IMPACT, OPPORTUNITY AND CHALLENGES OF GENERATIVE AI

INDIAai
A MEITY, NEGD & NASSCOM INITIATIVE

MINISTRY OF
ELECTRONICS &
INFORMATION TECHNOLOGY
GOVERNMENT OF INDIA

Digital India
Power To Empower

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Sri Narendra Modi

Honourable Prime Minister of India

"Artificial intelligence is a tribute to human intellectual power, the power to think enabled humans to make tools and technologies. Today, these tools and technologies have also acquired the power to learn and think. In this, one key technology is AI. The teamwork of AI with humans can do wonders for our planet." [1]
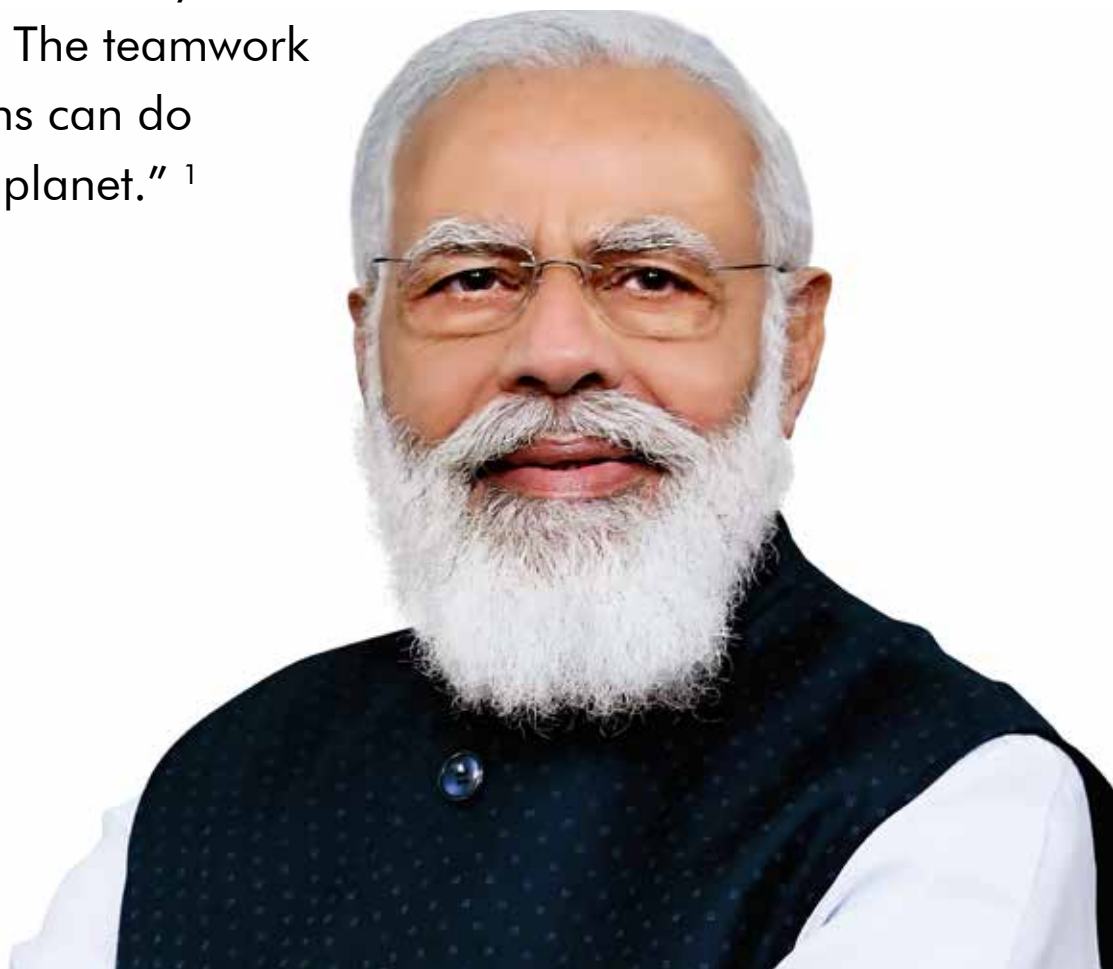
[1]. From the inaugural speech of RAISE 2020 Summit

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Introduction

Artificial Intelligence, both as an area of research and technology, has existed for more than half a century with varying levels of progress and success. The origin of machine learning and deep learning, fuelled by vast data pools and advancements in semiconductors and the internet, brought the most significant leap in the 2000s, giving us fascinating AI programs such as AlphaGo and Alpha Fold. However, the advent of transformer architecture in 2018 and the subsequent boom of Generative AI models, huge language models such as a GPT, has finally brought AI into the mainstream in recent months.

With the growing popularity of Generative AI tools such as Chat GPT and Midjourney, and tech companies such as Microsoft and Google in a race to incorporate these models into their search and enterprise offerings, we have reached a point where AI, especially Generative AI, is causing a significant influence in our day to day lives and beyond.

Considering this growing influence of Generative AI, INDIAai - the National AI Portal of the Government of India, conducted numerous research and held three roundtables that featured some of the prominent voices in Generative AI, AI Policy, AI Governance and Ethics, and academia to analyze the impact, ethical and regulatory questions, and opportunities it brings to India.

This report is the outcome of that process and is intended to be used by policymakers, entrepreneurs, practitioners, and students.

INDIAai Generative AI Roundtables

In the last few years, Generative AI technologies have exploded, ranging from sophisticated language models such as GPT-3 and image generation models such as DALLE-2. With the investment in AI to reach $422.37 billion by 2028, at a 39.4 % CAGR, experts believe Generative AI will play a critical role in pushing AI innovation and investment in the coming decade.[2]

Generative AI tools, primarily focused on low-cost and higher-value solutions, are perceived as the future of text, image and even code generation, sometimes indistinguishable from human creation. However, with the pace at which these technologies advance, we need to foresee the risks it brings. On the one hand, countries such as China have implemented regulatory measures to put a leash on Generative AI risks, such as watermarking the final product, auditing the algorithms, and even ensuring the consent of users are taken before using their data for training these models.

On the other hand, the socio-economic impact that Generative AI models can create is broad and deep and can even threaten our country's unity and national fabric, leading to the question of how we can ensure the ethical and responsible use of Generative AI models. Furthermore, the question of rights, attribution and IP of AI-generated works that mimic specific human creators opens more ethical questions.

With these questions in mind, INDIAai organised a series of roundtables with stakeholders and ecosystem players to understand the present Generative AI landscape, ethical and legal challenges, and solutions to mitigate the harmful impact these models can have in our society. The first roundtable on 31st Jan 2023 was a big success as it explored the current state of Generative AI and analysed recent hype around the subject.

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The participants were:

Prof Chandra Sekhar Seelamantula Professor, Indian Institute of Science	**Aman Taneja** Principal Associate, IKIGAI Law
Dr. Jyoti Joshi CEO & Founder, Kroop AI	**Emmanuel R Goffi** Founder and Director, Global AI Ethics Institute
Kazim Rizvi Founder, The Dialogue	**Aravind Aggarwal** Senior Research Scientist, IBM Research Lab, India
Tapan Aslot Communication Designer & Generative AI Artist	**Abhinav Aggarwal** Co-Founder & CEO, Fluid AI

[2] Industry Trends, Share, Growth, SWOT Analysis, Forecast by Zion Market Research

The second roundtable was organised on 28th Feb 2023, which looked deeper into the ethical questions regarding Generative AI and the need for regulatory frameworks and how to formulate a policy approach.

The participants were:

Shashank Reddy
Managing Partner, Evam Law & Policy

Divya Dwivedi
Lawyer, Supreme Court of India

Prateek Sibal
Technology Policy Researcher, UNESCO

Anna Danes
Data Ethicist, OdiseIA

Vibhav Mithal
Managing Associate, Anand & Anand / For Humanity

The third roundtable was held on 24th Apr 2023, and it focused on the India opportunity in Generative AI, especially the economic impact and how this technology could transform various sectors and parts of the economy.

The participants were:

Aveekshith Bushan
Vice President, GM - APJ - Aerospike, Inc

Jaspreet Bindra
Author, Founder of TechWhisperer

Deepak Visweswaraiah
Vice President, Platform Engineering and Site Managing Director, Pegasystems

Neethu Joy, Ph.D.
Founder & CEO of a stealth startup

Harsha Mundhada
Principal, Inflexor ventures,

S Pavankumar Dubagunta
Speech Scientist, Uniphore Software Systems

This report contains essential learnings, findings, analysis, and opinions from these roundtables.

What is Generative AI?

Generative Artifical Intelligence (GAI) describes algorithms (such as ChatGPT, Midjourney, Bard, DALL E, etc.) that can be used to create new content, including audio, code, images, text, simulations, and videos. Generative AI models use neural networks to identify the patterns and structures within existing data to generate new and original content.

In recent years, large-scale models have become increasingly important in the AI-generated content space, providing better intent extraction and, thus, improved generation results. Furthermore, with the growth of data and the models' size, the distribution that these models can learn becomes more comprehensive and closer to reality, leading to more realistic and high-quality content generation.

Contrary to popular belief, Generative AI (GAI) models have existed as a technology since the early days of AI. The history of Generative AI models can be traced back to the 1950s with the development of Hidden Markov Models (HMMs) and Gaussian Mixture Models (GMMs), as they generated sequential data such as speech and time series. With the advent of Deep Learning, Generative Models saw significant performance improvements.

The current boom of Generative AI has its origins rooted deeply in advance of Natural Language Processing (NLP), which is a subfield within AI which focuses on how computers process and analyse large amounts of natural language data. In NLP, the traditional method to generate sentences is to learn word distribution using N-gram language modelling and then search for the best sequence. This modelling can be used for disambiguating the input.

In addition, they can be used for selecting a probable solution. This modelling depends on the theory of probability. Probability is to predict how likely something will occur. Models that assign probabilities to sequences of words are called Language Models or LMs.

However, this method cannot effectively adapt to long sentences, and this issue was tackled by introducing Recurring Neural Networks for language modelling tasks.

The advent of generative AI models in various domains has followed different paths, but eventually, the intersection emerged due to the Transformer Architecture. Introduced for NLP tasks in 2017, a Transformer Model is a neural network that learns context and thus meaning by tracking relationships in sequential data like the words in this sentence.

Transformer models apply an evolving set of mathematical techniques, called attention or self-attention, to detect subtle ways even distant data elements in a series influence and depend on each other. Transformer was later applied in computer vision and then became the dominant backbone for many generative models in various domains.

