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Introduction to Generative AI and its applicationin Education

Mr. Rohit B. Uppin[1], Dr. Jayashri B. Madalgi[2]
[1]*Department of ISE, Gogte Institute of Technology, Belgavi, India*
[2]*Associate professor, Gogte Institute of Technology, Belgavi, India*

Abstract: ***Generative AI has made significant progress in re- cent years, with a growing range of applications in a variety of fields. Generative AI applications have catalyzed a new erain the synthesis and manipulation of digital content. Genera- tive AI is very recent technology which changed the way tradi-tional search engines work. The search engines work on the principles of information retrieval. However, openGL came up with use of Artificial Intelligence (AI) for synthesis of digital content and launched well known as ChatGPT. The GenerativeAI differs from traditional AL as it takes text ,audio ,video andusing knowledge it generates new content in any form namely the text, audio or video. The generative AI has many profound applications. Generative AI is a rapidly developing field with the potential to revolutionize many industries and aspects of our lives. As the technology continues to advance, we can ex- pect to see even more groundbreaking and transformative ap-plications emerge. In this paper the introduction to GenerativeAI is detailed along with how generative AI can be used in ed-ucation.***
Keywords: AI , Applications of GAI ,Generative AI, Education

I. INTRODUCTION

Artificial Intelligence is a discipline. It is program or system that trains model from input data. The trained model can make useful predictions from new or never seen before data drawn from the same one used to trainmodel.

Machine Learning(ML) gives computers the abilityto learn without explicit programming. Two common classes of learning models are supervised and unsupervised learning. Supervised learning implies datais already labelled.

In supervised learning we are learning from past examples to predict future values.

The unsupervised learning implies the data is not labelled. Unsupervised problems are all about looking atthe raw data, and seeking if it naturally falls into groups. Deep Learning (DL) is a subset of ML.DL uses Artificial Neural Network (ANN) -allowing them to process morecomplex patterns than traditional ML.

ANN consist of the following three layers:

- Input Layer
- Hidden Layer
- Output Layer

The nodes at input layer represent the input attributes from the training data and nodes in outputlayer indicates class attribute values. The Neural network task includes learning the weights for all the interconnected ages which fits the relationship among the input and output.

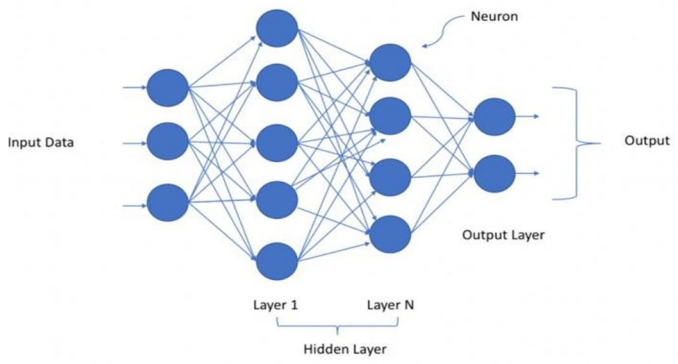


Fig 1: Neural Network Architecture

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Generative AI (Gen AI) is a subset of DL means, it uses Artificial Neural Network (ANN) and can classify or predict both labelled and unlabelled data

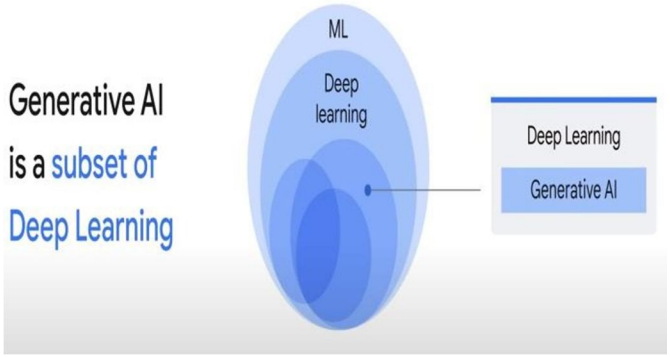


Fig 2: Generative AI

Deep learning models in general are of two types:

- Discriminative
- Generative

In discriminative the image processing is carried out using deep learning algorithms namely Convolutional Neural Network (CNN), PCNN etc. These machines learning supervised algorithms are used to identify object or quality of object etc. as classification task either as two class or multi class problem.

