation, must ensure robust documentation of all data sources used in AI systems. This includes detailed information about the metadata, data quality metrics, and protocols for data monitoring, storage, and destruction in compliance with legal and ethical standards. Such practices are crucial to ensure the integrity and reliability of AI applications in government operations.

Similarly, for departments like the Ministry of Urban Development, which might use AI for city planning and infrastructure development, operational AI governance demands data sourcing and usage be aligned with strategic goals, undergoing rigorous quality checks and continuous monitoring. In such applications, even minor inaccuracies in data can lead to significant issues in urban planning decisions.

Differentiating between training, validation, and operational data is also vital, each requiring specific workflows and processing techniques. For instance, in the Ministry of External Affairs, where AI could be used for analysing international trends or diplomatic communications, safeguarding against misleading or compromised data is crucial to maintain national security and diplomatic integrity.

By adopting these practices, each department ensures its use of Generative AI is responsible, secure, and in alignment with India's strategic objectives, as well as the ethical and legal standards governing data use.

## 6.8. Technology of AI system

When selecting the technology stack and solutions for Generative AI systems, each department in the Indian government must align its choices with its specific use cases, strategic goals, values, and risk tolerances. The design, development, operation, and monitoring of these AI systems should be tailored to meet the unique needs and objectives of each department.

For example, departments handling sensitive information, like the Ministry of Defence, may prefer a private, on-premises AI model to ensure maximum data security and confidentiality. On the other hand, departments with less sensitive data, like the Ministry of Tourism, which might use AI for analysing tourist patterns and preferences, could opt for a public cloud solution for its scalability and cost-effectiveness.

The involvement of designers and developers is critical in operational AI governance. Whether it's training a private model, utilising a cloud-based solution, on-premises solution, or deploying an externally developed system, continuous monitoring throughout the AI system's lifecycle is essential. This includes robust version control, deployment protocols, and operational metrics for performance monitoring.

Key operational AI governance components like repository management, operating environment, architecture, and health checks must be adapted to each department's context. In departments where accuracy is paramount, like the Ministry of Finance, which might use AI for economic forecasting or fraud detection, rigorous performance monitoring and validation are essential to ensure the reliability of outputs.

By customising the technology stack and operational governance to the needs of each department, the Indian government can effectively harness the benefits of Generative AI while aligning with its strategic objectives, ethical standards, and managing risks appropriately.

## 6.9. Algorithms

In the adoption of AI, understanding and managing algorithms, whether developed in-house or procured, is vital for sustainable and responsible AI development and use. Each department's approach should encompass an understanding of the algorithms' intended uses and potential misuses, ensuring alignment with national ethical standards and strategic objectives.

For example, in the Ministry of Road Transport and Highways, which might use algorithms for traffic management and safety analysis, it's crucial to ensure these systems are efficient and safeguard public privacy. Implementing explainable AI is vital here, making the decision-making process of AI transparent, especially in scenarios that directly affect public safety. Additionally, incorporating human oversight for decisions made by AI, particularly in cases of uncertainty, is key to maintaining control and reducing errors.

Training personnel to interpret AI outputs is another crucial factor. In departments such as Health, where AI could be used for diagnostics, it's important for medical professionals to accurately interpret and validate AI-generated suggestions for patient safety.

Regular monitoring of algorithm performance and conducting comprehensive health checks are indispensable. These processes should be systematic and based on metrics to guarantee consistency and reliability. For example, in the Ministry of Finance, where AI might be used for economic analysis or fraud detection, continuous assessment of algorithm accuracy and fairness is essential to ensure reliable insights and prevent bias.

By focusing on these aspects of AI algorithm management, each department within the Indian government can ensure their AI systems are not only effective but also adhere to ethical guidelines, respect citizen rights, and contribute positively to their specific national objectives.

