**Generative AI Models Landscape**

Generative AI Landscape -lex eta

This course provides a comprehensive exploration of the Generative AI landscape, focusing on the diverse applications and use cases of Generative AI technologies. You will delve into the world of artificial intelligence-powered creativity and innovation, gaining insights into how Generative AI is transforming various industries and domains. Throughout the course, you will study real-world examples and case studies that demonstrate the practical applications and creative potentials of Generative AI. They will examine how AI algorithms generate realistic images, compose music, synthesize human-like text, and create immersive virtual environments

**What is Generative AI?**

**Deep learning**, a subset of Supervised ML, is typically used for tasks such as classification and prediction, which falls under the category of Discriminative AI. We'll cover this again in more detail.

Generative AI utilizes deep learning models to recognize patterns and structures within training datasets, enabling the generation of new content or data. Generative AI tools can generate content based on given instructions.

A diagram of a diagram of a machine learning

Description automatically generated

This diagram illustrates that Generative AI (GenAI) is a subset of Deep Learning (DL).

Language Models (LLMs), a subset of Deep Learning and GenAI, specialize in comprehending and summarizing text, as depicted in the picture.

A diagram of a diagram of a machine

Description automatically generated

**GenAI Examples**

Assume we want to write an HTML code for a table with 3 rows and 3 columns or we want to create an image of a dinosaur. The following instructions to GenAI tools can produce them.

A screenshot of a computer

Description automatically generated

We see that Generative AI tools can significantly enhance our productivity and creativity. Let’s now understand what Generative AI is.

*\*DO NOT input any Personally Identifiable Information (PII), Infosys or client data  or ideas onto the external Playgrounds or websites.*

Generative AI is a type of Artificial intelligence that creates new content based on what it has learned from the existing content.   
The process of learning from the existing content is called **training**and results in the creation of a **stochastic model**.   
When given a **prompt**, GenAI uses this model created during training phase,  to predict what an expected response might be -- and this generates new content.   
  
You can next interact to see how Generative AI works on the user-supplied inputs called “Prompts” to generate the type of content the model is designed to create - for example it could give a piece of text explaining what GPT means or create a hi-definition image of “a vase filled with beautiful roses”.   
  
Note: GPT stands for "Generative Pre-trained Transformer".

Generative AI models are a type of Deep Learning models. These models are trained using supervised, unsupervised, and semi-supervised learning methods.

Deep learning techniques can be used to create 2 kinds of models: Discriminative models and Generative models.

A diagram of a brain

Description automatically generated

**Types of Generative AI Models**

Based on the type of inputs taken, there are two types of Generative AI (GenAI) models: **Generative AI text** models and **Generative AI Image** models.

The **text** models take text as an input and may create text/image/ voice as an output. Question answering, Summarization, text-to-speech, text-to-image are all examples of text models.

A GenAI **image**model takes an image as input and may produce image captioning, Animation, etc.

Depending on the type of task they perform, the models are named as follows.

|  |  |  |
| --- | --- | --- |
| **Model Type** | **Model Description** | **Examples** |
| **Text-to-text** | Generates a detailed Textual representation to serve as answer for a given text input | As seen with tools like ChatGPT, we can have long conversations, essays, lyrics and taglines made on any topic that we supply as input |
| **Text-to-image** | Generates an image representation from text input | As seen in the first example of this course, an image of “a dinosaur taller than trees with clear blue skies” can be obtained from the prompt as done by GenAI tools like DALL-E2, StableDiffusion, etc |
| **Text-to-video** | Generates a video representation from text input | Video generating tools like Synthesia, InVideo, Elai.io  etc allow one to go from prompt written to video generated in a few minutes, with options to supply the voice for narration, choose the Avatar, with multiple accents and languages, do one-click transcription, etc |
| **Text-to-3D** | Generates a 3D object that corresponds to a user’s textual description | 3D models that can be used in 3D games, etc based on textual input |
| **Text-to-task** | Trained to perform a specific task based on the text input | Block calendar of persons, send mail to a list of people etc based on textual prompt |

Usually a Generative AI (GenAI) model is trained on a wide variety of data. This model is called a **Foundational model**. This model is then fine-tuned to produce models for specific tasks like Sentiment analysis, Question answering etc.

