

Generative AI and its potential to transform Healthcare

From Drug Discovery to Medical Imaging, Generative AI is bringing forth a wave of transformation in Healthcare and Life Sciences

AHMEDABAD, GUJARAT, INDIA, March 30, 2023 /EINPresswire.com/ -- With ChatGPT (a generative

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Generative AI paired with human expertise can revolutionize healthcare. Regulatory guidelines and supervision will help accelerate the adoption of Generative AI-based models across the sector”

Dr. Purav Gandhi

conversational AI which is based on Open AI's GPT 3.5) capturing the attention of almost everyone in tech and non-tech industries, there has been a renewed interest in [Generative AI](#) and its use cases in various industries. While recent headlines focus on the use case for search and the competition between Microsoft Bing-ChatGPT and Google-BARD, Generative AI has been slowly making its way into the Healthcare and Life Sciences industry. In 2019, Insilico Medicine, an AI biotech firm, designed a new drug candidate with generative AI in 21 days and validated it in 24 days. The whole process which usually takes 2-3 years in a conventional timeline was completed within 45 days,

in what was dubbed as Pharma's AlphaGo moment.

Generative AI, with their semi-supervised or unsupervised machine learning algorithms, are capable of synthesizing new content with the help of learning algorithms. The commonly used algorithms for Generative AI models are:

- i. GANs (Generative Adversarial Networks) – they're used primarily for image and video-related output
- ii. VAEs (Variational Autoencoders) – either alone or in conjuncture with GANs, they're used for image recreation and noise reduction, audio enhancements, anomaly detections, etc.
- iii. Transformers are a variation of deep autoregressive networks used mainly in understanding and output of Natural Language, which is the basis of major Large Language Models like GPT & ChatGPT, BERT & LAMDA, NeMo, PaLM, etc.

Major current use cases of Generative AI can be broadly categorized in the following:

1. Text Generation: AI models generate text output as required by the user, which can be used

for a wide range of purposes like - Content Creation, Text Summarization, Language Translation, SEO Optimization, Understanding and Linking concepts, Chatbots, customer support, speech recognition & transcription, code completion, document analysis, etc.

2. Image Generation: AI models generate images that can be used standalone or along with text generation models. They are used for – content creation, designing products in various fields, video game development, film and animation, art creation, etc.

3. Audio Generation: These models generate audio, which can be used for speech-to-speech conversion, music & effects generation, audio content creation, speech synthesis, audio restoration, etc.

4. Video Generation: These models are used to generate and create videos – in video composition, for addition of special effects, animation, video generation, video prediction and editing, video game designing, training content, simulations, etc.

5. Synthetic Data generation: AI models generate specific kinds of data like medical data, 3D data, financial data, etc. These datasets can be used for training algorithms, running virtual simulations, identifying future problems, creating solutions, etc.

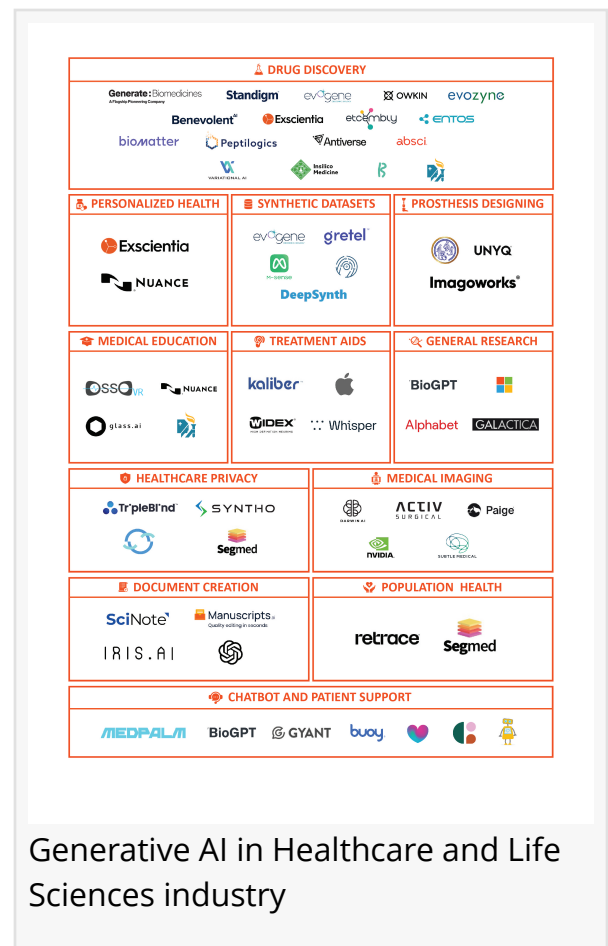
The [Healthark Insights](#) team researched and compiled the most prominent areas in the Healthcare and Life Sciences industry where Generative AI is gradually being adopted:

□ Drug Discovery:

Generative AI can play a significant role in the drug discovery and development process. It can help with the designing of new molecules/antibodies that can be suitable for a particular target. Generative AI can be used for the creation of synthetic datasets and digital twins for virtual trials & simulations and synthetic control arms for clinical trials. Insilico Medicine's Chemistry 42 platform based on Generative AI could design and validate a molecule in 45 days. AbSci uses a Generative AI platform – Zero Shot to design monoclonal antibodies which are effective in various therapy areas.