## 7
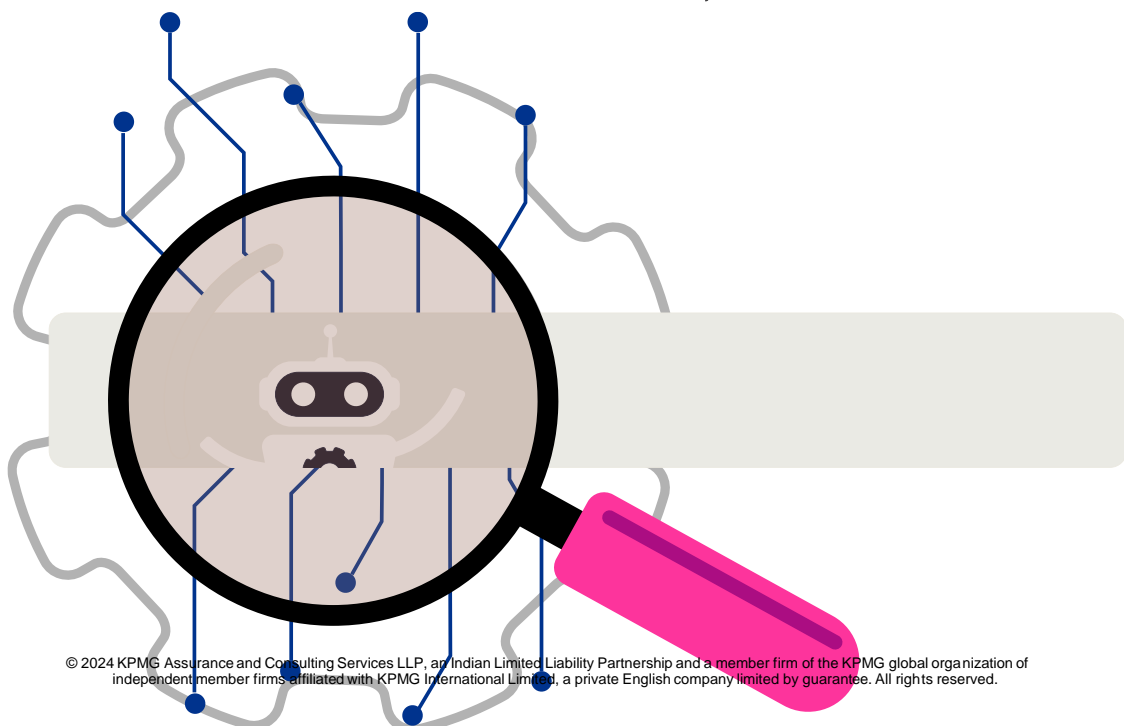
# Charting the future path

The field of Generative AI is still evolving and is going to be a game changer in every area of the industry. The market opportunity for GenAI as indicated earlier in the report is going to be USD45 - 50 billion globally by 2025. Developed countries are investing heavily on these technologies and are capturing the lion's share of market. India, as we have seen in the earlier sections of this report, is also building its capabilities but in a disjointed and in discrete mode, thereby creating lag in achieving the required scales of economy.

To position itself effectively in the GenAI landscape and leverage the potential benefits for its young and dynamic population, India needs to adopt a more cohesive and scaled approach. The following strategic points outline how India can centre itself in the GenAI development sphere:

## 7.1. Encourage investment and infrastructure in Gen AI

To boost Generative AI (GenAI) in India, a tailored strategy is necessary. The government, led by the Ministry of Electronics and Information Technology (MeitY), along with the Department of Science and Technology (DST) and NITI Aayog, should create a GenAI Investment Fund. This fund will promote GenAI in key sectors like healthcare, agriculture, and urban development, addressing India's specific needs and capitalising on opportunities.

Private sector investment is also important, and tax incentives plus public-private partnerships, particularly with leading IT and tech firms, are essential to attract funding for GenAI projects.

Building state-of-the-art computational facilities and data centres nationwide is crucial, utilising high-capacity servers and GPU clusters. The Digital India campaign could support this infrastructure development. Additionally, under the Atal Innovation Mission, a network of GenAI labs and testing facilities is proposed, offering vital resources for startups, researchers, and corporations to advance GenAI technology. Investment in digital infrastructure, particularly enhancing internet connectivity in rural and remote areas and cloud computing, is vital. The BharatNet project's role in connecting Gram Panchayats with high-speed internet is significant.

These measures will create a conducive environment for GenAI, fostering innovation and benefiting various sectors and regions across India, ensuring inclusive growth and development.

## 7.2. Integrate AI education across all levels

Integrating AI education throughout all educational levels in India demands a specific strategy, beginning at the grassroots and extending to higher education. This plan should start with the Central Board of

Secondary Education (CBSE) and the National Council of Educational Research and Training (NCERT) formulating a national curriculum that introduces AI concepts at the primary level and progressively incorporates advanced AI topics in middle and high schools, in line with technological progress and industry needs.

