



AI AND GENERATIVE AI - FUTURISM, NEW FRONTIERS OF DEVELOPMENT AND ADVERSITIES



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Synopsis

This paper objectively brings out the new frontiers of design, developments, and applications of tools from the stable of AI. How users' tasks are being made simpler by crafting powerful tools that can accept prompts in natural language have been narrated. Innovative developments in AI field have been captured that can generate much purposeful results considering a much wider data base and contents with deeper understanding and making sense befitting the context. It also brings out how different types of human cognitive intelligence are more being integrated in the same AI platform for entering the fields of fine and performing arts. Finally new frontiers of AI ethics have briefly been stated stressing on the imperatives of using humane qualities by all for taking best results out of AI to ensure inclusive smile and prspoerity.

Introduction

A digital technologist during a knowledge-sharing session for school students explained the fundamentals of data-centric artificial intelligence (AI). Hardly she could complete her deliberations, came a question from a student.

Image Source: <https://edinburgh-innovations.ed.ac.uk/news/edinburgh-to-lead-new-era-of-generative-ai>

He asked, ‘What is so artificial about it?’ He argued that transactional data have been generated by human beings, and the algorithms for AI tools have been crafted by some other human beings, then what the word artificial signifies. Is the machine performing anything like a human being?

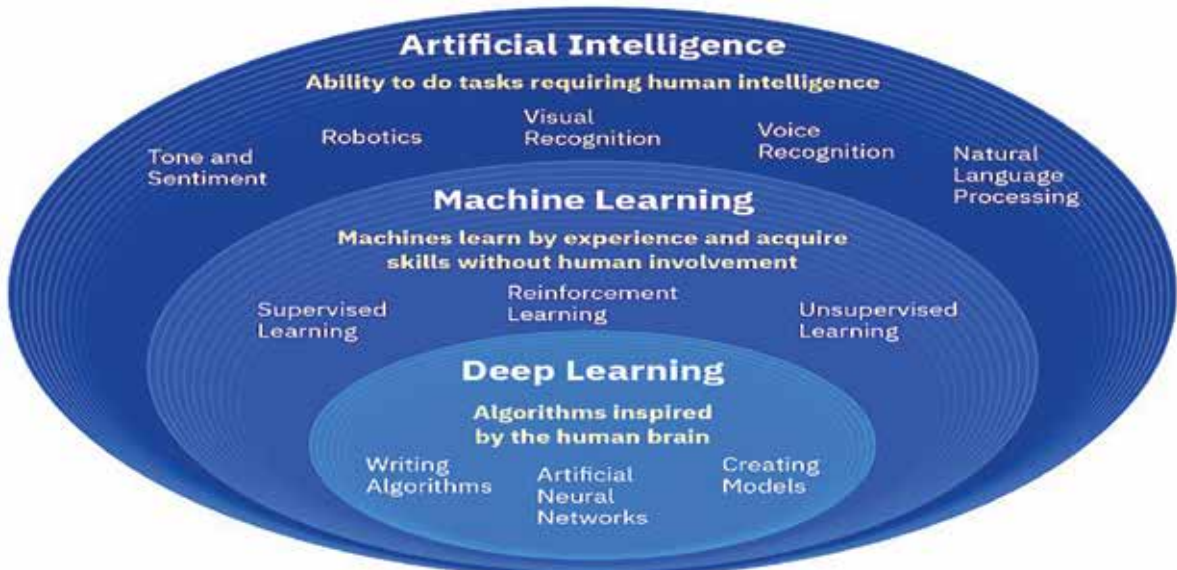
In that student’s question, the answer was hidden. The more one can train and impute into a computing machine by complex algorithms the cognitive capabilities of human beings, the more the attributes of artificial will creep in. The machine will be able to deeply observe the data and use training inputs to draw inferences like a human being. Thus far that student’s question has some merit because, without those complex algorithms, machines could have not done the job.