Generative AI deploys the following architecture/principle to generate text/image. **Transformer** architecture is used for text generation and**latent diffusion models** are used for image generation

**Transformers for text tasks**

The complexity of Text tasks is to handle the dependency of the next word based on the context. Sequence models were unable to handle long range dependencies as they tend to forget them.   
A new architecture called Transformer was invented to solve sequence-to-sequence tasks while easily handling long-distance dependencies. This revolutionized the field of NLP.

**Latent Diffusion for image tasks**

The motivation is an auto encoder ML model. This model is designed to compress and encode an image to a lower dimensional space and then convert/decode   this lower dimensional representation back to the original image. The two processes involved are also called encoders and decoders.

Latent diffusion models sample data from the latent space and develop it into a desired image conditioned on the prompt or text. The decoder learns to separate the noise from the data to produce the desired image.

**Prompt**

The prompt is the text that we input to the model. In the example discussed earlier, we gave the following prompts to GenAI models.

The prompt is the text that we input to the model. In the 1st example we gave the following prompts to GenAI models.

* Write an HTML code for a table that has 3 columns and 3 rows.
* Image of a dinosaur with clear sky and taller than the trees around.

**Prompt design** is the art of creating prompts so that the system understands your requirements completely and creates the optimum / desired results.

**Generative AI Applications and Limitations**

Generative AI Applications

Generative AI models can be used to carry out a number of tasks across the Software Development Life cycle.    We can use it for Requirement elicitation, Design, Code Generation, Code documentation & readability, Code translation, testing etc.

It can also be applied in other tasks in different business domains like Banking , Insurance, Healthcare, Manufacturing etc.  A few business use-cases have been discussed in this course.

### **Limitations of Large Language Models**

While Large Language Models such as ChatGPT and GPT-3 Codex and Text models have immense capability to generate text completions for a very large variety of inputs, they still have their limitations.

Some of the known limitations arise due to the fact that:

* Model is trained on a finite data (though massively huge) and may not contain recent updates
* The model is stochastic in nature and less probable or correct output tokens may be selected based on parameter settings.
* It is possible that the model may be misled by an incorrect input prompt.

While these models can be used as effort saving tools, their output must almost always be vetted by experts to ensure correctness and relevance.

Consider the example:

|  |
| --- |
| **Intent**: To know how chatGPT deals with incorrect prompts |
| **Prompt**:  The following python code is not calculating simple interest correctly. What is the reason? The calculated value is half of the correct value. def calculate\_interest(p, t, r ):    i = p\*t\*r/200    return i |
| **Response by model: ChatGPT** |
| The reason is that the code is dividing the result by 200 instead of 100. The formula for calculating simple interest should be: i = p \* t \* r / 100 \* (1 + r). |

Here, ChatGPT correctly identified the issue in the code. However, the correction suggestion was incorrect.

The suggestion given was “The reason is that the code is dividing the result by 200 instead of 100. The formula for calculating simple interest should be: i = p \* t \* r / 100 \* (1 + r).”   
However, we know that this is wrong. The correct formula is i = p \* t \* r / 100.

The model has no understanding of the world as a human has with his/her common sense. Hence, even if we trust the generated artifact like code, we must verify it for correctness.

### **Limitations of Large Language Models**

**Below are the limitations of the tool as claimed by the software providers - OpenAI**: (https://openai.com/blog/chatgpt)

“ChatGPT sometimes writes plausible-sounding but incorrect or nonsensical answers. Fixing this issue is challenging, as:

(1) during RL training, there’s currently no source of truth;

(2) training the model to be more cautious causes it to decline questions that it can answer correctly; and

(3) supervised training misleads the model because the ideal answer depends on what the model knows, rather than what the human demonstrator knows.”

**Generative AI Applications in Various Domains**

Generative Artificial Intelligence (AI) has revolutionized numerous industries by enabling machines to create and generate content with human-like creativity. By leveraging deep learning and neural networks, generative AI algorithms can learn from vast amounts of data and generate novel, unique outputs.

This technology has applications in diverse fields, including art and creativity, fashion and design, music and audio, video and animation, banking and finance, healthcare and insurance, manufacturing, etc. Let us explore how generative AI is transforming these domains.

A recent survey by [Markets and Markets](https://www.marketsandmarkets.com/) found that the use cases of generative AI are expanding. Generative AI can be used to improve productivity in *content creation*, operational efficiency in*predictive maintenance*, and breakthrough innovations in *drug and product development*. As Generative AI capabilities continue to expand, so will its use cases.