Unimodal – CV & NLP
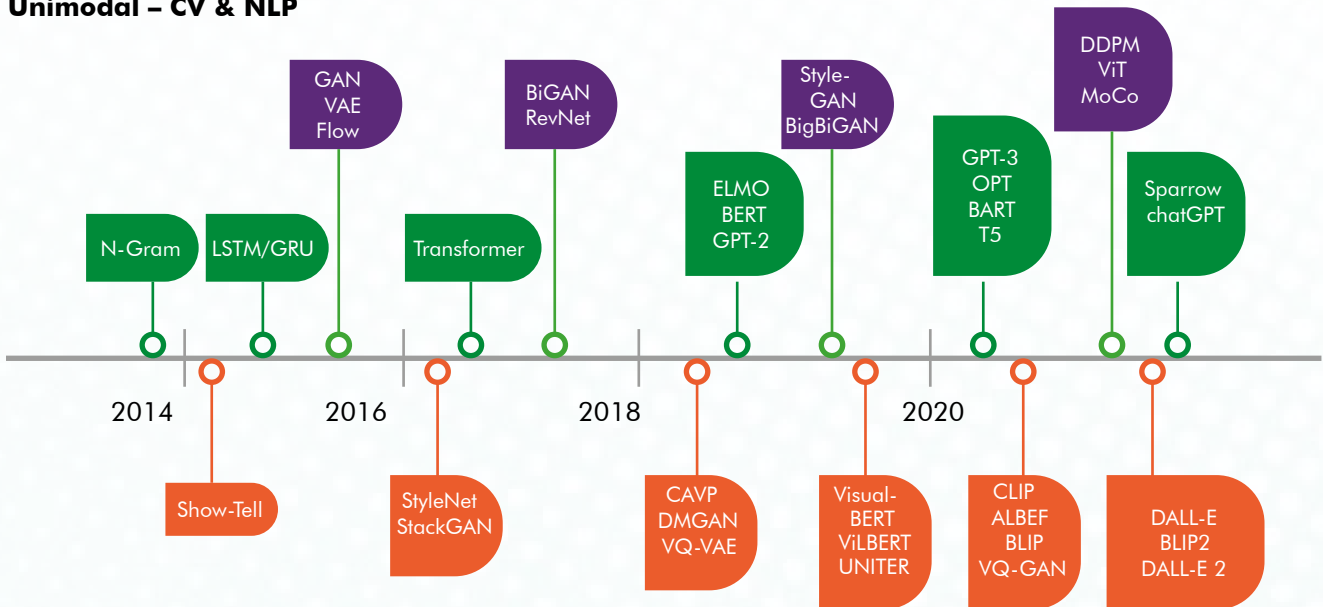
Multimodal - Vision Language　　■ NLP　■ CV　■ VL

Source: A comprehensive survey of AI Generated Content (AIGC): A History of Generative AI from GAN to ChatGPT by Yihan Cao & others, March 2023

Foundation models

Proposed to solve the limitations of traditional models such as RNNs, Transformer is the backbone architecture for many state-of-the-art models, such as GPT-3, DALL-E-2, Codex, and Gopher. Since the introduction of Transformer Architecture, pre-trained language models have become the dominant choice in NLP due to parallelism and learning capabilities. Generally, these transformer-based pre-trained language models can be commonly classified into two types based on their training tasks:

• Autoregressive language modelling

• and masked language modelling

Furthermore, despite being trained on large-scale data, the AIGC may not always produce output that aligns with the user's intent. To overcome this issue, reinforcement learning from human feedback (RLHF) has been applied to fine-tune models in various applications.

Developing computing with enhanced hardware, distributed training, and cloud computing contributed to the development of the foundation model.

Unimodal and Multimodal

Generally, GAI models can be categorised into unimodal models and multimodal models. Unimodal models receive instructions from the same modality as the generated content modality, whereas multimodal models accept cross-modal instructions and produce results of different modalities.[3]

[3.] Yihan Cao, Siyu Li, Yixin Liu, Zhiling Yan, Yutong Dai, Philips S. Yu, Lichao Sun, March 2023. A Comprehensive Survey of AI-generated Content (AIGC): A History of Generative AI from GAN to ChatGPT

A comprehensive Survey of AI-Generated Content (AIGC):

A History of Generative AI from GAN to ChatGPT

Unimodal
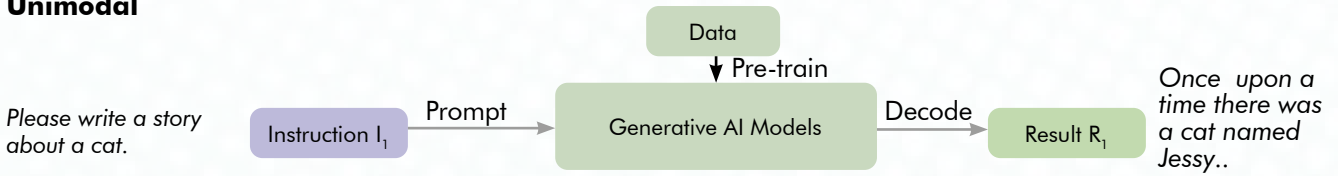
Multimodal

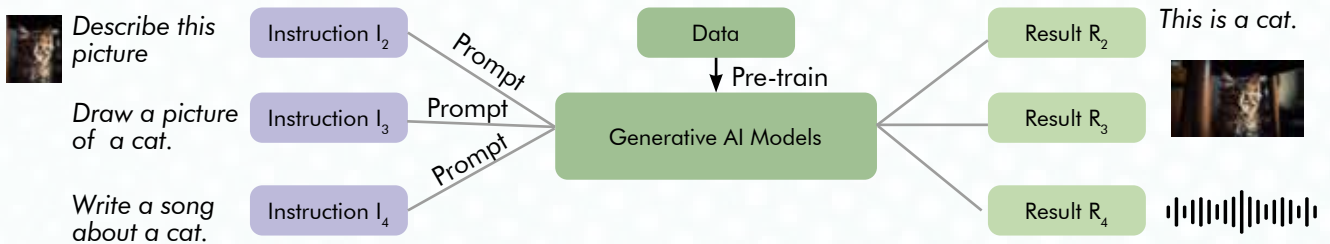Generative language models (GLMs) are unimodal models trained to generate readable human language based on patterns and structures in input data they have been exposed to. These models can be used for a wide range of NLP tasks, such as dialogue systems, translation and question-answering. These include decoder models and encoder-decoder models. Vision generative models are other kinds of unimodal.

Multimodal generations are relatively hard to learn compared to unimodal. The generation of state-of-the-art multimodal in vision language generation, text audio generation, text graph generation and text code generation aided in tackling this issue.

The application of these architectures can be seen in Chatbots, AI art generation, music generation, coding for AI-based programming systems, and education.

Popular Generative AI Models

Name	Description	Function
ChatGPT	It became one of the most famous chatbots in just 2 months. OpenAI has developed a language model that is close to a conversation with humans. It learns from interactions and processes information based on its learnings. Additionally, ChatGPT is trained on Generative Pre-Trained Transformer architecture — the neural network that lends the 'GPT' to its name.	ChatGPT works in the same way as automated chat services seen on customer support websites. It can answer queries and write many types of written content, such as articles, social media postings, essays, code, and emails.
DALL- E	DALL-E and DALL-E 2 are deep learning models developed by OpenAI to generate digital images from natural language descriptions, called "prompts".	DALLE 2 can generate unique, realistic visuals and art based on a text description. It is capable of combining concepts, traits, and styles. It can be used with an image made in DALL-E 2 or an image you've uploaded - it's been used to extend great works of art, such as the Mona Lisa, by adding more backdrop to the image.
Midjourney	Midjourney is a generative artificial intelligence program and service created and hosted by a San Francisco-based independent research lab Midjourney, Inc. Midjourney generates images from natural language descriptions, called "prompts"	Midjourney has introduced a new function called /describe, which lets users upload an image and receive written prompts that attempt to explain it. These prompts can then be utilised to create one-of-a-kind and engaging AI-generated art that is unlike anything else on the internet.
Chatsonic	It is a revolutionary generative AI tool built to beat all the limitations of Open AI, turning out to be the best alternative to ChatGPT. It integrates with Google Search to create content with the latest information. Additionally, it can create digital images and respond to voice commands.	Chatsonic can generate high-quality text, graphics, content for multiple social networking networks, emails, and website content based on the cues it receives. In addition to written commands, Chatsonic can be used with a voice command.
Jasper Chat	Jasper Chat is a new AI-powered generative way of interacting with generative AI.Instead of having to think in commands or strict prompts, you can converse with AI and refine responses with each engagement.	Jasper Chat may produce ideas, modify text passages, answer inquiries, and create creative stuff like poems or stories. Jasper Chat is intended for commercial use cases such as marketing and sales, as well as social media posts.
Copy.ai	Copy.ai is the new generative AI that is built for sales and content marketing teams. It can help you create articles, sales emails, social media captions, ad copy, blog posts, code and more all with real-time data.	Copy.ai assists the team with several types of copywriting and sales/copy, such as product descriptions, ad copy, website copy, blogs, and emails. It can make bullet points out of LinkedIn profiles. From a single term, it may generate a full content brief.
ChatFlash - Neuroflash AI	You can quickly start using this chat feature by asking questions or giving instructions. The Chatflash AI will answer you and provide results.	Neuroflash creates high-quality artificial intelligence material. It generates documents using multilingual, modern language models (auto-regressive language transformers; GPT-3).
GrowthBar	GrowthBar is an AI SEO content writing tool that specialises in AI content generation. The main feature is the long-form content editor, which helps you to write blog posts in 2 minutes flat.	GrowthBar creates AI content using advanced algorithms that produce and optimise your blog posts for you. Furthermore, GrowthBar performs keyword research, rank tracking, and backlink research in the same way as large SEO tools do.

Name	Description	Function
Rytr Chat	Rytr is an AI writing assistant that helps you create high-quality content, in just a few seconds, at a fraction of the cost. Powered by state-of-the-art language AI to generate unique, original content for almost any vertical	Rytr Chat was created to give Rytr users a more natural and conversational experience. Rytr Chat allows you to create content with a single click. It changes the content's tone, duration, or style.
Easy Peasy AI Chat	Easy-Peasy.AI is the AI Content Generator, which assists you and your team in breaking past creative barriers to create fantastic, original content 10X faster. It is an artificial intelligence content tool that may assist you with a number of writing jobs, such as producing blog posts and creating better resumes.	Easy Peasy AI Chat allows users to easily compose emails, social media messages, resumes, blog posts, and other documents. It can also make AI visuals, summarise large text, and transcribe audio.
LaMDA	LaMDA AI is a conversational Large discourse Model (LLM) developed by Google to power dialogue-based systems that generate natural-sounding human discourse. It has already been used for zero-shot learning, program synthesis, and BIG-bench workshop.	It is a natural language processing tool developed by Google with 137 billion parameters. It was built by fine-tuning a group of Transformer-based neural language models. For pre-training, the team created a dataset of 1.5 trillion words which is 40 times more than previously developed models.
GhostWryter	Ghostwryter is an AI application that generates high-quality material for marketing techniques such as SEO text and blog entries. It is easily available via Google Docs and employs artificial intelligence technologies through the use of an OpenAI licence key.	The app uses AI to help you create SEO optimised text, marketing content, and even blog posts for your business. You can simply write blog posts, and other marketing content with GhostWryter.
Ellie AI	Ellie AI is a platform that offers data teams with tools and frameworks to ensure that new data is constantly valuable to the business. It provides lightweight data modelling and information architecture elements and is intended for enterprises of all sizes. Ellie AI also offers an AI email assistant that can respond to your emails in your preferred style.	Ellie is a writing assistant exclusively for drafting email replies. Ellie learns from your own individual writing style, and allows users to pick a "mood" for her replies (i.e. her tone can be casual, professional, irritated, etc.) Ellie is also multilingual and will automatically reply in the language to which she was initially written.
Murf AI	Murf AI allows users to make studio quality voice overs for things like explainer videos, podcasts, advertisements and more using text. Just choose from the 120+ voice styles available on the site, including 20+ languages and accent options.	Murf AI features a straightforward user interface that anyone can utilise. Simply upload your text and select a voice from the library. You can vary the voice's tempo and pitch as you see fit. You may also upload your own sound clip and utilise the voice changer to make it sound more professional.
Stockimg.AI	Stockimg.AI aid in art generation. When generating an image, you let the AI know if you are looking to make a book cover, logo, icon, wall paper or stock images, and it creates visual content to suit your needs.	Stockimg.AI is an AI image generating platform that makes it simple to create AI logos, book covers, posters, and other graphics. Stock pictures, book covers, posters, wallpapers, logos, illustrations, icons, and web and mobile UI are just a few of the categories available.
Heyday	Heyday calls itself an AI powered memory assistant, but it's actually more like a research assistant. The app works with browsers, search engines, and apps like Gmail and Google Docs to help "resurface" content you may need to find once you've already reviewed it.	Heyday by Hootsuite is a conversational AI platform developed to assist retailers and eCommerce enterprises in capturing leads and increasing buyer engagement. Customizable branding, multi-channel communication, wait time management, prioritisation, push notifications, and scripted responses are among the key features.