Where as in case of generative the output is the generation of the dog image instead of output class variable prediction.

Discriminative technique → Classify (classify as a dog or cat) → Discriminative Model

Generative Model technique → Generate (generate dog image) → Generative

Fig 3: Deep learning models

The details of Discriminative and Generative deep learning model is given below:

1) Discriminative Deep learning Models are

a) Used to classify or predict.

b) Typically trained on a dataset of labelled data.

c) Learns the relationship between the features of the data points and the labels.

2) Generative Deep learning models are

a) Generates new data that is similar to data it was trained on.

b) Understands distribution of data and how likely a given example is.

c) Predict next word in a sequence.

GenAI consists of Supervised, Unsupervised and Semi- supervised learning techniques .Generative AI model is different from traditional predictive ML model used for classification tasks**.** GenAI is type of AI that creates new content based on what it learnt from existing content.

The process of learning from existing content is called training and results in creation of statistical model. When given a prompt, GenAI uses this statistical model to predict what an expected response might be-and this generates new content. The following figure show the difference between ML model and GenAI model.

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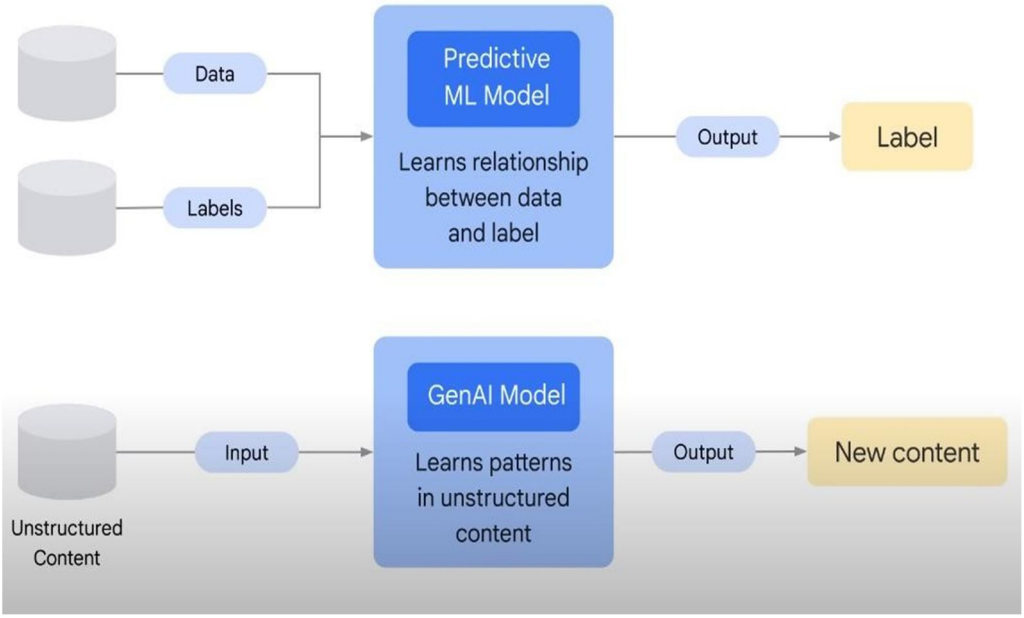


Fig 4: Difference between ML model and AImodel

The comparison for class variable y in non-generative AI and generative AI is shown below: Not GenAI when y is a:

- Number
- Discrete
- Class
- Probability

Is GenAI when y is:

- Natural language
- Image
- Audio

II. WORKING OF GENERATIVE AI

Generative AI works on the following 3 components:

a) Large Amount of data
b) Billions of parameters
c) Unsupervised learning

The following diagram illustrates the components ofGenerative Pre-Trained Transformer (GPT)

III. TYPES OF GENERATIVE AI MODELS

The different types of GenAI models are

1) *Text-Text:* The model takes natural language (NL) asinput and produce output as text itself. Are made to learnmappings between pair of texts.
2) *Text-Image:* Are relatively new and trained on large set of images, each captioned with short text description. Diffusion is one method to achieve this.
3) *Text-Video:* Generates video representation from text given as input.The input text can be a single sentence, full script and output is a video that corresponds to input given.3-D models can also be generated corresponding to user's text description.
4) *Text-to-Task:* The model are trained to perform specific task. This taskcan be wide range of actions such as answering questions, perform search, make prediction or take somesort of action.