**A diagram of various types of industry

Description automatically generated with medium confidence**

**A diagram of a company's company's company's company's company's company's company's company's company's company's company's company'

Description automatically generated**

**Banking and Finance:**

Generative AI has found applications in the banking and finance sector, particularly in risk assessment, fraud detection, and investment strategies.

Generative models can identify patterns, anomalies, and potential risks by analyzing vast financial data. These models can assist in credit scoring, determining the creditworthiness of individuals and businesses.

Generative AI can also be used to develop sophisticated trading algorithms that make data-driven investment decisions. Overall, Generative AI enhances the accuracy and efficiency of financial operations, enabling more informed decision-making.

**Healthcare and Insurance:**

In the healthcare and insurance sectors, Generative AI has the potential to revolutionize patient care, disease diagnosis, and insurance risk assessment.

Generative models can analyze medical data, including electronic health records and medical images, to aid diagnosis and treatment planning. This technology can also help generate synthetic medical images for training purposes, augmenting the limited availability of real patient data. Moreover, Generative AI can assist in risk assessment and fraud detection in the insurance domain, enabling more accurate underwriting decisions.

**Manufacturing:**

Generative AI has made significant advancements in manufacturing, particularly in product design and optimization.

Generative design algorithms can generate innovative product designs based on specified parameters and constraints, improving efficiency, and reducing material waste. These algorithms consider factors such as strength, weight, and manufacturability, resulting in optimized designs.

Generative AI can also assist in process optimization, predicting potential failures, and improving production workflows. Manufacturers can enhance product quality, reduce costs, and streamline operations by leveraging Generative AI.

**Art and Creativity:**

Generative AI has opened up new avenues for artistic expression and creativity.

Artists and designers can use Generative models to create unique visual artwork, generate novel designs, and explore abstract concepts. This technology can also assist in image editing and manipulation, allowing artists to experiment and create captivating visuals.

By combining the power of Generative AI with human creativity, artists can push the boundaries of traditional art forms and create groundbreaking works that captivate audiences.

**Fashion and Design:**

Generative AI has made significant strides in the fashion and design industry. Designers can employ generative models to create new patterns, textures, and styles, facilitating the process of generating innovative fashion designs.

With the ability to analyze large datasets of fashion-related information, Generative AI algorithms can identify emerging trends, helping designers predict future fashion directions. Additionally, Generative AI can assist in personalizing fashion recommendations and creating customized designs based on individual preferences.

**Music and Audio:**

Generative AI has transformed the music and audio landscape by enabling the creation of original compositions and audio content. Musicians can leverage generative models to generate melodies, harmonies, and rhythms, providing them with endless sources of inspiration.

Furthermore, Generative AI can assist in audio synthesis, creating realistic and immersive soundscapes for various applications, including virtual reality experiences and video games. By tapping into the power of Generative AI, musicians, and audio professionals can explore new realms of sonic possibilities.

**Video and Animation:**

Generative AI has had a profound impact on the video and animation industry. It enables the generation of lifelike characters, realistic animations, and special effects. Generative models can learn from existing video content and generate new footage, saving time and effort in the production process.

Moreover, Generative AI can aid in video editing and post-production tasks, automating scene segmentation and object tracking tasks. This technology opens up exciting possibilities for filmmakers and animators to create visually stunning and immersive content.

**Case Studies: Generative AI in Healthcare, Banking, Manufacturing & more**

One of the most common applications of Generative AI in banking and finance is to **create synthetic data**. This data can be used to train machine learning models to detect fraud, develop new products and services, and improve the efficiency of operations. For example, the company FICO uses generative AI to create synthetic credit card transactions that can be used to train AI models to detect fraud.

Another application of Generative AI in banking and finance is personalizing customer experiences. This can be done using Generative AI to create personalized marketing campaigns, financial advice, and investment recommendations.

For example,

* **Bank of America** uses Generative AI to create personalized marketing campaigns for its customers.
* **JPMorgan Chase** is using Generative AI to develop new investment products. The company has created a platform to generate millions of potential investment ideas, which can be screened for profitability and risk.
* **Wells Fargo**is using Generative AI to improve its customer service. The company has created a platform that can generate personalized responses to customer inquiries, which can help to reduce wait times and improve customer satisfaction.
* **Citibank** is using Generative AI to manage its risk. The company has created a platform that can generate simulations of different financial scenarios, which can help to identify and mitigate risks.