At primary and middle schools, the curriculum should nurture curiosity and basic AI knowledge, blending interactive modules and simple programming with core subjects like math and science, using age-appropriate tools. In high schools, the focus shifts to more intensive courses on machine learning, data analytics, and AI ethics, enriched with practical lab work and projects.

For higher education, the All-India Council for Technical Education (AICTE) and the University Grants Commission (UGC) should integrate AI education beyond computer science and engineering, into diverse fields such as business, healthcare, and social sciences, highlighting AI's interdisciplinary relevance.

Teacher training programmes are crucial for effective AI education, necessitating significant investment in professional development. Furthermore, collaborations with tech companies and AI startups are essential, offering students real-world insights through internships and workshops. Ensuring equitable AI education access, particularly in rural and underserved areas, is vital, necessitating enhanced digital infrastructure and support for underprivileged students.

By implementing this comprehensive approach, India can establish a strong AI education foundation, preparing its workforce for the digital future.

## 7.6. Implement a risk-based AI policy framework

India's implementation of a risk-based AI policy framework for Generative AI (GenAI) necessitates a nuanced approach, considering the country's diverse socio-economic and technological landscape. The Ministry of Electronics and Information Technology (MeitY), along with other relevant ministries like Health and Family Welfare, Finance, and Home Affairs, should categorise AI applications by their impact and risk levels, with heightened attention to high-risk sectors such as healthcare, finance, and public safety.

.For instance, in healthcare, GenAI applications would require stringent guidelines, ethical reviews, and impact assessments, overseen by organisations like the Indian Council of Medical Research (ICMR) and National Health Authority (NHA). In finance, the Reserve Bank of India (RBI) and Securities and Exchange Board of India (SEBI) should enforce regulations ensuring the security and accuracy of GenAI applications.

This policy framework must be dynamic and regularly updated, reflecting AI's rapidly evolving nature. Ongoing collaboration between government, industry, and academia is essential for crafting technically sound and practical regulations. Public awareness and engagement, perhaps through initiatives like the Digital India campaign, are crucial for informed discussions on GenAI policy.

By adopting this comprehensive and adaptable framework, India can responsibly engage with GenAI, aligning with broader societal and ethical standards while unlocking GenAI's transformative potential.

## 7.7. Create a framework for transparency and accountability in GenAI

Creating a transparency and accountability framework for Generative AI (GenAI) in India requires a collaborative approach led by the Ministry of Electronics and Information Technology (MeitY), alongside other key ministries and agencies. The objective is to establish ethical, fair, and clear guidelines for AI systems.

A critical component is mandatory disclosure by AI developers and operators of their methodologies, data sources, and algorithms. Oversight could be managed by a regulatory authority like the Data Protection Authority, in line with the Digital Personal Data Protection Act, 2023, ensuring compliance with data privacy and ethical standards.

Regular audits and monitoring of AI systems are crucial, potentially overseen by independent bodies established by MeitY or under the proposed Indian Council for AI. These bodies would assess AI systems for biases and adherence to ethical standards, maintaining public trust in AI technologies.

GenAI applications handling personal data must adhere to India's data privacy regulations. The framework should also include effective grievance and redress mechanisms, like online portals and helplines, for reporting concerns and seeking redress. Successful implementation depends on collaboration between government, industry, academia, and civil society, aligning GenAI development with principles of transparency and accountability, and building a trusted AI ecosystem in India.

## 7.8. Encourage international collaboration and standardisation in GenAI

India must actively engage with global entities and align with international standards to foster collaboration and standardisation in Generative AI (GenAI). Participating in international AI forums like the OECD, ITU, and UN initiatives is vital for India to stay abreast of GenAI advancements and ensure its applications are globally competitive.

Strategic partnerships with leading AI nations, such as the United States, China, and European Union countries, are essential. Bilateral agreements focusing on joint AI research, knowledge exchange, and standardisation of AI protocols can enhance India's GenAI capabilities and ensure global interoperability.

Adopting international standards, especially in data privacy, security, and ethical AI from bodies like IEEE and ISO, is crucial for India. This ensures Indian GenAI technologies meet global benchmarks, fostering trust and international market integration. India's role in global AI policy development is key. By advocating for the perspectives of developing nations, India can help shape inclusive global AI policies.