All children learn A, B, C, D from parents and teachers. After an initial few years of dependency, they become independent and start reading and writing on their own. What if a computing machine having all these in its storage systems, one day starts initiating some actions on its own? Digital scientists are of the view that developments in the AI domain are so fast, that day may not be far!

Readers might be aware of the news reported by the Gurdian¹ about *“The suspension of Google engineer who claimed a computer chatbot he was working on had become **sentient** and was thinking and reasoning like a human being has put new scrutiny on the capacity of, and secrecy surrounding, the world of artificial intelligence*

Genesis and AI Family

Readers may briefly learn about the genesis and evolution of Artificial Intelligence (AI) in the author’s previous paper². According to the writings of technology evangelist Gill Press traces of artificial intelligence were first observed in the work of ancient Greek and Chinese engineers around the early fourteenth century. Given the limitation of space, the following two graphics have been resorted to broadly explain the universe of AI and evolution.



Source: <https://blog.ivanverges.com/2020/03/artificial-intelligence-machine.html>

(AI).” As per Oxford Dictionary the word sentient means “Able to perceive or feel.”

In light of the Google employee’s experience, the big question that arises is whether AI is at the threshold of working independently for which the machine has not been made to learn and assimilate through any human intervention or algorithm. Such a conclusion may not be far-fetched as frequent news about ‘innovative’ applications of AI manifests that evolution is taking place at neck-breaking speed. AI is opening new frontiers of applications with lesser and lesser intermediation of human beings and large language modeling. The case in point is Generative AI One must not ignore that Quantum AI is knocking at the door.

Objective

The primary objective of this paper is to bring together the new frontiers of innovative additions to AI based tools and their application with much more versatility of purpose. It narrates what all are being done to enhance manifold the power of AI tools, varieties of tasks and background contents for diversities of applications beyond numbered data and written language-based contents. It also brings out some unique developments in the field of AI and Generative AI. On the same breath the new frontiers of ethics have also been narrated but for which AI may cause much more harm to humanity than rendering benefits for inclusive growth and smile.

AI, as a branch of computer science, enables a computer system by complex algorithms to think and perform like a human being in terms of cognitive abilities, e.g. natural language processing., voice and visual recognition, drawing sense out of huge data analytics, etc. According to the Oxford Dictionary algorithm means, “A process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer.” Such algorithms are again of various types namely, Supervised, Unsupervised, Decision Tree, Random Forest, Naïve Bayes (based on Bayes Theorem), Linear Regression, Logistic Regression, etc.

The first graphic above helps appreciation of the universe of AI which is the computing machine’s ability to mimic some of the cognitive intelligence of human beings at a relatively lower order. It depicts that Machine Learning (ML) is a subset of AI and Deep Learning (DL) is the subset of ML within the domain of AI family. In simple terms

- ML is the computerised process of using algorithms for a large volume of data in a manner as if imitating the way human beings would analyse, make sense of data, and gradually improve toward a precise understanding of the data.

- DL uses a multilayered neural network and hence is termed with the word deep. According to the Oxford Dictionary, a neural network is “A computer system modelled on the human brain and nervous system.” Thus, deep learning is a type of ML process that uses interconnected computing nodes. The algorithms for DL help craft an adaptive process that facilitates the computing system to continuously learn from mistakes and proceed ahead to resolve complex problems.

Evolution of AI since 1950s

The following graphic reveals the evolution of AI and related technology(ies) over the decades since 1950. As per recorded modern history, in 1956 John McCarthy christened this discipline of computer science as ‘Artificial Intelligence.’ More can be learned from my afore-quoted paper. The first three decades of AI worked with neural networks which transformed the computing system into a thinking machine. According to IBM³, “A neural network is a machine learning program, or model, that makes decisions in a manner similar to the human brain, by using processes that mimic the way biological neurons work together to identify phenomena, weigh options and arrive at conclusions.”