These are just a few examples of how Generative AI is being used to improve banking and finance. As this technology continues to develop, we can expect to see even more innovative and exciting applications of this technology in the future.

One of the most common applications of Generative AI in healthcare is to create synthetic medical data. This data can be used to train machine learning models to diagnose diseases, develop new treatments, and improve the efficiency of clinical trials. For example, the company **Enlitic** uses Generative AI to create synthetic medical images that can be used to train AI models to diagnose cancer.

Another application of Generative AI in healthcare is to personalize treatment plans. This can be done using Generative AI to create personalized simulations of how a patient's body will respond to different treatments. For example, the company **Nuralogix** uses generative AI to create personalized simulations of how a patient's brain will respond to different treatments for Alzheimer's disease.

In the insurance industry, Generative AI improves fraud detection, risk assessment, and claims processing.

Here are some real-world examples of how Generative AI is being used in healthcare and insurance:

* **FICO** and **Chubb** use Generative AI to detect fraudulent insurance claims.
* **Insilico Medicine** is using Generative AI to develop new drugs. The company has created a platform to generate millions of potential drug candidates which can be screened for safety and efficacy.
* **Verily** is using Generative AI to develop new diagnostic tests. The company has created a platform that can generate synthetic medical images, which can be used to train AI models to diagnose diseases.
* **Athenahealth** is using Generative AI to improve the efficiency of clinical trials. The company has created a platform to generate personalized treatment plans for patients in clinical trials.

These are just a few examples of how Generative AI is being used to improve healthcare and insurance. As this technology continues to develop, we can expect to see even more innovative and exciting applications of this technology in the future.

**Case Study 3: Generative AI for Manufacturing**

Einstein famously said, "Creativity is intelligence having fun"!

With Generative AI technologies, U.S electronic manufacturing companies are able to tackle material and component shortages by designing **new products from scratch**within just a few hours.

 Generative AI can also be used to **create synthetic data** for Visual Quality Inspection (VQI) systems to detect any defects on Printed Circuit Boards (PCBs). By replacing rules-based and code-based VQI systems with **a “golden" image of PCB without defects done by Generative AI**, quality engineers at OEMs and EMS organizations can now rapidly approve boards for production. As a result, these organizations gain throughput, reduce labor and scrap costs, and improve product quality, leading to a faster return on investment.

Moreover, a prominent Germany-based company uses Generative AI to stay at the forefront of **Digital twin** technology for generative engineering, simulation, and 3D printing.

With the development of generative AI apps like ChatGPT and Stable Diffusion, it is now easier to design 3D interactive experiences and environments, as well as digital twin simulations. This new technology has the potential to transform industries such as gaming, automotive, manufacturing, and healthcare.

But its potential goes well beyond that; these apps can also be used to allow users to access information in real-time using natural language when they interact with simulations, digital twins, and immersive environments. By **integrating 3D simulated environments with natural language processing and AI-based tools**, you can easily ask the computer questions such as "What's happening on the shop floor?", “How do I save this patient fast?” or "What are the three biggest issues I need to focus on right now?"

In the near future, AI can be used in manufacturing to **converse**with equipment using natural language. This can allow people to focus on higher value tasks, while also gathering sensory data and possible text-based inputs through Google's language model for robots called PaLM-E. With Generative AI tools, developers are able to **create new machinery**, and potentially **generate instructions for repair** and even **tailor software code**specifically to the equipment

Case Study 4: Art Generation using GANs

Generative Adversial Networks (GANs) have generated various art, including paintings, sculptures, and music. In some cases, the art generated by GANs is indistinguishable from human-created art.

One example of a GAN-generated art project is **DeepDream**. DeepDream is a Google project that uses a GAN to create psychedelic images from ordinary photographs. The images generated by DeepDream are often abstract and dreamlike, and they can be quite beautiful.

One more example of GANs for Art is the work of Kenny Jones and Derrick Bonafilia, who developed a GAN called GANGogh. GANGogh was trained on a dataset of Van Gogh paintings, and it can be used to generate new paintings that are in the style of Van Gogh. To use GANGogh, you first need to provide it with a prompt. This prompt can be anything, such as a title, a description, or a photo. GANGogh will then use the prompt to generate a new painting. The results of GANGogh are often impressive. The paintings that it generates are often indistinguishable from real Van Gogh paintings. This research shows that GANs have the potential to be used to create new art that is in the style of famous artists.