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The different tasks which can be carried out usingGenerative AI are

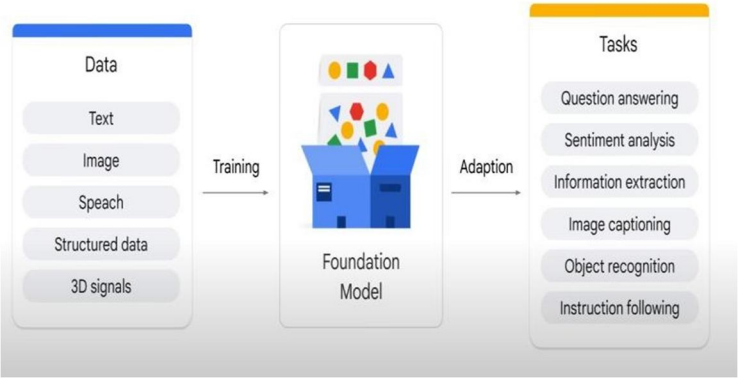


Fig 5: Tasks carried out using Generative AI

IV. GENERATIVE LANGUAGE MODELS

The Generative language models available are: LaMDA, palm, GPT.

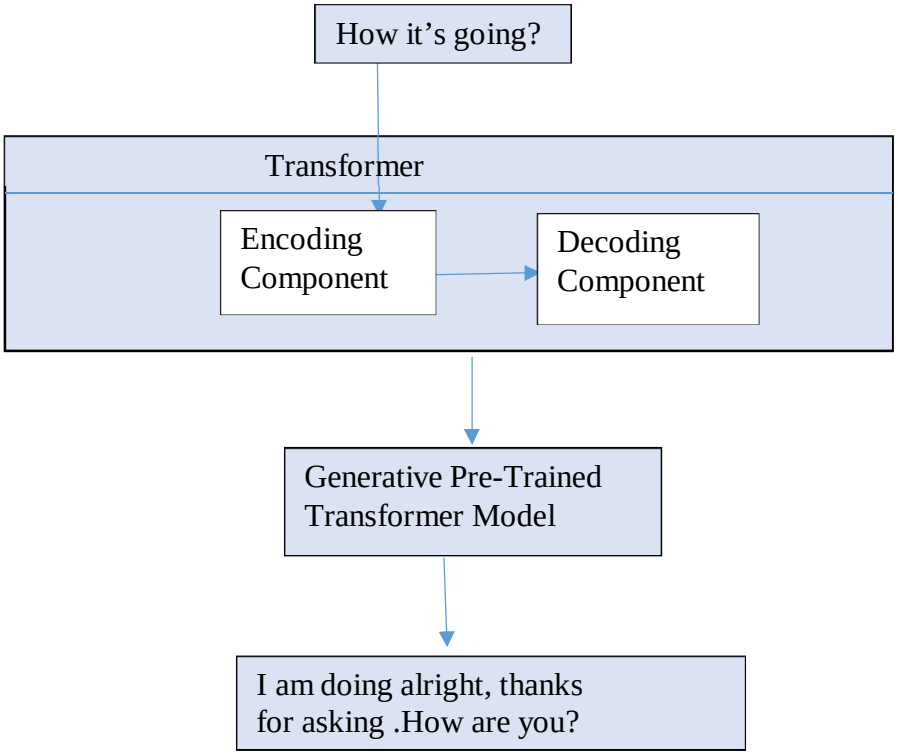


Fig 6: Development life cycle

The following are the generative application builders for development of Generative AI applications which simplifies the development life cycle.

- ✓ PalmAPI
- ✓ MakerSuite

- PalmAPI-entry point to Google's Large Language Models(LLMs) .Provides access to developer that are optimized for use cases such as summarization,classification, etc
- MakerSuite- approachable way to start prototypingand building generative AI applications. Iteration on prompts, Augment your dataset with syntheticdata, tune custom models etc.

The generative AI is being used in almost all the sectors.However, The following section details about applications of Generative AI in education for teachersand students in their teaching learning process. Also, it details about its use for researches in their research journey.