Source of Graphics: https://www.sas.com/en_in/insights/analytics/what-is-artificial-intelligence.html

ML with structured algorithms came into use in 1980 and dominated the scene till around 2010. DL emerged from the further evolution of AI. The excitement with futurism is continuing and will continue with the development of unique applications of AI rendering this segment of computer science the most dynamic one. People have already started using AI-powered laptops and in that, AI is disseminated through service-oriented actions as if to be the best personal assistant.

The latest addition is Generative AI (2022), The latest newest in this space, after Chat GPT (2022), Bard, Azure, Scribe, etc, is ‘Mistral Large’ (2024) from the nine months old French Startup Mistral AI. Evolution in the Generative AI has also helped create products like Gemini and Sora (2024) which can generate a short video based on the given command. The global view

is that Sora would bring revolutionary changes in the field of videography and cinematography. However, Google has called back Gemini for more perfection in the software before relaunch.

One more branch of AI that is knocking on the door is Quantum AI. AI-powered digital process automation is in any case a continuing and dynamic phenomenon in terms each development being unique from the previous one.

Adoption and Applications of AI Worldwide

Gartner, globally one of the most respected technology commentators, conducted a survey⁴ in 2019 amongst CIOs and received about 3,000 responses from 89 countries with an annual combined turnover of about

USD 18 trillion. They concluded that implementations of AI had grown by 270% over the past four years and by 37% in 2019 only. In this survey the most critical challenge emerged to be the shortage of skilled manpower in the AI discipline and despite that the above growth happened.

In May 2023 Gartner conducted another survey⁵ amongst 133 leaders from finance discipline. It

emerged from responses that 39% of the respondents' organisations use AI and ML and another 29% were planning for the same. Gartner concluded that *"The most successful AI-forward finance organizations embrace and evangelize AI at the C-suite level and embed data science teams directly within finance departments while avoiding reliance on third parties,"*



Source: <https://www.statista.com/statistics/1365145/artificial-intelligence-market-size/>

According to the above data of Statista⁶ the market volume of AI was about USD 200 billion and is expected to cross USD 1.80 trillion by 2030 with a CAGR of about 36.87%. Statista has defined AI market as, *"The AI market covers a vast number of industries. Everything from supply chains, marketing, product making, research, analysis, and more are fields that will in some aspect adopt artificial intelligence within their business structures. Chatbots, image generating AI, and mobile applications are all among the major trends improving AI in the coming years."* According to a prediction of Sevion Global Solutions, *"... by 2025 95% of customer interactions will be powered by AI."*

Readers can guess from the above statistics the enormity of worldwide adoptions and applications of a variety of AI-based tools across industry sectors, including e-commerce, strategic value-chain management healthcare, education, agriculture, gaming, banking, financial services, etc. AI has also started entering the domain of fine arts also, including music, videography, and cinematography. A data-centric AI layer is now added to every Blockchain platform for drawing insights from transactional data to help participants make strategic business decisions. All these helps them make strategic business decisions.

Advanced AI Tools and Applications

In the afore-quoted paper² the author narrated many applications of AI, AI-powered robotic process automation (RPA) along with the risks and ethical issues that come in the wake. Further developments in the field of AI are never-ending and each new evolutionary product is unique and with versatile capabilities of its own kind. The field of AI is gradually evolving as incredibly powered 'Computer Assistants' that can revolutionalise the computing systems by acquiring more and more cognitive abilities of human beings and deliver just with a prompt in natural language. Increasingly relatively higher levels of human cognitive skills are being simulated by further advancements and the generative power of algorithms. Some of the most exciting applications that one can expect are:

- ⊙ Generative Design Tools,
- ⊙ Voice Synthesizer,
- ⊙ Music composer from the prompt of a lyric and Raga,
- ⊙ Sketches, painting, artwork,
- ⊙ Multipurpose Critical Skill Toolbox, etc.

At this stage, it would be useful to know about the following developments since the said paper² in the area

of programming for AI from the perspective of a user and solution developer.