Another example of a GAN-generated art project is **Imagen**. Imagen is a new GAN model that Google AI developed

Imagen is capable of generating high-quality images from text descriptions. For example, you could give Imagen the text description “a painting of a dog looking curiously in the mirror, seeing a cat” , which would generate the image as seen.

GANs are still a relatively new technology, but they can potentially revolutionize how we create art. In the future, GANs could be used to create art that is more realistic, more creative, and more accessible than ever before.

Here are some of the benefits of using GANs to generate art:

* GANs can generate art that is indistinguishable from human-created art.
* GANs can generate realistic, abstract, and dreamlike art.
* GANs can be used to generate art from text descriptions.
* GANs can generate more creative and original art than human-created art.

Here are some of the challenges of using GANs to generate art:

* GANs can be difficult to train.
* GANs can be unstable, and they can sometimes generate art that is not realistic or creative.
* GANs can be used to generate art that is offensive or harmful.

**Case Study 5: Fashion Design with Generative Models**

One of the most common ways that generative models are used in fashion is to create new designs. This can be done by training a generative model on a dataset of existing fashion designs. The model can then generate new designs similar to the ones it was trained on but with some variations. This can help fashion designers to produce new ideas and to explore different design possibilities.

Another way that generative models are being used in fashion is to improve the efficiency of the design process. This can be done by using generative models to create prototypes of new designs. Prototypes can test the fit and look of new designs before making them. This can help to save time and money in the design process.

Finally, generative models are also being used to personalize the shopping experience for customers. This can be done using generative models to create personalized product recommendations. For example, a generative model could recommend new clothes to customers based on past purchases and style preferences.

Here are some real-world examples of how generative models are being used in fashion:

* Google AI has developed a generative model called **DeepFashion** that can be used to generate new fashion designs. **DeepFashion** was trained on a dataset of over 300,000 fashion images. The model can generate new designs similar to the ones it was trained on but with some variations.
* Zara is using generative models to create prototypes of new designs. Zara has a team of data scientists who use generative models to create digital prototypes of new designs. Before making these prototypes, we can test the fit and look of new designs. This helps Zara to save time and money in the design process.
* Amazon is using generative models to personalize the shopping experience for customers. Amazon has a team of machine learning engineers who use generative models to create personalized product recommendations.
* For example, Amazon could use a generative model to recommend new clothes to customers based on past purchases and style preferences.

Case Study 6: Music Generation Using Neural Networks

Music generation using neural networks is a rapidly growing field with many potential applications. In this case study, we will explore real-world examples of how this technology is being used today.

One of the most common applications of music generation using neural networks is to create new music. This can be done by training a neural network on a dataset of existing music. The model can then generate new music similar to the ones it was trained on but with some variations. This can help musicians to produce new ideas and to explore different musical possibilities.

Another application of music generation using neural networks is to create personalized music experiences. This can be done using neural networks to create personalized playlists or generate music tailored to a specific listener's preferences. This can help to make music more engaging and enjoyable for listeners.

Finally, music generation using neural networks can also be used to create new forms of music that would not be possible with traditional methods. For example, in real-time, neural networks can generate or create music based on natural sounds. This can help to expand the boundaries of music and to create new and exciting experiences for listeners.

Here are some real-world examples of how music generation using neural networks is being used today:

* Google Magenta is a research project from Google AI focused on developing new ways to create and experience music using artificial intelligence. One of the projects within Magenta is called **Magenta Music Generator**, which can generate new music using various neural network models.
* OpenAI **MuseNet**is a neural network model that can generate music in various styles. MuseNet was trained on a dataset of over 1.2 million songs and can generate music indistinguishable from human-created music.
* **Amper Music** is a service from Spotify that uses neural networks to generate new music. Amper Music can create custom music for various purposes, such as commercials, films, or video games.
* **Futuri**, a media company, has created **RadioGPT**, the world's first AI-powered radio station. It uses GPT-3 technology to produce content tailored to local markets. RadioGPT scans social media and other sources for trending topics, then uses GPT-3 to create a script for on-air use. The AI can also be trained to sound like existing radio personalities. More on this can be read in the following article -  [RadioGPT: 'World’s first' AI-driven radio station is here](https://interestingengineering.com/innovation/radiogpt-worlds-first-ai-radio-station).