V. APPLICATION OF GENERATIVE AI INEDUCATION

GenAI has many profound applications in the domains like:

a) Business
b) Marketing
c) Gaming
d) Music
e) Biotech
f) Drug Discovery
g) Brain
h) Education

Technology will continue to be an effective tool for learning and education. We have long been using the computer for learning and doing assignments and also to help with and improve our writing. We have used spellcheckers, grammar checkers, and AI text editors like Grammarly to correct grammatical errors and improve word choice and sentence structure. Students use calculators, spreadsheets, and tools like MATLAB and Mathematica for calculation, statistical analysis, andsimulation. They have been quickly consulting Wikipedia and online resources (blogs, social media, and scholarly articles) assisted by powerful search engines like Google and Google Scholar to write essays and for learning research. So, teachers' and students' wide spread use of educational software and AI tools is not new, and educational institutions have adapted to them. What is new is that we have more powerful and versatile cognitive GAI tools that can help students, teachers, and researchers with higher-level cognitive tasks.

ChatGPT-like chatbot is a teaching tool as well as a learning tool. For example, it can assist schoolteachers in generating sample lesson plans, learning objectives, and activities for students at a given level, which they must review and refine. It can also help teachers and students plan, generate ideas, and organize lessons. Fur-thermore, ChatGPT can not only create code but also debug it.

With the popularity of ChatGPT, a new term, "prompt engineering,"18 has emerged; it refers to generating prompts or input text for a language model such as ChatGPT or any other application built using LLMs. To get a better response, prompt(s) have to be relevant, coherent, and cons tent with the intended purpose of theoutput.

Besides chatbots, several AI tools and applications can help in programming, debugging, and creating meaningful connections and learning experiences.

However, using AI tools in education has led to concernsabout increased student plagiarism, also known as "AIgiarism." To address this issue, several tools haveemerged, including GPTZero. GPTZero identifies text authored by AI based on perplexity, a measure of howcomplex the text is, and burstiness, a measure of howuniform a text is in terms of sentence length. OpenAI's classifier rates the likelihood that a given text is AI- generated. However, these tools can still be evaded by minor edits or alterations and cannot be relied upon solely to detect AI-generated text.

Education is facing a tech-driven crisis as students and teachers across the globe are beginning to embrace dis-ruptive GAI tools such as ChatGPT. Educators need to recognize that GAI can help students to learn and write better, assist teachers, and help in research and discov- ery, but it can also help one to cheat. Moving forward, we must consider ways to augment learning, teaching, and research using GAI rather than curb its use. It seems futile to fight against the educational use of AI tools. In- stead, we must integrate GAI's various offerings mean-ingfully into teaching and learning and remodel studentlearning objectives and assessments. Historically, edu- cational institutions have adapted to new technologies and new sources of information to enhance learning and teaching. They can and should do the same with new AI tools, supported by new safeguards and updated policies on academic integrity. In response to the emergence of new GAI tools and their potential use, several educa- tional institutions have updated their working regardingstudent assignments, plagiarism, proper crediting ofAI tool usage, and academic integrity.

The Examples of how artificial intelligence is currentlybeing used in higher education include:

- Plagiarism Detection
- Exam Integrity
- Chatbots for Enrollment and Retention
- Learning Management Systems

- Transcription of Faculty Lectures
- Enhanced Online Discussion Boards

Apart from teaching learning process, Generative AI isvery helpful for the researchers in Research and de- velopment.