⊙ **Low Code and No Code (LCNC) Platforms:**

The rudimentary form of such a platform was first experienced as Lotus Notes in 1990s, which the author has also used. This has advanced into Excel Sheets with versatile power of first level data analytics and data visualisation enabling users to perform more. For working on such a platform certain command buttons are used instead of writing any software. However, the idea of making computers more useful and friendly for common people LCNC is progressing further with dynamic capabilities.

According to the National Informatics Centre of India⁷ “LCNC Frameworks are built on actual coding languages like PHP, Python, and Java, end users are not concerned with the specifics. Instead, they are given visual software development environments where they can drag and drop program components, link them, and watch what occurs. In effect, it may be utilized as a familiar wizard-style paradigm to build, test, and even deploy apps that are totally focused on simplicity of use. Many people consider Visual Basic as one of the earliest low-code integrated development environment (IDE). Such kinds of frameworks provide higher degree of independence to users.

⊙ **Transformer Model:** In earlier models of recurrent neural networks, the software tool used to see/scrape a sentence word by word and try to make meaning of it. Whereas in the Transformer Model based on the ‘Attention Mechanism’ the tool can make the machine view the entire sentence and even the paragraph at a time. This helps the system understand the context of each word from the overall perspective of the sentence and paragraph. Generative AI platforms must have drawn lots of power from such a model. This has also accelerated the pace of the task being performed based on the prompt typed by the user.

⊙ **Large Language Model (LLM):** LLM is an extended version of the Transformer Model. On a wider scale the program is run in an interconnected computing environment integrated through web-based APIs. Hence one can imagine the volume of text that can be brought into the purview of the AI tool. The well-known generative AI tool Chat

GPT is a unique example of LLM that scrapes through the wider universe of text-based inputs available in cyberspace. Generative AI tools can be made more versatile by combining three functions, viz., translating, summarising texts, and generating answers to the prompted questions.

⊙ **Integration of Generative AI With Independent Apps**

Like combination drug offerings by the pharmaceutical industry, digital technologists have also successfully integrated several independent Apps with Generative AI. Cases in point are MS Office, Google, Bing, Coursera, etc. Such successful combinations have made their products much more versatile with result orientation, productive, efficient, and effective.

⊙ **Collaborative Robotics (CoBot)**

The application of Robots for the manufacturing industry is well-known. Robots are products of Mechatronics. Mostly industry synchronously integrates the actions of such robots with human actions for attaining zero-error perfection in industrial processes like assembly units of a motor vehicle manufacturing unit.

Such CoBots are more being powered by AI tools for initiating self-generated actions. For example, a robot can advise a bank’s clients through voice or written message after scrapping through the back-end transactional data, getting it processed by the advanced AI tools, testing for in-built compliance requirements, and presenting the advice that can serve unique purposes of the client. However, there are debates on many related issues.



Source: https://www.freepik.com/premium-photo/ai-music-composer-generator-with-robot-play-guitar_39033536.htm

A CoBot can also copy the dance by a human being to the tune of a music and then reproduce the same. This capability with advanced AI algorithms can dynamically be delivered for many advanced applications like complex robotic medical surgery, or industrial applications. After learning and reproducing thousands of such dances the ML tool of the Robot can choreograph a dance for an entirely new song. In a similar way a Robot can also compose music for a given lyric after listening to thousands of songs.

⊙ **Robotic Process Automation (RPA)**

Similarly, robotic process operation is the process of making a operating software (OS) self-operating on an end to end basis, For any bank a RPA based system can perform KYC to onboard a customer, process request for sanctioning loan in compliance with policies and regulations and prompt for remittance of fund to the customer's account without any human interventions. For this first it uses an AI tool for Optical Character Recognition (OCR) to read and capture customers' data from documents uploaded by her/him.

Thereafter the RPA software can assess eligibility of the applicant based on all captured information and sanction the loan. In this process it also captures picture of the applicant using webcam. Before sanctioning the software also scrapes through entire loan book of the bank, the applicant's CIBIL score, verifies and validates documents like PAN Card and Aadhaar Card by directly interacting with the related data base of respective issuing authorities. Such RPA based systems can also be integrated through API with the transactional platforms of say eCommerce companies so that their customers can promptly avail of consumer loans against large value items instead of paying.