Name	Description	Function
Wordtune Read	Wordtune does offer a generative writing option, but what's more interesting to me is its reading option. Wordtune Read summarises lengthy documents and helps highlight key points so that users can understand more, more quickly. It can even provide different summaries based on a specific point of view, for instance what the text means for an overall industry or decision-makers within the field.	Wordtune Read quickly and accurately summarises any document, making it possible for anyone to read lengthy, complex texts in a fraction of the time. Not only does it extract essential lines like other reading aids, but thanks to our advanced AI technology, it also summarises the main themes for you.
Regie AI	This app will help research potential contacts and help sales agents create personal emails that feel authentic to your company. Regie uses a large language model to help create a voice specific to your brand.	Regie.ai is used to develop, test, and analyse personalised prospecting sales campaigns. This product package may be used to develop interesting sales sequences, collaborate on content, and boost front-line efficiency. It can also be used to validate content so that people can converse with confidence.
Resume Worded	The app was designed to provide instant feedback on your resume or LinkedIn profile, including scores on key criteria that real recruiters use when hiring candidates. Users can also use the app to identify keywords most relevant to the job descriptions they're searching for.	Resume Worded is a career platform that assists you in adapting your resume to the position for which you are pursuing. This resume scanner will assess the job posting and highlight keywords and skills that are missing from your resume in 10 seconds after you upload your resume and the job description.
Looka	Looka allows you to create a beautiful logo with the click of a button. Just input your company's name, industry type, and color palette, and you'll have an endless range of logo possibilities at your fingertips.	Looka provides high-resolution PNG and JPG logo files, SVG and EPS logo files for scaling, and colour variations for use online or offline. Other features include business card designs, social media templates, brand information, and lifetime logo support.
Google Bard	Bard is Google's AI-powered interactive chat service. It is intended to function similarly to ChatGPT, with the main distinction being that Google's service will obtain its data from the internet. Bard, like most AI chatbots, can code, solve math questions, and assist you with your writing needs.	Google's Bard is a chatbot that uses generative artificial intelligence to have natural conversations; it was built using the LaMDA family of LLMs and then the PaLM LLM. In direct competition with OpenAI's ChatGPT, it was created.
Adobe Sensei	Adobe Marketo Engage's Sensei GenAI aligns marketing and sales teams with real-time conversational experiences that accelerate time to market, increase pipeline, and increase calendared meetings.	Adobe Analytics can automatically analyse customers and audience groups using Adobe Sensei to uncover meaningful distinctions, attribute conversion drivers, and anticipate future behaviour.
Adobe Firefly	Adobe Firefly is a generative AI engine for creativity. It's just arrived in Adobe Photoshop, and it'll change the way you create forever.	Adobe Firefly's mission is to help people develop their innate creativity. Firefly, as an embedded model within Adobe products, will provide generative AI capabilities tailored to creative demands, use cases, and processes.
Amazon Bedrock	Amazon Bedrock is a fully managed service that makes FMs from major AI companies and Amazon available via an API, allowing you to select the model that is best suited for your use case from a diverse set of FMs.	Amazon Bedrock's serverless architecture makes it simple to get started, personalise FMs with your own data in private, and integrate and deploy them into your applications with the AWS tools and capabilities.
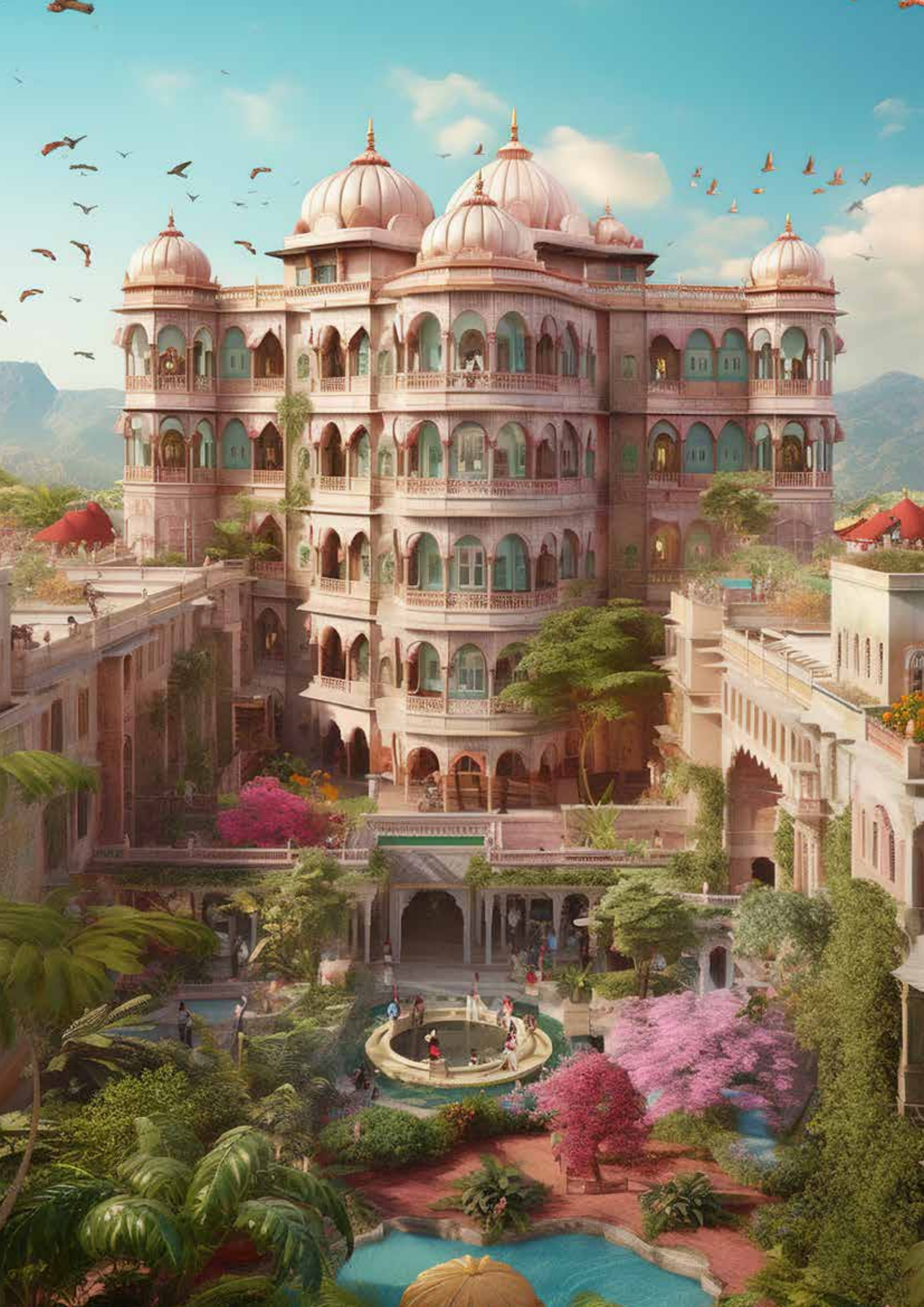
Large Language Models

Large Language Models (LLM) are neural networks that analyse and comprehend natural language. Commonly trained on large datasets, they can be utilised for tasks including text generation, classification, question response, and machine translation.

Large language models process vast volumes of text data to approximate human speech. The LLM uses a deep learning model, a network of interconnected neurons, to process, analyse, and forecast complex data to produce these natural language responses.

Today, many tasks in NLP, such as speech-to-text and sentiment analysis, rely on language models as their basis. These models can analyse a text and guess what word will come next. For example, the parameters of an LLM let it make predictions about the likelihood of word sequences by considering the text's relationships. The model can capture complex relationships and handle unusual words with more parameters.

> **By 2030, a major blockbuster film will be released with 90% of the film generated by AI (from text to video), from 0% of such in 2022.[4]**

Some of the popular Large Language Models

BERT

BERT (Bidirectional Encoder Representations from Transformers) is a family of masked-language models developed by Google researchers in 2018. According to a 2020 literature review, "in little more than a year, BERT has become a ubiquitous baseline in Natural Language Processing (NLP) experiments, counting over 150 research publications analysing and improving the model."

BERT was first implemented in English with two model sizes:

(1) BERTBASE (12 encoders with 12 bidirectional self-attention heads totalling 110 million parameters)

(2) BERT LARGE (24 encoders with 16 bidirectional self-attention heads totalling 340 million parameters)

BERT is a free and open-source NLP machine learning framework. The purpose of BERT is to provide context to help computers interpret ambiguous words in the text.

[4.] Gartner Article, January 2023. Beyond ChatGPT: The Future of Generative AI for Enterprises

GPT-3

GPT-3 (Generative Pre-trained Transformer 3) is a language model developed by OpenAI, a San Francisco-based artificial intelligence research laboratory. The 175-billion-parameter deep learning model can produce text that resembles human language and was trained on large text datasets containing hundreds of billions of words.

GPT-3 employs deep learning to generate human-like text. It will generate text that continues the prompt when provided a prompt.

LaMDA

Google's LaMDA (Language Model for Dialogue Applications) is a collection of conversational large language models. Initially developed and released as Meena in 2020, the first-generation LaMDA was announced during the Google I/O keynote in 2021, followed by the second generation the following year. LaMDA attracted significant attention in June 2022 after Google employee Blake Lemoine claimed that the chatbot had grown sentient.

BLOOM

BigScience The huge Open-science, Open-access Multilingual Language Model (BLOOM) is a large language model based on transformers. Over 1000 AI researchers collaborated to construct a free big language model for anyone who wants to explore it. It is considered an alternative to OpenAI's GPT-3, which has 176 billion parameters and was trained on about 366 billion tokens from March to July 2022. BLOOM employs a modified Megatron-LM GPT-2 decoder-only transformer model design.