Through these efforts, India can establish itself as a significant player in the international GenAI landscape, influencing AI evolution while aligning with global standards and practices.
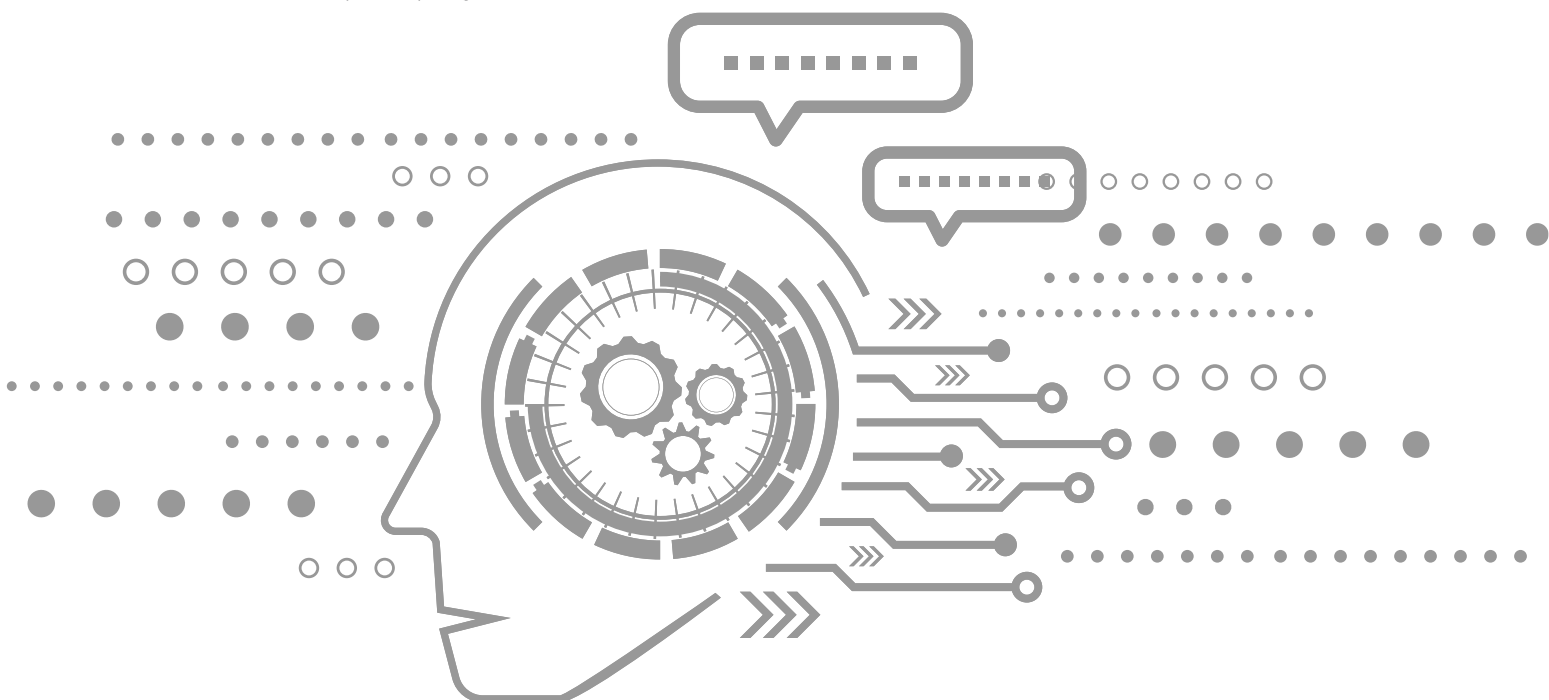
## 7.3. Boost research and intellectual property creation

To advance Generative AI (GenAI) research and intellectual property in India, a strategy leveraging existing research infrastructure and fostering innovation is essential. Key institutions like the Indian Institutes of Technology (IITs), Indian Institutes of Science Education and Research (IISERs), and the Council of Scientific and Industrial Research (CSIR) should be involved.

The government, through the Department of Science and Technology (DST) and the Ministry of Electronics and Information Technology (MeitY), needs to prioritise GenAI research funding. This funding should support projects in strategic sectors such as agriculture, healthcare, and smart cities, with dedicated grants and awards to motivate innovative research.