□ Healthcare Privacy:

Generative models can mask and replace patient-identifiable information to protect privacy and adhere to compliance, while also making the data eligible for sharing. Also, lookalike datasets



can be generated and mixed with real data sets to increase the security of databases. Firms like Syntegra are providing solutions based on their Generative AI models in the creation of patient anonymized data with all other information being the same

□ Personalized Medicine:

Generative AI can potentially help with creating personalized treatment plans based on disease history, patient history, and other factors. The solutions for this are currently still in the experimental stage with no real-world models as of now

□ Medical Imaging:

Generative AI can be used for the reconstruction of an image by removal of artifacts and using parts of the information provided by different types of imaging modalities which will help in better diagnosis and understanding of the disease states. Multiple companies are working on this, Subtle Medical being one of them which provides solutions in image enhancement using Generative AI

□ Creation of Prosthesis:

Similar to drug designing, Generative AI can be used for prosthesis designing. These prostheses will fit better for the patients since it was customized for them in particular. An Indian-based company called ALIMCO is using Generative AI (Avocado) for designing prostheses for limb amputees

□ Population Health Management:

Creation of data samples for disease & analyzing them and comparing them with real-world data sets to create & implement prevention & treatment strategies. This is still in a theoretical and early research stage with no experimentation started as of now

□ Medical Education:

Generative AI can produce training materials and natural language search results (based on diseases and disease journeys) for simulations and training of healthcare students.

Organizations such as Glass.ai are pivoting in this field through the creation of clinical cases, diagnoses, and treatment plans for training healthcare students.

□ Healthcare Chatbots and Patient Support:

Similar to ChatGPT, healthcare chatbots that provide urgent query and FAQ query resolution is being tried for the patient's benefit - MedPaLM, Flan-PaLM, etc. Google's MedPaLM was found to be providing a query resolution with 92% similarity to clinicians. Such Chatbots can provide a faster query resolution to patients at any time of the day and advise patients / alert healthcare providers in case of an emergency requirement of treatment.

□ Synthetic Data Set Creation:

Due to the unavailability of sufficient data sets, it becomes difficult for organizations to train AI models. Synthetic datasets are created using the available information (clinical data, genotypic,

phenotypic, molecular, etc.) which can be used to train the AI. Gretel, a Generative AI organization, used real genotype and phenotype data to generate artificial genomic datasets, which were used by Illumina.

□ Creation of Documents and Research Materials:

Language-based models of Generative AI can assist with the creation of documents and research materials. Multiple tools, including general ones like ChatGPT / GPT – 3.5 are being used for this. The model needs to be provided with a template and the data, after which it generates the research content / official documents which can then be cross-checked by humans.

□ General Research:

Generative AI with an underlying connected database can unearth connections & links and help with a better understanding of concepts through a comprehensive view. The concept is in the building phase (for healthcare-specific use cases) with no organization being able to provide acceptable accuracy. Meta's Galactica Model was built for this specific use case but was taken down due to inaccuracies. Microsoft recently released BioGPT which claims to have an 81% accuracy level on PubMedQA

□ Treatment Aids:

Organizations are testing Generative AI-based products that can treat patients with hearing loss, vision loss, etc. Such products help reduce noise and enhance voice/images & the important parts, which can assist patients with their respective diseases. Currently, these are in the early development stage

Despite the great progress made in the field, it is important to note that much like any upcoming technology, Generative AI too has its own set of limitations, which pose barriers to its wider acceptance in the healthcare industry. Some of these are:

1. Black Box Solutions: It is difficult to understand the output data – as to why this output as compared to other possible outputs, in most of the Generative AI models
2. Pseudo imagination / Hallucination: Providing wrong/made-up information with confidence leading to downstream errors if not correlated/cross-checked with other sources
3. Expectation – Reality gap: The output provided (especially in situations of personalized medicine, prosthesis, etc.) may lead to unrealistic expectations which may not be met in real-world scenarios leading to discontentment
4. Copyright ambiguities: On who owns the copyright protection of AI-generated works and content and the infringement of copyrights of the training data
5. Accountability: If a solution / following an output leads to undesired situations, the issue of accountability arises between the solution (and the vendor) or the user/provider

6. Bias and exclusions: The output of the models may be biased due to the bias in the training datasets. This leads to exclusion of certain kinds of data, which may be important for real-life

7. Ethical Problems: Certain ethical issues arising from job losses and their effects due to the increased capabilities of Generative AI models would be a barrier to their implementation

8. Privacy and Security: Generative AI can be used to create privacy and security issues

Overall, Generative AI paired with humans has the potential to revolutionize the Healthcare and Life Sciences sector in various fields such as patient care, drug discovery, healthcare insurance, etc. It will be critical to strike the right balance between the benefits and the potential risks to ensure the safe implementation of the technology. Regulatory guidelines and supervision will help accelerate the adoption of Generative AI-based models across the sector.

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Healthark Insights team helps customers make critical decisions every day through expertise that combines deep domain knowledge, rigorous research, and analysis, understanding of markets, technology, and experience. With the right experience and expertise, the team not only provides insights but also works closely with clients to execute the strategy that they have helped develop.

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