GPT-4

OpenAI's Generative Pre-trained Transformer 4 (GPT-4) is a multimodal big language model and the fourth in its "GPT-n" series of GPT foundation models. It was published on March 14, 2023, and is now publicly available in a limited form through the chatbot product ChatGPT Plus (a premium version of ChatGPT), with access to the GPT-4-based version of OpenAI's API available through a waitlist.

Google - Bard

Google introduced Bard, a LaMDA-powered conversational generative artificial intelligence chatbot. It is intended to function similarly to ChatGPT, with the main distinction being that Google's service will obtain its data from the internet. Google's Bard is a conversational generative artificial intelligence chatbot based on the LaMDA family of large language models (LLMs) and later the PaLM LLM. It was created in direct response to the rise of OpenAI's ChatGPT, and it was initially published in a restricted capacity in March 2023 to lukewarm reviews before moving to other nations.

Furthermore, Bard, like most AI chatbots, can code, solve maths questions, and assist you with your writing needs.

List of Large Language Models

Name	Developer	Year
BERT	Google	2018
XLNet	Google	2019
GPT-2	OpenAI	2019
GPT-3	OpenAI	2020
GPT-Neo	EleutherAI	March 2021
GPT-J	EleutherAI	June 2021
Megatron-Turing NLG	Microsoft and Nvidia	October 2021
Ernie 3.0 Titan	Baidu	December 2021
Claude	Anthropic	December 2021
GLaM (Generalist Language Model)	Google	December 2021
Gopher	DeepMind	December 2021
LaMDA (Language Models for Dialog Applications)	Google	January 2022
GPT-NeoX	EleutherAI	February 2022
Chinchilla	DeepMind	March 2022
PaLM (Pathways Language Model)	Google	April 2022
OPT (Open Pretrained Transformer)	Meta	May 2022
YaLM 100B	Yandex	June 2022
Minerva	Google	June 2022
BLOOM	Large collaboration led by Hugging Face	July 2022
Galactica	Meta	November 2022
AlexaTM (Teacher Models)	Amazon	November 2022
LLaMA (Large Language Model Meta AI)	Meta	February 2023
GPT-4	OpenAI	March 2023
Cerebras-GPT	Cerebras	March 2023
Falcon	Technology Innovation Institute	March 2023
BloombergGPT	Bloomberg L.P.	March 2023
PanGu-Σ	Huawei	March 2023
OpenAssistant	LAION	March 2023
PaLM 2	Google	May 2023

(Disclaimer: This is not complete list of LLMs, but a curated list by INDIAai team)

Current state of Generative AI

With the launch of ChatGPT, Generative AI has taken over the world by storm. According to NVIDIA Founder and CEO Jensen Huang, Generative AI has finally caused the inflexion point in AI. He calls it the iPhone moment for AI as a new computing platform has been developed and emerged.

"This is a new computing model that you program in a new way, and this new way is using human language," stated Huang. "The first computer you can program in any language you like; English, Chinese, French, Japanese, however you like to do it," he noted.

The open-to-public version of ChatGPT gained 100 million users in just under two months, while Stability AI's Stable Diffusion, which can generate images based on text descriptions, garnered more than 30,000 stars on GitHub within 90 days of its release. Today, many believe that ChatGPT has the potential to change the entire business stream.

Public perception of AI

While some opine generative AI as a threat rather than a boon because of the lack of awareness of the actual capability of the tool, others are extensively using it and gaining a clear understanding of what the tool can accomplish.

"A significant number of people are still looking at AI as a threat. There is generally low acceptance with regard to AI as people are still relating AI with Hollywood movies they might have watched, in which it is often portrayed as how Ai is going to take over the world. There is a dire need to educate people," said Generative AI artist Tapan Aslot at the first INDIAai Generative AI Roundtable.

Lack of basic understanding of AI is yet another major issue. "The public is lost in the complexity of the field. explaining AI without hiding its complex nature is essential, said Emmanuel Goffi, Founder and Director of Global AI Ethics Institute."Some people do not even have access to 4G in countries like India and Africa. Their knowledge of Chat GPT and Generative AI is limited. This clarity will lead to inclusivity and the maintenance of balance," he added.

> **By 2025, 30% of outbound marketing messages from large organisations will be synthetically generated, up from less than 2% in 2022.[5]**

[5.] Gartner Article, January 2023. Beyond ChatGPT: The Future of Generative AI for Enterprises

Is Generative AI 'creative' or 'generative'?

The emergence of creative tools such as Midjourney and DALL- E has opened the debate regarding the "creativity" of these tools. According to Prof Chandra Sekhar of IISc Bangalore, these models are only 'generative' as they derive results from existing material and are not creative. In his opinion, creativity is still unique to humans as natural intelligence would be hard to replicate.

"AI is not completely well founded. That is the actual threat," Prof Chandra Sekhar noted. Furthermore, self-learning is still a dream for the models. But, for now, AI lacks thought; the initial input must still be from the human," he stated in the first roundtable.

Abhinav Aggarwal, whose company Fluid AI recently released a book authored by AI, pointed out that even the "creative" humans are also dependent on other reference materials before creating a particular model.

"Why is it that when a human does it, it is creative and generative when an AI does it?" he asks.

To elaborate on this, he added that till now, AI has been able to generate something based on the information being fed to it. But being creative is something which is unique, on which humans have a clear advantage. He pointed out that one must distinguish between inference-based and memory-based logic. At present, AI systems are working on inference-based logic, but a decade later, it will be functioning on memory-based logic.

When an AI system learns from data, it is dubbed as non-creative, whereas if a similar thing is done by humans, it is termed as creative. Hence, it is either that the definition of creativity is blurred or we term one to be less creative than the other.

According to the first INDIAai Generative AI Roundtable, at a finer level, one needs to distinguish between creative and generative AI. While at present, the difference is blurred, and both are used interchangeably, a decade down the line, this difference will amplify. Defining creativity in an era of ChatGPT is a task in itself.

Future of jobs

The fear of being replaced by machines in the workspace has always been a major concern whenever a new technology arises. The recent boon in Generative AI has just amplified this concern. According to many reports, Generative AI could impact up to 300 million jobs globally. Generative AI could substitute up to 25% of current work in the US and 24% in Europe while complementing most of the remaining work.

Jyoti Joshi, Founder and CEO of Generative AI startup Kroop AI, pointed out that, though there are concerns about AI replacing humans, in the present stage, human intervention is a necessity. "Correct innovation is the key to the correct output", she added.

Despite AI bringing in a lot of automation in many processes, the technology will still need to replace jobs. It will add to new kinds of job profiles and lead to job

efficiency, concluding the first INDIAai Generative AI Roundtable.

The insights from the roundtable further backed Goldman Sachs findings that should generative AI reach its full potential and capabilities, the labour market might experience quite an upheaval. By analysing data on occupational tasks in both the United States and Europe, the report came to the conclusion that approximately two-thirds of existing jobs are susceptible to various degrees of AI automation. Not only that, Generative AI has the

potential to replace as much as one-fourth of the current workload. Alternatively, Generative AI has the potential to automate around 18% of the total workforce.[6] Also, an independent study[7] on GPTs and their impact on labour market points that 80% of the US workforce might have at least 10% of their tasks affected by such large language models. With access to LLMs, 15% of all other work tasks could be expedited while maintaining the same quality level. Given below are representations of job growth and job loss and how Generative AI will transform work across industries.

Total job growth and job loss

Future of Jobs

Total job growth and loss

23% of today's job will change

○ One million   ● Lost jobs   ● Stable jobs   ● New jobs
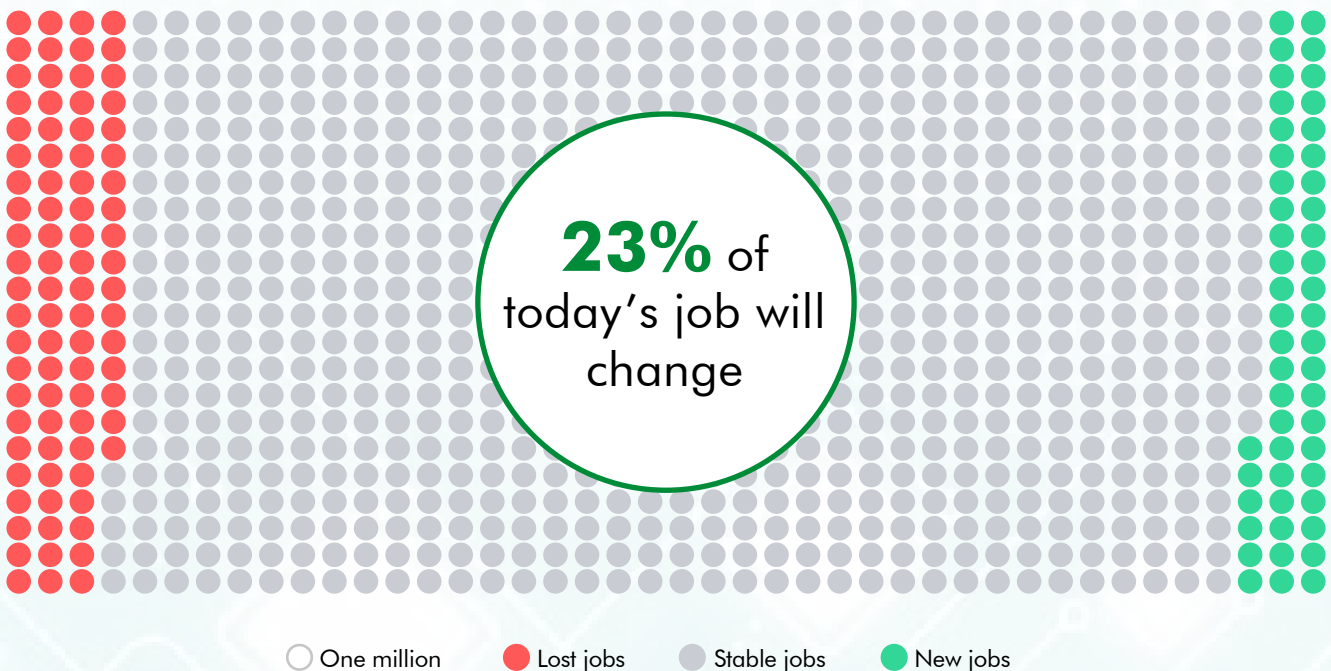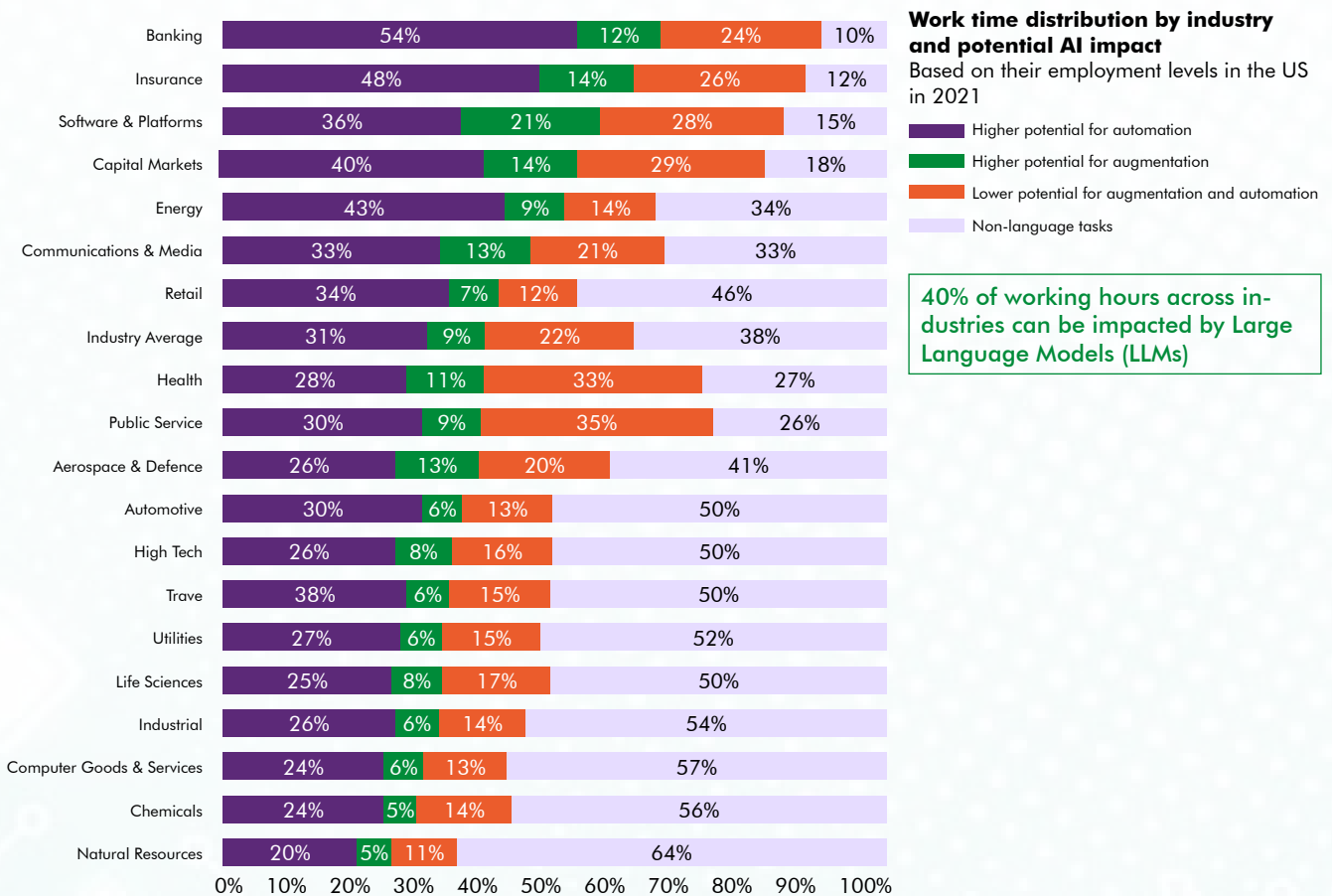
Source: World Economic Forum, Future of Jobs Report 2023