A. Research and Development

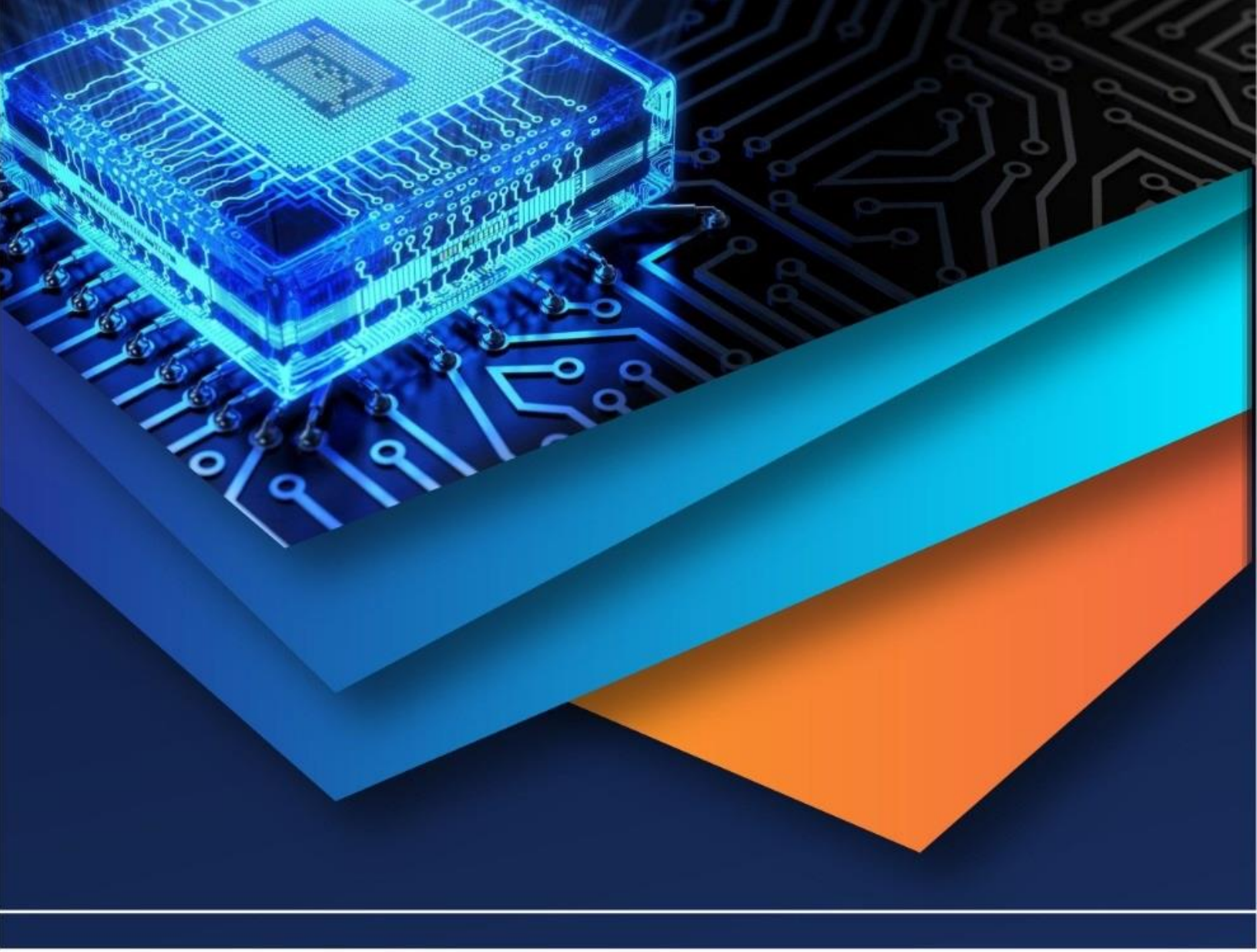
GAI will have significant implications for research, cre-ating both opportunities and concerns. For instance,GAI can help researchers summarize the literature, iden-tify research gaps, understand concepts in other domainsthey can embrace, improve their papers, write software for analysis and simulation, and even help with design- ing experiments. They are likely to revolutionize re- search practices, accelerate innovation, make science more equitable, and increase the diversity of scientific perspectives. However, if not used ethically and professionally, they could also harm research quality, transparency, and cre- ativity and raise concerns about publications (which willbe discussed in an upcoming Computer article). Several issues on the implications of GAI on research and devel-opment need further discussion among stakeholders.

VI. CONCLUSION

The Generative AI has great potential upcoming years however the issues include increased plagiarism, racial bias in their response, the potential for creating harmful content, and ethical concerns. Furthermore, these chatbots may aid cybercrime, fraud, and cyberattacks bycreating spam messages or other means and may also face legal issues around copyright and other legal matters. Some may misuse AI-generated content, claiming they had written or created it. For example, students could claim an AI-written essay that is well done and can attract a good grade as their own, even without understanding what is written, increasing incidences of AI-driven plagiarism.

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