These are just a few examples of how music generation using neural networks is used today. As this technology continues to develop, we can expect to see even more innovative and exciting applications of this technology in the future.

Case Study 7: Video Synthesis with Generative Models

Video synthesis is creating new videos from scratch or modifying existing ones. Generative models are artificial intelligence (AI) that can be used to create new data, such as images, text, or even music. In the case of video synthesis, generative models can be used to create new videos that are realistic and engaging.

Several different generative models can be used for video synthesis, including but not limited to Generative Adversarial Networks and Variational Autoencoders.

Video synthesis with generative models has several potential applications. Some of the most promising applications include:

* Entertainment: Generative models can create new movies, TV shows, and video games. This could revolutionize the entertainment industry, allowing creators to create new content more quickly and easily.
* Education: Generative models can create new educational content, such as interactive simulations and virtual reality experiences. This could help students to learn more effectively and efficiently.
* Marketing: Generative models can create new marketing content, such as product demos and advertising campaigns. This could help businesses to reach a wider audience and increase sales.

Here are some real-world examples of how video synthesis with generative models is being used today:

* **Deepfakes**: Deepfakes are videos manipulated to make it look like someone is saying or doing something they never said or did. Deepfakes can be used for entertainment, education, or malicious purposes.
* **DALL-E 2**: DALL-E 2 is a generative model that can create images from text descriptions. DALL-E 2 can create various images, including realistic images of people, animals, and objects.
* **StyleGAN**: StyleGAN is a generative model that can create images with a specific style. StyleGAN can create images like paintings, cartoons, or even photographs.

These are just a few examples of how video synthesis with generative models is used today. As this technology continues to develop, we can expect to see even more innovative and exciting applications of this technology in the future.

**Generative AI Models Landscape**

Over the past few years, numerous generative AI models have been unveiled, with some of the most notable ones being Large Language Models like **OpenAI's** GPT, **Google's** LaMDA, and **Google's**PaLM.

Alongside these large language models, a diverse array of other models have also been introduced, including those for text-to-image generation and text-to-speech generation. These models encompass a broad spectrum of tasks that can be accomplished using the capabilities of Generative AI.

You can next interact to see the landscape of Generative AI models that are available in both paid and open-source options - to work for different types of applications.

**A screenshot of a computer screen

Description automatically generated**

**A screenshot of a computer

Description automatically generated**

**Generative AI Offerings by Tech Giants (OpenAI, Microsoft, Google, Facebook, Amazon, IBM)**

Generative AI is a rapidly growing field with the potential to revolutionize many industries. Tech Giants are leading the way in developing and deploying Generative AI solutions, and their offerings are becoming increasingly sophisticated. This section will examine the Generative AI offerings from some of the biggest tech companies, including Google, Amazon, Microsoft, and IBM. We will discuss the different types of Generative AI services available and explore the potential applications of Generative AI in various industries.

OpenAI Generative AI Offerings

OpenAI is a non-profit research company that is dedicated to promoting and developing friendly artificial intelligence in such a way as to benefit humanity as a whole. One of the ways that OpenAI is working to achieve this goal is by developing and deploying generative AI solutions.

Generative AI is artificial intelligence that can create new content, such as text, images, or music. This technology can potentially revolutionize many industries, and OpenAI is at the forefront of its development.

Here is a summary of the Generative AI offerings from OpenAI:

* **DALL-E 2** is a text-to-image generation model that can create realistic images from text descriptions. For example, you could give DALL-E 2 the text prompt "a painting of a cat sitting on a keyboard," it would generate a realistic image of a cat sitting on a keyboard.
* **ChatGPT** is a large language model that generates text, translates languages, and answers questions. ChatGPT is still under development, but it has already been used to create chatbots that can provide customer service, write creative content, and answer your questions informally.
* **CLIP**is a multimodal image and text embedding model that can be used for tasks such as image captioning and text-to-image generation. CLIP can be used to generate captions for images, create new art forms, and improve the accuracy of image searches.
* **Whisper** is a powerful, open-source speech transcription model by OpenAI. Trained on extensive multilingual data, it supports transcription and translation from 99 languages to English, excelling in accuracy and resilience to noise and accents. Whisper can transform human-computer interaction for speech-to-text, virtual assistants, and more.