[6.] Goldman Sachs Economics Research, March 2023. The Potentially Large Effects of Artificial Intelligence on Economic Growth (Briggs/Kodnani)

[7.] Tyna Eloundou, Sam Manning, Pamela Mishkin, Daniel Rock, March 2023. GPTs are GPTs: An Early Look at the Labour Market Impact Potential of Large Language Models

Generative AI will transform work across industries

Industry	Higher potential for automation	Higher potential for augmentation	Lower potential for augmentation and automation	Non-language tasks
Banking	54%	12%	24%	10%
Insurance	48%	14%	26%	12%
Software & Platforms	36%	21%	28%	15%
Capital Markets	40%	14%	29%	18%
Energy	43%	9%	14%	34%
Communications & Media	33%	13%	21%	33%
Retail	34%	7%	12%	46%
Industry Average	31%	9%	22%	38%
Health	28%	11%	33%	27%
Public Service	30%	9%	35%	26%
Aerospace & Defence	26%	13%	20%	41%
Automotive	30%	6%	13%	50%
High Tech	26%	8%	16%	50%
Trave	38%	6%	15%	50%
Utilities	27%	6%	15%	52%
Life Sciences	25%	8%	17%	50%
Industrial	26%	6%	14%	54%
Computer Goods & Services	24%	6%	13%	57%
Chemicals	24%	5%	14%	56%
Natural Resources	20%	5%	11%	64%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Work time distribution by industry and potential AI impact
Based on their employment levels in the US in 2021

- Higher potential for automation
- Higher potential for augmentation
- Lower potential for augmentation and automation
- Non-language tasks

40% of working hours across industries can be impacted by Large Language Models (LLMs)

Source: World Economic Forum, May 2023. These are the jobs most likely to be lost - and created - because of AI

Occupations with high proportion of tasks that could be automated by Generative AI[8]	
Occupation	Proportion of task that can be automated by Gen AI
Office and administrative support	46%
Legal	44%
Architecture and engineering	37%
Life, physical and social science	36%
Business and financial operations occupations	35%
Occupations with least proportion of tasks that could be automated by Generative AI[9]	
Occupation	Proportion of task that can be automated by Gen AI
Building and grounds cleaning and maintenance	1%
Installation, maintenance and repair occupations	4%
Construction and extraction occupations	6%
Education, training and library occupations	7%
Health-care practitioners and technical occupations	8%

However, on the brighter side, AI has the potential to create jobs as well. The World Economic Forum predicts by 2027, there will be a significant increase in the number of AI and machine learning specialists by 40%. In other words, 1 million jobs are expected to be created with the increase in usage of AI and machine learning across all industry verticals. Additionally roles such as data analysts, data scientists, big data specialists and information security analysts are also expected to experience an increase of 30-35% and 31% respectively. These developments are anticipated to generate an additional 2.6 million jobs.[10] Another skill that will gain much prominence in the future is prompt engineering. It is a comprehensive process encompassing the entire interaction cycle between humans and AI. Prompt engineering aids in smooth, clear and efficient human-AI interaction. The field is expected to flourish and continue to evolve and develop as new techniques and demand for advanced AI systems increase over time.


8. Glenn Mossy, March 2023. The Impact of Generative AI on Labor Productivity, Employment, Wages and GDP
9. Glenn Mossy, March 2023. The Impact of Generative AI on Labor Productivity, Employment, Wages and GDP
10. World Economic Forum, Future of Jobs Report 2023

Fastest growing vs. fastest declining jobs

Top 10 fastest growing jobs	Top 10 fastest declining jobs
AI and Machine Learning Specialists	Bank Tellers and Related Clerks
Sustainability Specialists	Postal Service Clerks
Business Intelligence Analysts	Cashiers and Ticket Clerks
Information Security Analysts	Data Entry Clerks
Fintech Engineers	Administrative and Executive Secretaries
Data Analysts and Scientists	Material-Recording and Stock-Keeping Clerks
Robotics Engineers	Accounting, Bookkeeping and Payroll Clerks
Electrotechnology Engineers	Legislators and Officials
Agricultural Equipment Operators	Statistical, Finance and Insurance Clerks
Digital Transformation Specialists	Door-to-Door Sales Workers, News and Street Vendors, and Related Workers

Source: World Economic Forum, Future of Jobs Report 2023

> **40% of working hours across the industries can be impacted by Large Language Models[11]**

Opportunities

Generative AI has emerged as a powerful tool that has significantly impacted economic opportunities across various industries. The potential economic benefits of generative AI are vast, offering increased productivity, automation, and enhanced decision-making capabilities, ultimately driving growth, efficiency, and competitiveness in numerous sectors of the economy.

Generative AI is expected to increase from USD 11.3 billion in 2023 to USD 51.8 billion by 2028. The CAGR is expected to touch 36% between the forecasted period.[12] "There are endless opportunities for generative AI in India. Starting from big companies making chatbots to students using ChatGPT for writing academic papers. Even the older generation is curious about ChatGPT," pointed out Pavankumar Dubagunta, Speech Scientist at Uniphore Software Systems.

According to Goldman Sachs estimates, Generative AI could raise global GDP by 7% (USD 7 trillion) and increase productivity by 1.5% in the next decade.[13] PwC estimates that the openness to tap into the power of Generative AI will likely only continue to grow with an estimated USD 15.7 trillion of potential contribution to the global economy by 2030.[14]

According to Jaspreet Bindra, in technology as fundamental and transformative as generative AI, there would be both sides.

"In India as a country, I see five possibilities. Firstly, it has the potential to make everyone a 10x engineer, which will be a benefit in the technical space. Secondly, with open APIs and the cloud, it provides greater possibilities for entrepreneurship. Thirdly it will benefit service companies. Fourthly if we do it right, AI provides huge possibilities for the creative industry, and India has a massive creative industry. And finally, India stat can be leveraged with the abundant amount of data. With AI in the market, we now have a tool to leverage this data", he added.

There are multiple opportunities across the generative AI value chain, with much of the opportunity in its applications and services.[15]

[12] Markets and Markets Report. Generative AI Market by Offering, Application, Vertical and Region - Global Forecast to 2028

[13] Goldman Sachs Article, April 2023. Generative AI could raise global GDP by 7%
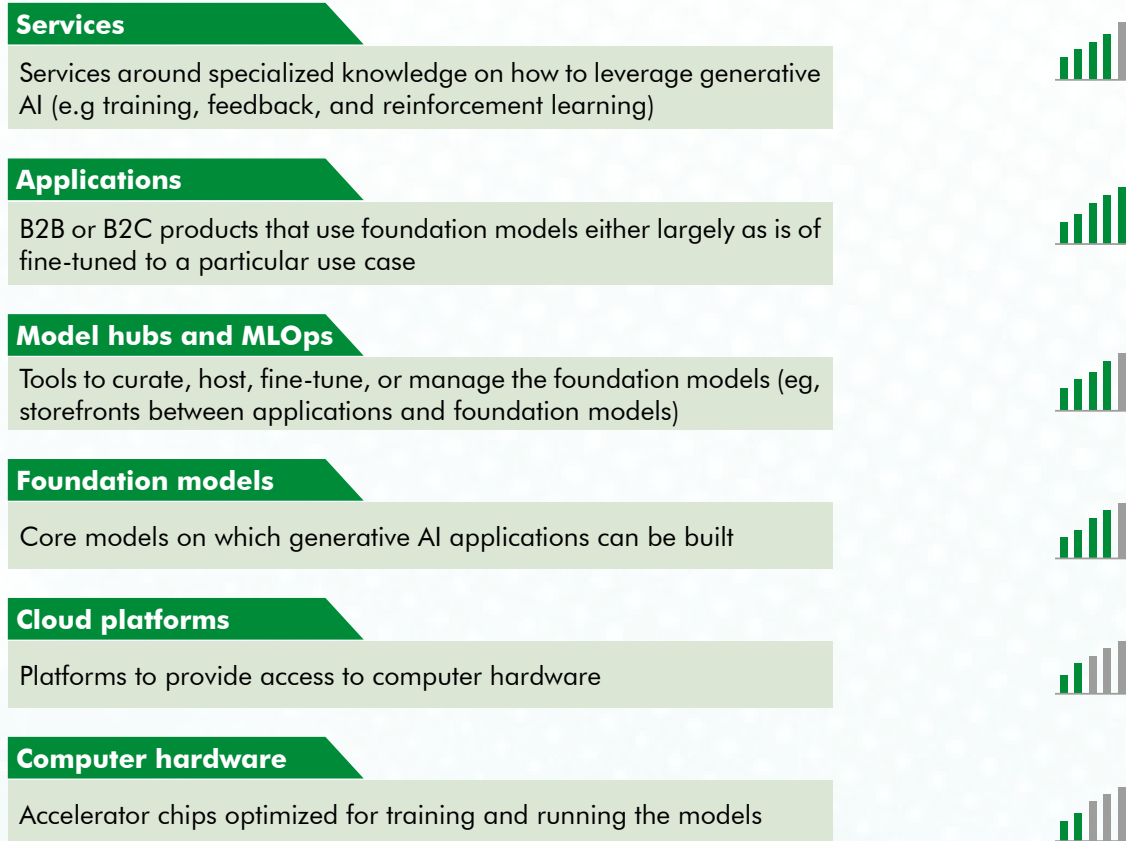
[14] PwC Report. Sizing the Price: What's the real value of AI for your business and how can you capitalise?

