Revolutionizing Agriculture in Artificial Intelligence Through Exploring the Potential of Machine Learning and Chat GPT

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Abstract: Revolutionizing agriculture is providing rebirth to agriculture sectors through the virtual applications in farm practices. AI is steadily emerging as a part of the agricultural industry's technological evolution. AI is an umbrella term whereas ML is a subfield, that uses algorithms trained on data to produce adaptable models using the past experience to predict the future, which can perform a variety of complex tasks. Chat GPT is used for crop management and optimization, where farmers can use Chat GPT to get real-time insights on weather patterns, soil health and crop growth predictions. The research was conducted at College of Agriculture, Assam Agricultural University, Jorhat with the post graduate and Doctoral scholars of the academic year 2023-24. 50 students were selected randomly and the data were collected using a well-structured and pre-tested interview schedule. 82 percentage of the respondents prefer AI in receiving any kind of information. The respondents have been found in highly using AI weekly twice (38%). Half of the respondents (50%) anticipate that AI will have a boom in the field of technology in two years. Every respondent of the study felt the need for training among the students regarding the field of AI. 94 percentage of the respondents were found to be interested in receiving AI training right away. 58 percentage of the respondents contemplated that importance of AI among the farmers was very high. Among the given challenges that were anticipated in using AI, connectivity was ranked first by 24 of the respondents out of 50. Research on AI in agriculture is still not sufficient and need to be explored. Meanwhile, there is a need to set boundaries for using AI and accessing its functions.

1 INTRODUCTION

In the current scenario of global updating, cultivation and transition in the agriculture sector is taken up by virtual things. Especially the term 'Digital Agriculture' means to cover broad aspects of various disciplines under farming. Revolution in agriculture is indeed due to the shortage of labor and increased capitals. Revolutionizing agriculture is providing rebirth to agriculture sectors through the virtual applications in farm practices. Main focus is given on reducing the time period and predicting the anticipated outcomes of the future.

Technological practices have been developed gradually in our day-to-day life. Indians have become active internet users with 759 million to reach 900 million in 2025 (IAMAI). Internet penetration rate in India was boosted fourfold in the last decade. It has changed the life style and food pattern of humans significantly. Artificial Intelligence plays a notably vital role in that. The present status of mobile gadgets and its peripheral usage on the earth is booming with a great degree. It provides abundant information and application in agricultural practices. Mobiles act a-key-drivers in bridging the digital divide in farm activities.

1.1 Artificial Intelligence

The quest to recreate human-like intelligence within a computational substrate has obtained traction in recent years, mostly due to the emergence of deep learning methods and convolutional networks (Schmidhuber, 2015; Bengio et al., 2015; Goodfellow et al., 2016). Artificial Intelligence is a simulation of

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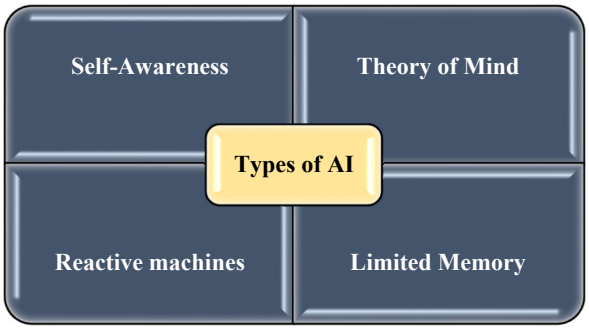

Figure 1: Types of Artificial Intelligence.

human intelligence by machines. It thinks, senses and acts like humans. According to Arend Hintze (2018) the AI functions based on the listed types.