OpenAI's Generative AI offerings are still under development but can potentially revolutionize various industries. For example, DALL-E 2 could be used to create new product designs, ChatGPT could be used to create chatbots that can provide customer service, and CLIP could be used to improve the accuracy of image searches.

Here are some specific examples of how OpenAI's Generative AI offerings are being used today:

* Artists have used DALL-E 2 to create new works of art, designers to create new product designs, and businesses to create new marketing materials.
* ChatGPT has been used by businesses to create chatbots that can provide customer service, by schools to create educational chatbots, and by governments to create chatbots that can provide information to citizens.
* CLIP has been used to improve the accuracy of image search, generate captions for images, and create new art forms.

Microsoft Generative AI Offerings

Microsoft is a tech giant that is constantly innovating and developing new technologies. One of the areas where Microsoft is investing heavily is in generative AI. Generative AI is artificial intelligence that can create new content, such as text, images, or music. This technology can potentially revolutionize many industries, and Microsoft is at the forefront of its development.

Microsoft's Generative AI offerings are still under development but can potentially revolutionize various industries. For example, Azure Bot Service could be used to create chatbots that can provide customer service, Azure Cognitive Services could create new art forms, and Copilot could help developers write code more quickly and easily.

Here are some specific examples of how Microsoft's Generative AI offerings are being used today:

* **Azure Bot Service:** businesses are using This service to create chatbots that can provide customer service. For example, the National Football League (NFL) uses Azure Bot Service to create a chatbot that can answer questions about the NFL.
* **Azure Cognitive Services:** This service is used by businesses to create new art forms. For example, DALL-E uses Azure Cognitive Services to create a service that generates images from text descriptions.
* **Copilot:** Developers use this tool to write code more quickly and easily. For example, GitHub uses Copilot to help developers write code for its platform.

Google Generative AI Offerings

Google is a leader in Generative AI and offers a variety of products and services that can be used to create new content.

* **Imagen** - Imagen is a new Generative AI model from Google that can create high-quality images from text descriptions. Imagen is trained on a massive dataset of text and images and can generate images indistinguishable from real photos. Imagen can create various images, including products, marketing, and personal photos.
* **LaMDA** - LaMDA is a Generative AI model from Google that can generate text, translate languages, write creative content, and answer your questions informally. LaMDA is trained on a massive dataset of text and code and can generate text that is both informative and engaging. LaMDA can be used for various tasks, including writing blog posts, creating marketing materials, and even writing fiction.
* **PaLM** - PaLM is a Generative AI model from Google that can solve many problems, including natural language processing, machine translation, and code generation. PaLM is trained on a massive dataset of text and code and can solve problems that would be difficult or impossible for humans to solve. PaLM can be used for various tasks, including writing code, translating languages, and even answering your questions in an informative way.

Google, in its most recent Cloud I/O summit, announced the public launch of ChatGPT rival BARD and is soon planning to change the base model of BARD from LaMDA to PaLM and to integrate the capabilities of PaLM in Google’s office suite along with the services such as Google Photos, Google Maps, etc.

**Generative AI offerings from Startups**

Although Tech giants dominate the Generative AI field because of their reach to ample resources and the field’s substantial resource requirements, startups are using these models' capabilities to establish themselves as industry leaders.

These startups recognize the vast potential of generative AI and are actively using it to drive innovation in various sectors. They combine the skills of data scientists, machine learning engineers, and domain specialists to adapt and customize generative AI models for specific industry needs.

Furthermore, startups understand niche markets and specific domains, allowing them to tailor their generative AI solutions to meet unique industry requirements. This targeted approach delivers precise and impactful results.

Additionally, startups excel at forming strategic partnerships and collaborations. Working with established companies or academic institutions gives them access to additional resources, knowledge, and expertise, further enhancing their capabilities in the Generative AI landscape.

A screenshot of a computer

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Some of the well-known tools in this domain are DALL-E-2, Midjourney, Craiyon etc.

Synthesia, lumen5, magisto, D-ID, and Descript are some of the well-known tools in this domain, let’s compare their capabilities.