[15] Quantum Black, AI by Mckinsey, April 2023. Exploring Opportunities in the Generative AI Value Chain

There are opportunities across the generative AI value chain, but the most significant is building end-user applications.

Generative AI value chain	Opportunity size for new entrants in next 3-5 years, scale of 1-5
Services Services around specialized knowledge on how to leverage generative AI (e.g training, feedback, and reinforcement learning)	
Applications B2B or B2C products that use foundation models either largely as is of fine-tuned to a particular use case	
Model hubs and MLOps Tools to curate, host, fine-tune, or manage the foundation models (eg, storefronts between applications and foundation models)	
Foundation models Core models on which generative AI applications can be built	
Cloud platforms Platforms to provide access to computer hardware	
Computer hardware Accelerator chips optimized for training and running the models	

Source: McKinsey article Exploring opportunities in the generative AI value chain

Generative AI tools from India

KissanGPT	KissanGPT is an AI chatbot that leverages the power of GPT 3.5 and the Whisper model exclusively for serving India's underserved agricultural domain. Launched on March 15th 2023, KissanGPT has already earned the hearts of farmers all over the country with its remarkable ability to guide the farmers in irrigation, pest control and crop cultivation.
PolicyGPT	Plum, a Bengaluru-based startup, has introduced PolicyGPT to transform the insurance industry. The purpose of the GPT-3-based chatbot is to educate consumers on their health insurance policies. In addition, the chatbot is designed to reduce the complexity of insurance policies by answering queries about coverage and elucidating inclusions and exclusions.
GitaGPT	A Google India software developer named Sukuru Sai Vineet developed the AI chatbot called GitaGPT. It uses GPT-3 technology and the Bhagavad Gita to offer answers to life's problems. Users can ask questions on the GitaGPT app, and a chatbot will respond by researching the Bhagavad Gita's teachings.

BharatGPT	Bengaluru-based conversational AI platform CoRover recently released BharatGPT. In comparison, OpenAI's ChatGPT supports only 95 languages and mainly interprets English instructions. In addition to text, CoRover's chatbot can also process rich data types, including photos, audio, video, and maps, which is not the case with ChatGPT. While the accuracy of ChatGPT has yet to be determined, CoRover asserts that BharatGPT is 90% accurate.
Lexi	Lexi is an AI chatbot created by Velocity, a financial startup powered by ChatGPT. Lexi seeks to help e-commerce entrepreneurs by simplifying business analytics. Lexi, integrated with Velocity's analytics product, Velocity Insights, assists organisations in tracking market spending, sales, and more and provides daily business reports over WhatsApp. In addition, customers may now utilise Lexi, the AI chatbot, to get answers to their concerns, increasing their company operations, thanks to the integration of ChatGPT in the same WhatsApp interface. Velocity announced this in an official blog post.
Jugalbandi	Jugalbandi is a free and open platform that combines the power of ChatGPT and Indian language translation models under the Bhashini mission to power conversational AI solutions in any domain.

When it comes to talent, presently, much of the AI talent works in the US, India, UK 60% of the Generative AI talent pool comes from the US, India, UK, Germany, Canada and France. Yet, in India, there is a rush to find talent in AI despite around 416,000 people working in AI and Data Science. At present, India still faces a demand of approximately 629,000 AI talent.[16] According to NASSCOM, there is still an additional demand for One million workers in the space, which is expected to increase exponentially in the coming years.[17]

Bridging the digital divide

According to Jensen Huang, Generative AI can positively impact countries like India and is one of the most fantastic opportunities we have ever had to close and bring together the social and technology divide.

For the last 30-40 years, only so many people know how to program a computer. So the number of people who know how to use this incredible instrument for the benefit of themselves or their business or their country is really quite limited.

"And yet, all of a sudden, there's a new type of computer, this new type of computer, you don't have to learn C, C++, you don't have to learn Pascal, you don't have to learn Fortran, you don't have to learn Java. You don't

even have to learn Python. You just have to speak your language. And by communicating to this computer what you need, what you want, what problems you want to be solved, this computer will write the software by itself." He theorises that everyone is a computer programmer now.

"This is going to have the greatest opportunity for us to democratise this very powerful instrument we call the computer for the very first time in history," he said.

"I believe it will lift so many segments of society. It will bring great education to people who don't have access to education. It's the most powerful democratisation force I've ever seen," he concluded.[18]

When it comes to bridging divides, linguistic barriers have plagued the country for many decades, and Generative AI tools built alongside the Government of India's Bhashini program can be a valuable asset in the future.

"Creating content in multiple languages is an issue for India. This shortcoming can be tackled with Generative AI," says Harsha Mundhada of Inflexor Venture. The language translation and other Generative AI capabilities will make India's apex judicial bodies more

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[16.] NASSCOM study, February 2023. State of Data Science & AI skills in India - Data and the Art of Smart Intelligence

[17.] NASSCOM study, February 2023, State of Data Science & AI skills in India - Data and the Art of Smart Intelligence

[18.] INDIAai article, March 2023. Generative AI can help India close the technology divide, NVIDIA CEO Jensen Huang

accessible to people across the country, she added.

Furthermore, many believe that Generative AI tools are a blessing for many people with disabilities. According to Pavankumar Dubagunta, Speech Scientist, Uniphore Software Systems," people who have deficiencies in speaking and autism can leverage technologies like AI, and I think it will be a life-changing experience for them."

Generative AI's impact on different sectors

The economic opportunities brought about by generative AI are vast and diverse. It empowers industries to leverage data-driven insights, enhance productivity, and drive innovation. As technology advances, we can expect further transformations across sectors, paving the way for a more efficient, personalised, and technologically advanced future. Some of the significant impact sectors for Generative AI include healthcare, fintech and education, with the education sector already being transformed into Generative AI.

Generative AI can play the role of personalised teachers in the education sector. It can provide customised modules and classes for students based on their aptitude.

"AI is becoming the supportive tutor providing personalised teaching plans for students. I see applications which are catering towards that, be it in one-on-one skill development training to something as simple as fluency improvements," said Neethu Mariam Joy, who is currently working on a new Generative AI startup that focuses on EdTech.

"Not just in EdTech, in healthcare, it is simple to build a query-based system where AI takes the role of proxy doctors. Most of the applications are bringing personalization into whichever sector you are applying it into," she added.

Generative AI could revolutionise healthcare by helping doctors analyse medical data, diagnose patients, and customise treatment strategies. Recently, researchers from Drexel University's School of Biomedical Engineering, Science and Health Systems recently demonstrated that Open AI's GPT-3 program could identify clues from spontaneous speech that are 80% accurate in predicting early stages of dementia.[19]

Since there is still no cure for the disease, diagnosing it early can give patients more options for therapeutics and support. The current practice for diagnosis involves medical history review and a lengthy set of physical and neurological evaluations and tests.

[19.] Drexel University Research, December 2022. AI behind ChatGPT could help spot early signs of Alzheimer's disease

Generative AI impact on different sectors in India

Sector	Applications	Tools
Agriculture	• Crop Management- Generative AI systems can find patterns and trends in satellite imagery, weather data, and soil composition to help farmers decide when and where to sow, water, and harvest crops. • Crop Optimisation - Generative AI can also help farmers choose the best crops and production methods for their needs. • Resource Management- Generative AI can assist farmers in maximising water, fertiliser, and pesticide use, boosting sustainable farming. • Pest control - Generative AI can improve pest control by assessing pest populations, weather, and crop health to predict outbreaks and offer focused interventions. • Supply Chain Optimisation - Generative AI helps farmers and agribusinesses assess massive logistical data, detect bottlenecks and inefficiencies, and enhance supply chains. • Climate-Resilient Agriculture - Generative AI can analyse climatic trends, soil health, and crop performance to build more resilient agricultural practices. • Crop Innovation - Generative AI can help researchers and plant breeders find and develop novel crop types with improved performance, yield, and pest and disease resistance. • Farmer education - Generative AI could transform farmers' information availability and decision-making.	• Ama KrushAI • Farmer.chat • Apurva.ai • Kissan GPT • jiva ag
Education	• Course Design - Generative AI techniques can organize syllabi, lesson plans, and exams. Practice problems and interactive exercises can be tailored to students' knowledge gaps, skills, and learning methods. • Personalized Lessons - Personalized lesson plans help students get the best education based on their needs and interests. • Content Creation for Courses - Generative AI can help create quizzes, exercises, and concept explanations. It can help teachers who need to develop a lot of stuff. AI can transform original content into new content. • Restoring Old Learning Materials - Generative AI can enhance low-quality learning materials, including historical documents, photos, and films. AI can improve the resolution of these items, making them more interesting for kids acclimated to high-quality media. • Tutoring - Students can connect with a virtual tutor and receive real-time feedback and guidance using generative AI. It can aid pupils without in-person tutoring.	• NOLEJ • TutorAI • Snapxam • QANDA • tabnine
Healthcare	• Diagnosis and Screening - Generative AI helps clinicians identify and treat patients faster and more accurately, improving patient outcomes. • Personalized Medicine - Generative AI algorithms can analyze enormous medical datasets to find patterns, predict outcomes, and improve health. These personalized medicine methods can help doctors create more effective treatment regimens and follow-up care. • Drug Discovery - Generative AI algorithms can analyze clinical trials and other data to find potential medication targets and predict the most successful molecules. New medications could be developed faster and cheaper. • Creating Research Ideas - In healthcare, generative AI can also be utilized to generate new concepts. • Avoiding Medical Errors - Generative AI can automatically repair spelling problems in the documentation, which is helpful for electronic prescriptions, and populate the system with the relevant data.	• MedPaLM • Viz.ai • Enlitic • Merative • CloudMedX