Readers may refer the website of SimpliLearn for learning about eighteen cutting age applications of AI at the web page <https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/artificial-intelligence-applications>.

Quantum AI (QAI)

This is a combination of Quantum Computing with AI tools for performing the AI related tasks by a quantum computer. QAI will increase the speed of any AI tool by multiples of thousands of times. It is well known that what task the latest generation of a desktop computer

can do in ten years, a quantum computer can do in ten minutes. The author has written a paper⁸ on quantum computers and urge the readers to peruse through it. QAI has the power of bringing in ground-breaking computer revolution.

According to a publication of in Forbes⁹ *“The deliberate collision of two game-changing technologies has the potential to bring about a new era of business disruption and innovation. Few industries will be spared this transformation, and it will create completely new value and w. In the future, artificial intelligence is likely to become supercharged by quantum computing. It's a partnership that could change the world.”* This can upgrade all applications of Generative AI with more perfections and enhanced reliability. It may reduce plagiarism by 'transcreative' paraphrasing capturing the underlying sense to the context.

However, QAI can pose huge threat to digital transformation with the most trusted Blockchain technology. Cybercriminals would be able to break the barriers of dynamic encrypting algorithms and penetrate to spawn ransomware. For Red Hat hackers hacking any computing system will be like a child's play.

Quantum Computer Brain (QCBrain)

This is an advanced innovation of QAI for neuromorphic computing and is very difficult to appreciate at this stage by a common man. It would be useful to quote from the writing of Albert Christoppher that can trigger imagination of all including the author. According to him, *“The Quantum Brain is the main instance of neuromorphic computing, which is also the future of computing. These mainly take the help of cobalt atoms on a superconducting black phosphorus surface to copy the methods of signals in the human brain.”*

The author wonders whether very soon QAI and QCBrain aided computing systems would soon be able to capture the sentiments and emotional intelligence of human beings that can be gathered out of written verses or voice speeches. One can extend this thought by saying that days many are not very far when computers would also be able to speak out words of wisdom befitting any situation and advice human beings, if not provide intuitive and judgemental comments.

Demystification of Generative AI

The common perceptions about the outputs from Generative AI tools, particularly which are language based, are that these tools, irrespective of its origin linked to any digital giant or successful startups like Open AI, are plagued with the following serious faults

and experience based criticisms:

- ⊙ Indulges into plagiarism and open to risks of violating patents and copyrights,
- ⊙ Produce different text-based outputs from at different points of time for the same prompt from the same machine at different points of time or from different computing machines at the same time,
- ⊙ Unacceptable outputs because those are found to be beyond any logic and reasoning,
- ⊙ Does not take into consideration publications of any other language other than English and a few other selective languages as are included in the backend software,
- ⊙ Information and texts produced against any prompt may contain dated information and facts because of the time-period for considering and scrapping contents of cyberspace as defined in the backend software which may not be dynamically updated, and so on.

All these shortcomings are not unfounded and may be critical particularly for learners at any stage of imbibing asynchronous education. But despite all these Generative AI tools are more and more being adopted by companies across industry sectors. Let the author conclude that these industrial units are mostly applying Chat GPT or Bard like Generative AI Tools for dealing with information, data base and contents from their own storage.

The above can be explained by the example of Coursera, a globally accepted and popular EdTech Company. They have amassed huge reliable and enriched academic contents for all disciplines of education which help learners to acquire knowledge. They have also embedded AI and Chat GPT in their tools for imparting application-oriented training, testing and self-evaluation. Coursera also provides access to their systems on an institutional basis with predefined numbers of access rights.