A screenshot of a computer

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Video Creation/Editing domainA table of text with black and white text

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Coding Domain

A screenshot of a web page

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Here are the key points about GitHub Copilot:

**1. Autocomplete-Style Suggestions:** GitHub Copilot offers autocomplete-style suggestions as you code, making the development process more efficient and reducing the time it takes to write code.

**2. Natural Language Code Generation:** It generates code based on natural language descriptions. You can describe the functionality you want in plain English, and Copilot translates this description into actual code snippets, providing developers with a starting point for their projects.

**3. Avoiding Nonsensical Answers:** GitHub Copilot is designed to ensure that it doesn't generate nonsensical or illogical code snippets. The suggestions it provides are contextually relevant and follow logical programming patterns, reducing the likelihood of generating erroneous or nonsensical code.

**4. Resilience to Incorrect Prompts:** These models are developed with safeguards to prevent them from being misled by incorrect or ambiguous prompts. While they generate code based on natural language, they are designed to interpret the intent behind the description and generate appropriate code accordingly.

**5. Availability as a VS Code Extension:** GitHub Copilot is available as a Visual Studio Code (VS Code) extension. This means developers can seamlessly integrate it into their coding environment, enhancing their productivity without the need for extensive setup or configuration.

**6. Compatibility with GitHub Codespaces:** GitHub Copilot works wherever VS Code works, including GitHub Codespaces. This ensures that developers can leverage its capabilities not only in local development environments but also in cloud-based development setups, fostering collaborative and remote coding efforts.

GitHub Copilot represents a significant advancement in developer tools, utilizing AI to assist programmers in their coding tasks, making the process faster, more efficient, and accessible.

**SUMMARY**

Artificial Intelligence (AI) is a science of making machines intelligent. AI has come a long way since Alan Turing first asked the question – **“Can machines think?”** in 1950. The global artificial intelligence market size was valued at USD 428 Billion in 2022 and is projected to contribute USD 15.7 Trillion to the global economy by 2030. Perhaps no other technology has caught the imagination of both technologists and laypersons, like Generative AI. The release of ChatGPT in 2022, followed by a proliferation of related tools in the market, has amplified everybody’s interest in the rapid developments in this area.

At Infosys, we are focused on helping our clients become **AI-first Live Enterprises**. We believe Generative AI will help us amplify our human potential. You can visit the **Generative AI Channel** page to learn more on each of the topics as seen below. Explore the curated learning offerings based on your needs. Check out the latest training schedules and explore interesting games to test your knowledge!

A circular chart with text and images

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Amazon Generative AI Offerings

Amazon is a leader in the Generative AI field and offers various products and services that can be used to create new content.

* **Amazon CodeWhisperer -**Amazon CodeWhisperer is a new Generative AI model from Amazon that can help developers write code. CodeWhisperer is trained on a massive code dataset and can generate code suggestions in real time based on a developer's comments and prior code. CodeWhisperer can help developers improve their productivity and reduce the number of bugs in their code.
* **Amazon Transcribe** - Amazon Transcribe is a service that can transcribe audio and video files. Transcribe is trained on a massive dataset of audio and video files and can transcribe files in various languages. Transcribe can be used to create transcripts for lectures, meetings, and other events.
* **Amazon Polly** - Amazon Polly is a service that can generate text-to-speech audio. Polly is trained on a massive dataset of human voices and can generate audio that sounds like a real person. Polly can create audiobooks, podcasts, and other audio content.
* **Amazon Lex** - Amazon Lex is a service that can be used to create conversational AI chatbots. Lex is trained on a massive dataset of human conversations and can generate natural-sounding responses to a wide range of prompts and questions. Lex can be used to create chatbots for customer service, sales, and other applications.

IBM Generative AI Offerings

IBM is a leader in the Generative AI field and offers various products and services that can be used to create new content.

* **Watson Assistant -** Watson Assistant is a conversational AI platform that can be used to create chatbots that can understand and respond to natural language. Watson Assistant is trained on a massive dataset of text and code and can generate natural-sounding responses to a wide range of prompts and questions. Watson Assistant can create chatbots for customer service, sales, and other applications.
* **Watson Composer -** Watson Composer is a low-code development platform that can be used to build and deploy generative AI models. Watson Composer provides a drag-and-drop interface that can be used to build models without prior machine-learning experience. Watson Composer can be used to build Generative AI models that can be used to create new content.

**A diagram of a product management

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