Sector	Applications	Tools
Manufacturing	• Product Development and Design - Generative AI can accelerate the development of new design concepts, pharmaceuticals, materials, and market research, reducing time to market. • Quality Control - Predictive AI systems monitor and report production concerns in real-time, whereas generative AI systems find and alert against faults. • Supply Chain Management - Generative AI may eliminate the necessity for an integration platform for interoperability. As original equipment tools evolve, continuous integration platform changes are unnecessary. • Customer Interactions and Support - Generative AI systems can provide 24/7 customer service, reducing staff and increasing productivity.	• Autodesk • Fanuc • Birlasoft • FortiSandbox • Altexsoft
Retail	• Personalised Product Recommendations - Generative AI can analyze customer data to create tailored journeys, customized discounts, and engaging content for specific shoppers. • Manage Inventory Levels - Generative AI analyses sales data and suggests inventory management. AI can help retailers optimize supply chain and delivery by aRetailng historical data, consumer sentiment, and competition data to predict trends and make smart purchasing and production decisions. • Monitor And Optimise Prices - Generative AI algorithms can quickly optimise retail prices by analyzing rival prices, demand patterns, and market trends. • Build Customer Service Chatbots - Generative AI can help customers solve problems with chatbots. As a result, it can help retailers improve customer service and reduce customer support agent workload. • Detecting Fraudulent Activities - Generative AI systems can prevent fraudulent purchases and returns, saving companies money and building customer confidence.	• vertex ai vision • Discovery AI • Market360 • Scanunlimited • numerator
Media[20]	• Automated Content generation: LLM can be used to generate content, such as articles, blog posts, or social media posts. This will be beneficial for those who want to create content on a regular basis. For example, social media influencers, • Variety and improved content: LLMs can create a variety of interesting content that caters to different audience sections. The quality of content will be much better as AI models learn from a large amount of data. • Personalised content: AI models can generate personalized content based on the preferences of individual users • Customer management: Generative AI can help in customer management, providing timely responses and engagement with a digital audience. ChatGPT, a form of Generative AI, can be used to answer more general questions. Off late, there are Google Chrome extensions that allow brands and Twitter users to install Chat GPT bots that respond to all Tweets • Localization of content using deep fakes: The OTT platforms have increased the need to create content in local/regional languages. For example, the task of dubbing and content moderation for lip-syncing with an on-screen character can be smoothly accomplished using deep fake technology. The technology superimposes voice from a source to target face with a perfect lip-sync. This is achieved through face synthesis.	• Lately • Sprout Social • HubSpot • Copy.ai • Emplifi

[20] INDIAai Knowledge Asset, March 2023. How Generative AI will influence media industry

Sector	Applications	Tools
	• Upscaling content through super-resolution: Super-resolution is a method of using ML algorithms to infer form an original image (with fixed pixels) and create another version of the same image but with higher pixels. Super resolution improves the display of images and video. Such super resolution is mostly required by documentaries focusing on nature, wildlife or even sports. • Upscaling Visual Effects: The rise in demand for animation and VFX content has powered immersive experiences, with exponential growth in AR & VR technology that has Media the entertainment market. For example, AI can help in superimposing/transposing a source face to a target face with much ease.	
Marketing[21]	• Cost-saving and scheduling – Voice cloning via synthetic media can cut down on the time needed to chase busy voice actors. To put it simply, if you have Awkwafina voicing a character in your animated film, you can capture her voice sample and generate the lines. • Custom regional accents – Rather than selecting just one human character, advertisers could generate hundreds or thousands of synthetic characters to appeal to narrow demographic bases. This means, instead of having one celebrity extol the virtues of a toothpaste, different characters can appeal separately to college-going teens, stay-at-home dads, and potential trendsetters. • Reaching people in their language – Using AI synthesis, one can create David Beckham's video about malaria in Gujarati or Jackie Chan's video about wearing a mask in Tamil. This can create an opportunity for advertisers to reach out to people in their own languages. • Archiving people around – Advancements in synthetic media can also let us preserve ourselves as well as our loved ones. You might be able to ask questions to a 5-year-old you or listen to your grandmother sing long after she's gone.	• Jasper AI • MarketMuse • Acrolinx • Semrush • Seventh Sense

Next frontiers for Generative AI

According to experts, one of the sectors expected to be disrupted by Generative AI in coming years is Fintech.[22]

One of the sectors which will face a huge impact due to Generative AI will be FinTech, says Aveekshith Bushan, Vice President and General Manager for APJ at Aerospike. " If there is fraud in the FinTech sector, it will affect thousands of users," he added. He believes that at some point, someone will find a way to break into the security protocols followed currently. Unless and until the FinTech sector finds the means to tackle this possibility, the probability of sectoral disruption is strong.

According to Jaspreet Bindra, "The sector which would be disrupted is the one which created it- the tech (IT) sector," "Generative AI has been writing codes involving basic process automation and many more. I recently read a tweet by a programmer who used ChatGPT for the first time for writing codes. He said the value of 90% of his skills had gone down to zero dollars", he added.

[21.] INDIAai article, November 2021. Generative AI & Synthetic Media: A New Era of Advertisements

[22.] Insights from INDIAai Roundtable Discussion What is India's Opportunity in Generative AI, May 2023

Challenges

While generative artificial intelligence (AI) holds tremendous potential and has made significant advancements in various fields, it also presents unique challenges. The complexity and power of generative AI algorithms can give rise to ethical, legal, and societal concerns.

According to Kazim Rizvi, Founding Director of a tech policy think tank called The Dialogue, "Generative AI has inspired many to gain first-hand experience with AI in recent times. However, an opaqueness in data collection, developers of the models, and biases being fed into the system still exists. This ambiguity will continue to remain even if the technology is evolved."

One of the major concerns that Generative AI possesses at present is its potential to amplify the spread of misinformation that can have varying impacts, especially when these language models can often produce outputs that are not real. According to researchers, this phenomenon of AI generating confident responses that do not seem to be real or justified by its training data is called hallucination.[23]

"In markets like India, content can go out and spread quickly," says Aveekshith Bushan. "There could be biases and misinformation. We have already seen it on the other side of ChatGPT, where the output is irrelevant to the content searched. People will have to decipher and say what looks relevant and what does not," he added.

For many years, we have seen Generative AI techniques, such as deep fakes, being used to bring social and political unrest across the globe. The recent developments in Generative AI technology can make these kinds of threats more prevalent.

"It was challenging to analyze the impact of the previous AI revolution, which was algorithms and information shared. It is also complicated to foresee the implications of deep fakes. This is a threat to the democracies of the world which is hard to tackle," says Anna Danes, Data Ethicist who works with organizations to create frameworks and practical methods to ensure responsible developments in AI.

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23. Ziwei Ji, Nayeon Lee, Rita Frieske, Tiezheng Yu, Dan Su, Yan Xu, Etsuko Ishii, Ye Jin Bang, Andrea Madotto, Pascale Fung, March 2023. Survey of Hallucination in Natural Language Generation

Another area of concern regarding the widespread use of Generative AI models is the different kinds of bias the results produced by these models show.

According to Divya Dwivedi, a lawyer at the Supreme Court of India, who focuses on tech-law, "We really do not know what kind of data it will generate and what kind of bias it will come up with since we already have made these models very biassed as a result of our own nature."

Bias in AI models has been a central point of debate for many years, and Generative AI models have just amplified these biases.

"There is an inherent bias that is there when we are training the dataset that comes out of how humans have kind of embedded their prejudices in the system," points out Prateek Sibal, Programme Specialist for AI, Emerging Tech and Internet Governance at UNESCO.

Recently, India Today conducted a political experiment involving leading platforms that use AI to generate visual imagery, suggesting that these platforms could be biased in terms of their knowledge and understanding of various nations.

The Generative AI tool Midjourney was asked to create pictures of "most popular elected political leaders posing in front of the Eiffel Tower in 2023." The prompt was generic, without mentioning names to check the scope of the results. The AI-generated image only included leaders with a Western appearance, such as Angela Merkel, Emmanuel Macron, and Donald Trump. None of the popular Asian leaders were included in the result.

These demonstrations have only strengthened the belief that these models amplify human biases.

Ethics, rights, and intellectual property

The use of copyrighted materials for training AI models is still unclear, and hence is said to be in a legal grey area. It can be said that there are no copyright laws so far that would safeguard any wholly AI generated model or creation. It becomes irrelevant whether that creation stemmed from a human-crafted text prompt. While fair use laws permit the use of copyrighted material under certain conditions without the owner's permission, the ongoing legal disputes could disrupt this status quo and bring uncertainty in the future of AI model training.

Undoubtedly, the advent of generative AI has revolutionized our lifestyle, labor practices, and artistry output within a mere few months. In turn, the inundation of AI-fabricated written works, pictures, and tunes, alongside the mechanisms through which they were created, has stimulated a plethora of intricate legal inquiries. These challenge our understanding of ownership, fairness, and the core foundation of innovation, writes Anndy Lian.[24] Anndy Lian is an all-

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[24] INDIAai article, May 2023. The Legal Complications of AI-generated Content in Copyright Law

rounded business strategist in Asia and the author of the book NFT From Zero to Hero.

"There are papers and research where Generative AI or ChatGPT has been mentioned as co-authors, what does this mean for original scientific work? " asks Prateek Sibal. Prateek is Programme Specialist, Digital Innovation and Transformation at UNESCO who is working to understand the impact of digital technologies, specially artificial intelligence (AI), on societies from a human rights, openness, inclusive access and multi-stakeholder governance perspective.

Copyright laws play a fundamental role when it comes to protecting intellectual property and encouraging creativity. It allows creators to rightfully control the usage, distribution, and adaptation of their work. The law encourages creators to create more by offering them exclusive rights. Creative Commons licenses enable the free distribution of an otherwise copyrighted "work". They also provide more options for creators to choose the level of protection they want for their work.

With advancements in AI technology, there is a simultaneous increase in its usage in the creative process. With the increase in AI capabilities to generate fresh and original content there is a growing need for a legal framework that addresses the copyright protection of collaborative works involving AI.This legal framework is highly important to strike a balance between safeguarding the rights of creators while boosting innovation and originality.

This is difficult to predict how copyright law will shape up around AI-generated work. However, it is clear that the legal framework governing copyright protection will undergo significant transformation.

How to ensure responsible use of Generative AI?

With the rise in the usage of generative AI, there is a dire need for a holistic,and a comprehensive framework that would ensure responsible usage of the technology to harness the best benefits while mitigating its risks. This framework shall include ethical guidelines, regulatory measures, transparency, accountability, and ongoing collaboration among stakeholders. By boosting fair practices we can nurture the technology, increase people's trust in it, protect it against potential harm, and ensure that generative AI serves humankind and society in more productive ways.

According to Jaspreet Bindra, Founder and MD of Tech Whisperer Ltd. "The biggest thing we will have to figure out is how to control this monster. The democratization of technology is the biggest challenge here. The closest I can think about something we came across like AI was nuclear power. Countries shall come together to regulate it."

On the other hand, people like Deepak Visweswaraiah, Vice President, Platform Engineering and Site Managing Director at Pegasus Systems, point out that "Controlling the monster does not happen due to government regulations. It should be a collective effort. How do we teach developers to be mindful of AI ethics? The developers should be clear about the purpose of each model and share awareness to avoid misuse."