To nurture innovation, setting up GenAI-focused incubation centres and startup accelerators in major tech hubs like Bengaluru and Hyderabad is crucial. These centres would offer mentorship and resources, linking academic research with marketable products. Streamlining the patent filing process under the Indian Patent Office is also vital. This includes reducing costs and simplifying procedures, complemented by regular IP-related workshops at research institutions. Furthermore, establishing a national repository for GenAI research and patents, managed by an entity like CSIR, would track progress and facilitate academia-industry collaboration.

By adopting these measures, India can significantly enhance its GenAI research and intellectual property, contributing to global research impact and technological growth.

## 7.4. Adopt a pro-innovation approach for GenAI

To foster Generative AI (GenAI) innovation in India, the government, particularly the Ministry of Electronics and Information Technology (MeitY), needs to create an ecosystem that aligns with India's socio-economic context and promotes ethical AI development. A key step is establishing a responsive regulatory framework under MeitY or a dedicated GenAI body, balancing innovation with public interest.

Supporting startups in the GenAI sector is vital. Utilising existing technology incubators, like those under the Start-up India initiative, will provide necessary funding, mentorship, and technology access. Public-private partnerships, encouraged by bodies like NITI Aayog and state governments, can combine government support with private sector ingenuity.

Policies to incentivise GenAI research and development, including tax breaks and subsidies, should target sectors like healthcare and agriculture. Collaborations with industry and academia can help tailor these incentives effectively. An ethical AI culture is crucial, with values of transparency and accountability. An AI Ethics Committee, under MeitY or DST, should oversee ethical standards in AI development, enhancing public trust in technology. Through these strategies, India can develop a strong GenAI ecosystem, balancing technological innovation with ethical and social responsibility.

## 7.5. Identify and prioritise key sectors for GenAI application

In India, strategically prioritising sectors for Generative AI (GenAI) application is crucial to address national challenges and harness strengths. The government, through ministries like Electronics and Information Technology (MeitY), Health and Family Welfare, Agriculture, and Education, should focus on applying GenAI in healthcare, agriculture, education, and manufacturing.

In healthcare, GenAI can revolutionise personalised medicine, diagnostics, and drug discovery, improving patient care. Collaborations with institutions like AIIMS can integrate GenAI into the healthcare system.

Agriculture, vital to India's economy, can benefit from AI in predictive analytics for crop management, soil health, and climate-adaptive farming. Programmes like the Pradhan Mantri Krishi Sinchai Yojana could incorporate GenAI for smarter farming. In education, GenAI can offer personalised learning and modernise educational infrastructure, particularly in rural areas, aligning with initiatives like Digital India. For manufacturing, a key GDP contributor, GenAI can enhance automation, supply chain efficiency, and predictive maintenance. 'Make in India' initiatives can leverage GenAI for innovation.

Strategic partnerships and tailored policies are vital for effective GenAI implementation, potentially positioning India as a global leader in AI-driven innovation.

# 8 Conclusion

In formulating a comprehensive national AI strategy and legal framework for Generative AI (GenAI) in India, the involvement of multiple key governmental entities is essential. The Ministry of Electronics and Information Technology (MeitY), already at the forefront of digital initiatives, is leading this mission. Collaboration with the Department of Science and Technology (DST) and the Indian Council of Medical Research (ICMR) is crucial to focus on research and development, especially in high-impact sectors like healthcare and agriculture.

Incorporating AIOps readiness and scalability into this strategy is vital. The MeitY, along with industry partners, can drive initiatives for the development of scalable AI infrastructure and platforms, ensuring that GenAI applications can handle the growing data and computational needs. This includes leveraging cloud technologies and advanced data centres, which are essential for the robust performance of AI systems at scale.

Special Economic Zones (SEZs) and technology parks, under the purview of the Ministry of Commerce and Industry, should be utilised as innovation hubs for GenAI. These zones can offer incentives and an enabling environment for startups and larger corporations to develop, test, and scale GenAI applications.

The legal framework, developed in collaboration with the Ministry of Law and Justice, needs to address data privacy, intellectual property, and ethical considerations specific to AI. This framework must be agile to adapt to the fast-evolving nature of AI technologies. Further, engaging with international bodies and adhering to global standards in AI is imperative. The Ministry of External Affairs should play a role in forging international collaborations and partnerships, facilitating knowledge exchange, and aligning India's GenAI initiatives with global standards.