Assuming that a faculty member of such an institute wants to design a course with 100 marks on Strategic Finance can give a prompt accessing to Courser's systems for doing the task. The output will only be based on the contents of the predefined limited domain of Coursera and not the open-ended cyberspace. Thus, that output also will not suffer from many of the above criticisms and qualitatively better than the output given to an open Chat GPT user for similar prompt. This example can be extended to many such uses by

corporates.

New Frontiers of Ethics and Adverse Impacts on Human Life

The author is of the view that technology does not have morality, ethics, compassion, emotional intelligence, and accountability. But technologists, building the solutions, and people, using those have. Again, technologies at times, albeit should not, may indulge into some bias because of passion for the product, commercial interests, etc. But users having complete independence to choose, adopt and apply can never do so. Therefore, evils and ethical issues can be handled and rendered-off only by the stakeholders. If they compromise with those humane qualities, technology would be in wrong hands and can generate disastrous results.

Therefore, it will in no way be advisable to only gloss over the benefits from the advanced AI tools. Because the entire world is up in arms shouting about the evil effects from usage of AI Tools. The author in his quoted paper² have enumerated ethical issues and risks related to AI applications including use of AI tools by Cyber criminals. Those are not being repeated, instead some new dimensions are being added here.

Kaushikkumar Patel (2024) in his research paper¹⁰ has stated that, *"In conclusion, this study underscores the necessity of ongoing ethical reflections in the advancement of data-centric AI. It advocates for a proactive approach in addressing ethical challenges, ensuring that AI development is aligned with societal values and human rights. The paper concludes with a call to action for continued research and collaborative efforts in fostering ethical AI practices."*

None other than Sam Altman, the CEO and co-founder of Open AI, that delivered Chat GPT, has himself called for a global agency to oversee, in other words control and monitor, AI applications with the same degree of criticality as that of International Atomic Energy Council. One can, therefore, understand what adversities and risks he apprehends from innovative developments and applications of AI tools without any checks and balances.

Speaking at the World Government Summit in Dubai, in February 2024 he also cautioned that AI is advancing at a much faster pace than what is being globally expected. He was quoted¹¹ saying *"There's some things in there that are easy to imagine where things really go wrong. And I'm not that interested in the killer robots walking on the street direction of things going wrong.... I'm much more interested in the very*

subtle societal misalignments where we just have these systems out in society and through no particular ill intention, things just go horribly wrong.” He commented that AI industry should not participate and be in any commanding position while framing regulations for the industry.

As the new frontiers of innovation in designing and applying AI platforms and tools are opening up every day, new frontiers for considerations of Ethical AI are also unfolding with paramount importance and imperatives because AI tools are more and more being applied for inter alia:

- ⊙ Taking financial decisions like pricing of products, lending and, fixing rate of interest and sharing values,
- ⊙ Delivering judgements by judiciary for criminal and civil disputes,
- ⊙ Framing and executing policy decisions, like providing financial subsidies and extending social welfare benefits to needy citizens by government,
- ⊙ Strategic decisions while making decisions for hiring and firing of human resources and framing business policies in the light of ESG obligations,
- ⊙ Deciding about the need for rendering services and people-centric activities by NGOs and Civil Society organisations,
- ⊙ Deciding war strategies and spreading deepfakes with ill motives by
- ⊙ Conducting crimes and extracting ransom by cyber criminals, and and so on

The above list is just illustrative and in no way comprehensive. Any unethical usage of AI tools can create horrendous effects in society and harm humanity like as per the indication of of Sam Altman nuclear weapons can. Therefore, some of the key principles of ethical usage of AI should be based on the foundations of fairness to all, privacy, security and safety, transparency, inclusive growth for inclusive smile and last but not the least accountability.

Conclusion

Zillions of bytes have been occupied in cyberspace and tonnes of papers have been inked for writing on various dimensions of AI, its applications, benefits, and ill effects. The author has made efforts to clearly bring out various dimensions of all these. He would consider some success for this effort if all stakeholders use this powerful technology keeping in view all associated

responsibilities and for the ultimate purpose of doing good to humanity, for inclusive smile and prosperity. MA

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