Regulation[25]

When it comes to regulation, countries will not have uniform reasons to regulate Generative AI. For example, China's draft regulations are geared towards preventing further developments in AI technology that might undermine the government's control over domestic internet and tech space. On the other hand, the EU places the prevention of harm to individuals front and center in its draft for the AI Act. Therefore, the purpose of regulations must be defined to ascertain what the regulations should contain.

At a foundational level, all generative AI regulations should attempt to protect individuals against potential harm. Harms that could include violating an individual's privacy and data rights, discrimination in access to services, or being subject to false or misleading news and information. Protection against these, and similar harms, has to be non-negotiable. There is an international consensus on the necessity to ensure such protections, though the granular details of practical implementation still need to be clarified.

"When we are talking about regulation, what we are trying to do is regulate the impact of technology on society. And sometimes we just don't know what it is going to be, and you don't want to make any regulation because probably it's too soon", says Prateek Sibal.

Of late, there has been a significant debate on whether regulations should also include protection from second-order harms, such as violation of intellectual property rights (IPR) and defamation. While this has not yet been settled in a definitive manner, generative AI systems will likely be subject to at least IPR laws soon.

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[25] INDIAai article, April, 2023. Analyzing AI regulations based on dynamics in the AI ecosystem

Apart from individual harms, regulations could also look at systemic harms, specifically the increased concentration of economic and market power in the hands of Big Tech players. The fundamental requirements for developing generative AI systems - access to substantial amounts of data and computing power to process this data - are readily available only to the Big Tech companies.

"The regulation of AI tends to focus on formal equality rather than substantial equality, even though the end goal is often equity," points out Shashank Reddy, Managing Partner at Evam Law & Policy.

Algorithmic Auditing is one of the tools put forward to mitigate Generative AI risk.

"Auditing AI systems is a mechanism or criteria for the system to comply with legal obligations. Such legal obligations could be a hard law obligation, which may be an existing law, or it could just be just a company that is aware of the AI act or some other law and is looking to be compliant with it", says Vibhav Mithal, of Anand and Anand and Future of Humanity.

In order to narrow down to the exact entity that is causing the harm, it is very critical to examine the generative AI value chain closely. Commercial Generative AI system has four pillars: Developers, who develop the system; Deployers, who create and work on the base mode for advanced functionalities for themselves or other third-party customers; Users, who are individuals, corporate organizations, or platforms who use the AI system themselves either internally or through product offerings; and ultimately the Recipients, people who receive and use the output of the AI system.

"I see a lot of engineering teams being very skeptical about the impact of what they are developing. I see people from engineering teams saying I'm also partly accountable for what I'm doing. This shows that people are becoming more aware and vigilant." says Anna Danes, a Digital Ethicist who works with organizations to create frameworks and practical methods to ensure responsible developments in AI.

She also believes that, "we all start thinking a little bit about what incentives we can give companies, private companies, and also public institutions to awaken their ethical knowledge or imagination so that they can develop ethical products".

AI regulation efforts across the globe

The capabilities of the generative AI models have been a matter of concern for governments, researchers, and the common man worldwide. As a result, governments worldwide have imposed AI regulations. The European Union's AI Act, Canada's Artificial Intelligence and Data Act (AIDA), the United States's AI Bill of Rights and State Initiatives, and China's Algorithm Transparency and Promoting AI Industry Development have been a subject of discussion in several forums.

Each of these country's AI regulations are eceptionally thorough and have great visions around the usage and protection of AI. While the AI Act concentrated on a risk-based approach to guide the use of AI in both the private and public sectors, the AI Bill of Rights targets specific use cases. Though the Chinese government has yet to pass rules on AI technology at large, recently, the country introduced a law that regulates how private companies use online algorithms for consumer marketing.

Name of the country	Description
EU	• The EU regulation places the prevention of harm to individuals front and center in its draft AI Act. • According to the proposal, these AI tools will be classified under their perceived risk level, from minimal to limited, high, and unacceptable. • According to the proposal, these AI tools will be classified under their perceived risk level, from minimal to limited, high and unacceptable. • The act focuses on biometric surveillance, spreading misinformation or discriminatory languages. • The high-risk tools are not expected to be banned but are expected to be highly transparent in their operations.
US	• The Biden-Harris Administration has announced new actions that will further promote responsible American innovation in Artificial Intelligence, considering the people's rights and safety. • prioritize people and communities by enhancing responsible innovation that serves the public good, balancing it with protecting society, security and the economy. • companies have a fundamental responsibility to ensure their offered products are safe to use before they get deployed. • The administration released a Blueprint for an AI Bill of Right and related executive actions, the AI Risk Management Framework and a roadmap for standing up a National AI Research Resource made public earlier this year.
China[26]	• The Cyberspace Administration of China, the country's top internet watchdog, recently passed a regulation on "deep synthesis" technology, which it defines as "technology that uses deep learning, virtual reality, and other synthesis algorithms to generate text, images, audio, video, and virtual scenes." • Users are prohibited from using generative Ai to engage in activities that endanger national security, damage public interest, or are illegal • Anonymity doesn't exist in the Chinese internet • Wants to censor what algorithms can generate • Service providers must audit AI-generated content and user prompts manually or through technical means • Baidu, one of the first to launch a Chinese text-to-image model, already filters politically sensitive content. • The regulation bans people from using deep synthesis tech to generate and disseminate fake news • When the data used for AI training contains personal information, technology providers should follow the country's personal information protection law. • Platforms should also remind users to seek approval before they alter others' faces and voices using deep synthesis technology. • If the result of generative AI may cause confusion or misidentification among the public, the service provider should put a watermark in a prominent place to inform the public that it is a work by the machine.

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23. Ministry of Industry & Information Technology, Government of China, Order No. 12, November 2022. Provisions on the Administration of Deep Synthesis of Internet Information Services.

Name of the country	Description

UK[27]	• The UK Government published[28] a White Paper entitled "A pro-innovation approach to AI regulation"
	• The White Paper elaborates on the approach to AI set out by the Government in its 2022 AI Governance and Regulation Policy Statement
	• The white paper identifies five major principles:
	  ❖ The AI systems should function in a Safe, Secure and Robust manner
	  ❖ Transparency and Explainability of organizations developing and deploying AI to communicate about the purpose of AI systems.
	  ❖ The AI systems should be fair and devoid of any biases and discrimination against the users
	  ❖ Effective oversight is necessary for the functioning of AI systems
	  ❖ Contestability and redress
	• The white paper recognizes risks with a de-centralized regulatory framework, including inconsistent enforcement or guidance across regulators.
	• Currently, the paper is waiting for feedback until 21st June 2023

Canada[29]	• The Government of Canada has issued The Artificial Intelligence and Data Act (AIDA) • AIDA is an important milestone in implementing the Digital Charter and ensuring that Canadians can trust the digital technologies that they use every day • The framework proposed in the AIDA is the first step towards a new regulatory system designed to guide AI innovation in a positive direction, and to encourage the responsible adoption of AI technologies by Canadians and Canadian businesses. • AIDA would ensure that high-impact AI systems meet the same expectations with respect to safety and human rights to which Canadians are accustomed • The Minister of Innovation, Science, and Industry would be empowered to administer and enforce the Act, to ensure that policy and enforcement move together as the technology evolves. • Prohibit reckless and malicious uses of AI that cause serious harm to Canadians and their interests • The obligations for high-impact AI systems is guided by the principles of human oversight and monitoring, transparency, fairness and equity, safety, accountability, validity and robustness

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27. Government of China News, May 2023. Xi Jinping replied to the letter and encouraged the teachers and students of Macau University of Science and Technology

28. Marianna Drake, Jasmine Agyekum, Marty Hansen, Lisa Peets & Mark Young, April 2023. UK Government Adopts a "Pro-Innovation" Approach to AI Regulation

29. Government of Canada. The Artificial Intelligence and Data Act (AIDA) - Companion Document

Recommendations from the roundtables

1. Foster Education and Public Awareness: It is crucial to educate the public about generative AI to dispel fears of job replacement and promote understanding of its capabilities. This can be achieved through awareness campaigns, workshops, and educational programs.

2. Establish Data Sharing and Usage Regulations: Given the importance of data quality in building robust generative AI models, there is a need for regulations to govern data sharing and usage. This can help protect privacy, ensure ethical practices, and maintain transparency in AI development.

3. Develop Global Standards and Regulatory Frameworks: The lack of global standards for AI poses a significant challenge. Governments and international organizations should collaborate to establish common frameworks that address the regulatory aspects of generative AI, including accountability, bias mitigation, and safety measures.

4. Encourage Self-regulation: In addition to governmental regulations, individuals and corporations involved in generative AI development should adopt self-regulatory practices. This includes being clear about the purpose of each model, promoting ethical guidelines, and fostering responsible use of AI technologies.

5. Prioritize Bias Mitigation: While it may be difficult to completely eliminate bias, it is important to prioritize efforts to mitigate bias in generative AI models. Developers should invest in research and development of bias detection and mitigation techniques to ensure fair and unbiased outcomes.

6. Explore Augmentation of Human Intelligence: Generative AI tools have the potential to augment human intelligence. Encourage research and development in using generative AI as a tool to enhance human capabilities and improve productivity across various sectors.

7. Foster Collaboration and Interdisciplinary Approaches: The development of generative AI models involves multiple stakeholders. Encourage collaboration among researchers, developers, policymakers, and domain experts to foster interdisciplinary approaches and ensure a comprehensive understanding of the societal impacts and potential risks of generative AI.

8. Address Ethical Concerns: Given the intellectual capacity of generative AI, it is crucial to address ethical concerns and potential misuse. Developers should consider the ethical implications of their models and proactively work towards preventing any harm or unintended consequences.

9. Support Accessibility and Inclusivity: Generative AI can have a positive impact on individuals with communication difficulties or disabilities. Encourage the development of inclusive AI solutions that cater to the needs of speech-impaired individuals, autistic people, and others who may benefit from improved communication tools.

10. Emphasize Safety and Control: As generative AI continues to advance, safety and control measures must be prioritized. Governments, organizations, and developers should collaborate to establish safeguards that prevent malicious use or unintended consequences, ensuring that the technology is harnessed for the benefit of society.

11. Monitor Future Enhancements: Stay vigilant about future enhancements to deep learning models that require less training. It is important to carefully assess the implications of these advancements, including potential risks and unintended consequences, to ensure responsible and safe deployment of generative AI technologies.

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Notes

The National AI Portal of India (INDIAai) is a central repository of AI information and resources, serving the Indian AI ecosystem and providing global insight into AI in India. Launched in May 2020, it has gained recognition and features interviews and articles by industry leaders. The portal houses information on AI initiatives by the government, academia, and corporates, while maintaining a database of Indian AI startups. INDIAai is respected as an authoritative source on AI in India and worldwide. With the potential to add $957 billion to India's economy by 2035, INDIAai aims to foster a unified AI ecosystem, drive knowledge creation, develop an AI-ready workforce, and utilize AI for economic growth.

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