India can strategically enhance its Generative AI (GenAI) capabilities by investing in robust infrastructure and education, focusing on sectors pivotal for its growth. By adopting a risk-aware policy framework with an emphasis on transparency and accountability, and fostering international collaborations that align with global standards, India is well-positioned to become a key player in the global GenAI landscape.
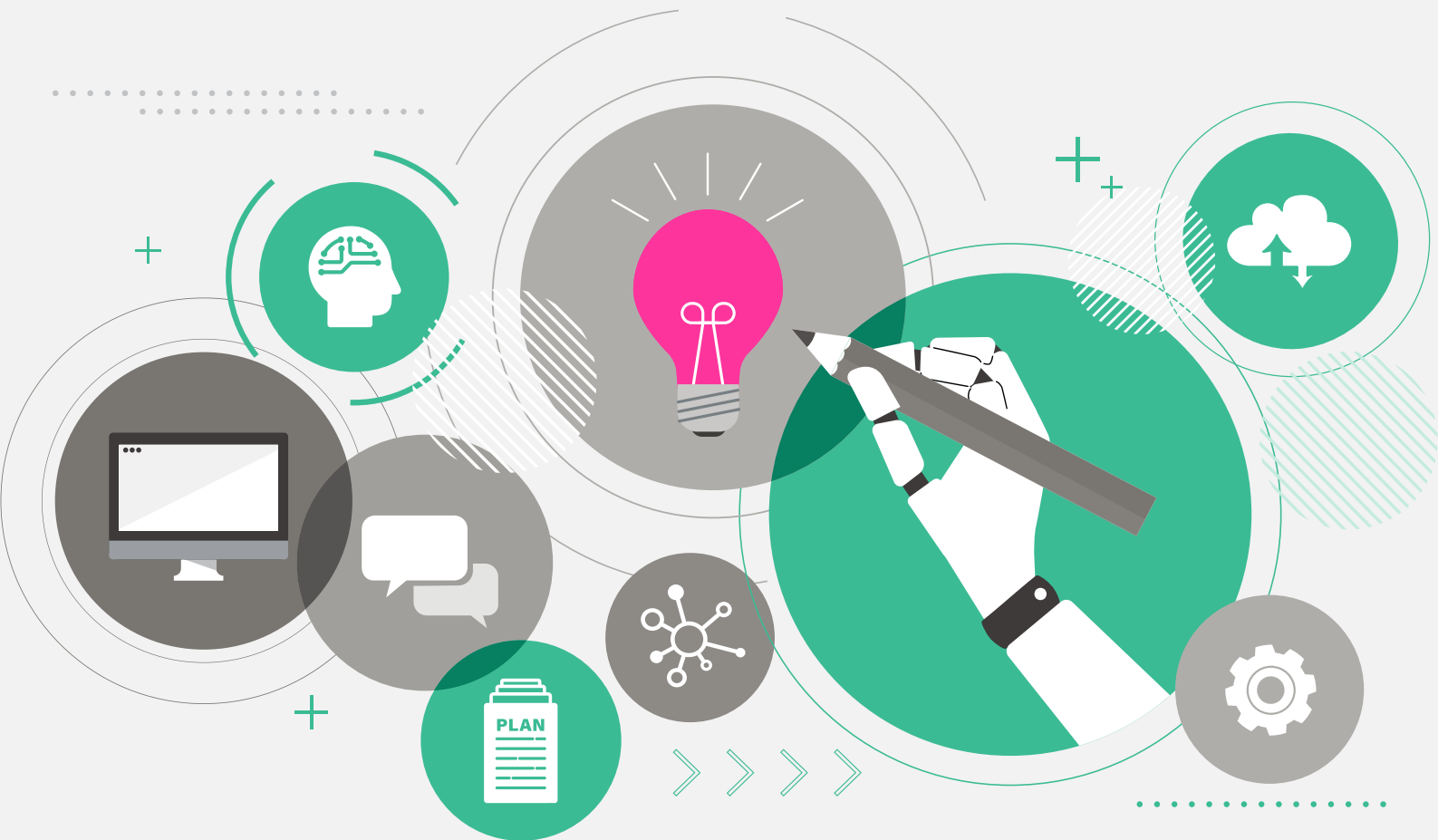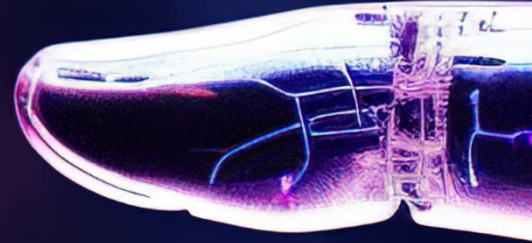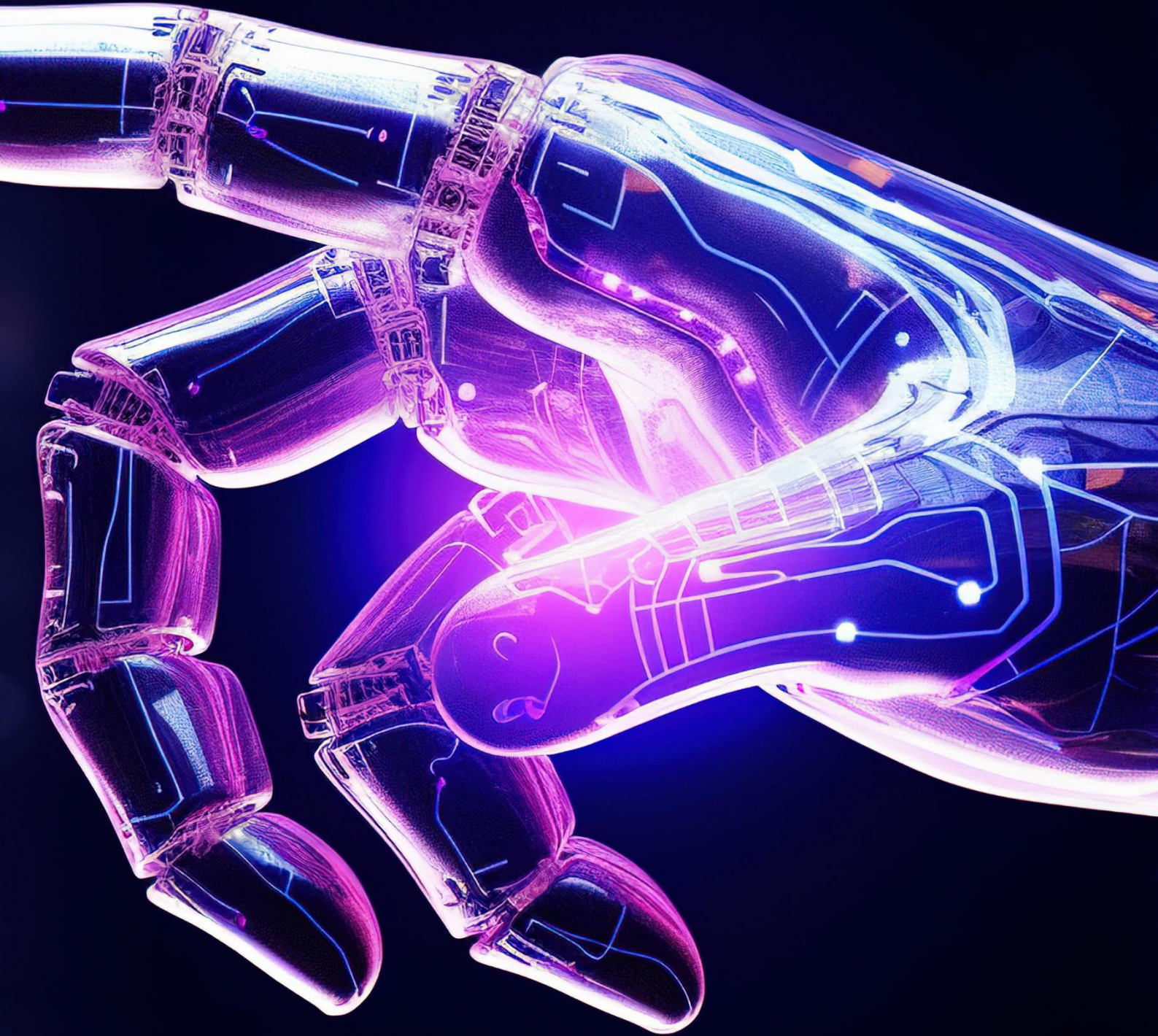
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