AI is steadily emerging as a part of the agricultural industry's technological evolution. AI powered solutions effectively enables farmers with quality and quantity output and ensures faster go-to-markets for crops. Virtual platforms like face book, you tube and digital pages exist everywhere, but there still exists a gap to address. India is the one of the most populated countries with a greater number of internet users across the globe. Naturally, digital tools like Artificial Intelligence, Machine learning, Chat GPT, Internet of Things, Augmented and Virtual reality will easily penetrate the country. Artificial Intelligence saves agriculture from the instant climate change, population growth, employment issue and food safety. Agri GPT is one such example. According to Wipro, a globally renounced company, AI is an automation platform. Its robots used in agriculture, will eliminate 80% of chemicals and will result in less expenditure, up to 90% of the total cost. AI sprayers drastically reduce the number of chemicals applied for the particular produce to improve the quality of the produce with cost efficiency. AI is a steadily emerging and clubbing partner in the agriculture sector along with technological evolution. AI can be used as a ladder for agricultural development. The global challenge is to increase food production up to 50% within the year 2050. As a step for achieving this, AI provide powered solution in a fast manner, like go-to market for the farm produces (Revanth 2022). Chat bots are trained to grasp the data in human conversations and record the data based on those dialogues, to learn how to understand what they discussed, and finally come up with appropriate responses. This is suitable to humans for both their queries and problems (Pandey 2018). Researchers trained the computer models to identify the traits of the people based on the social media posts (Wu, Kosinski and Stillwell 2015). However, AI is similar to chat bots, that could be used to automatically construct personalized messages for many people using data obtained from their browsing history, emails and tweets (Brundage et al., 2018). Reactive machine is a part of AI which remembers and learns the past success and failures, in case of the similar situations that can happen in the future.

1.2 Machine Learning

AI is an umbrella term whereas ML is a subfield, that uses algorithms trained on data to produce adaptable models using the past experience to predict the future, which can perform a variety of complex tasks. Elements in ML algorithm process are Representation, Evaluation and Optimization for finding appropriate model for designing programme. Its performance should be like humans but to reduce the time and save the power. Key drivers in ML are predictive modelling, automation, scalability, generalization and addictiveness. In simple terms, the process is that it learns, predicts and improves for analysing the future demands. ML models used in agriculture sectors in general are regression, clustering, Bayesian models and clustering for a variety of reasons.

1.3 Chat GPT

Chat GPT is an artificial language model developed by Open AI on November 2022 in San Fransisco. It uses ML for generating human-like conversation, suggestion and feedback. GPT (Generative Pre-trained Transformer) is the brain behind this. GPT-3.5 is a language model, which can draw data from the internet to generate natural language responses.

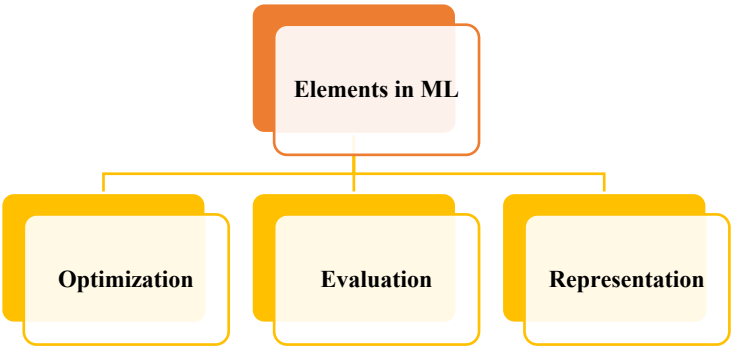

Figure 2: Elements in Machine Learning.

GPT-4 understands the context better, read between the lines and understand the nuances. It is better suited to respond to prompt situations that require more complex and deeper understanding. Especiallyin agriculture, Chat GPT is used for crop management and optimization, where farmers can use Chat GPT to get real-time insights on weather patterns, soil health and crop growth predictions (Destika et.al., Indonesia, National research and innovation agency, 2023). GPT 4 and its image description is mainly useful in agriculture sector for detecting the disease and pests. Scientist team from University of California, Berkeley and University of Southern California explored in combining the NLP-Natural Language Processing with AI driven chat bots trained in GPT-4 language model to design timely advisories. With the help of this, farmers would get instant information on crop disease and pest infestations. They evaluated the effectiveness of those chat bots in reducing the agricultural losses. It showed evident results of an average decrease in loss by 5.5% and maximum of 16%. Researchers from the University of California, San Diego (UCSD) developed GPT-4 application through conversational interface to answer farmer queries on crop growth, pest control and other topics. It proved to be more effective, accurate, fast, reliable and cost effective than the traditional methods. The various GPTs make the farmers pro-active and mitigate their problems instantly. Now experts are venturing to expand these services to even other disciplines of agriculture as well.

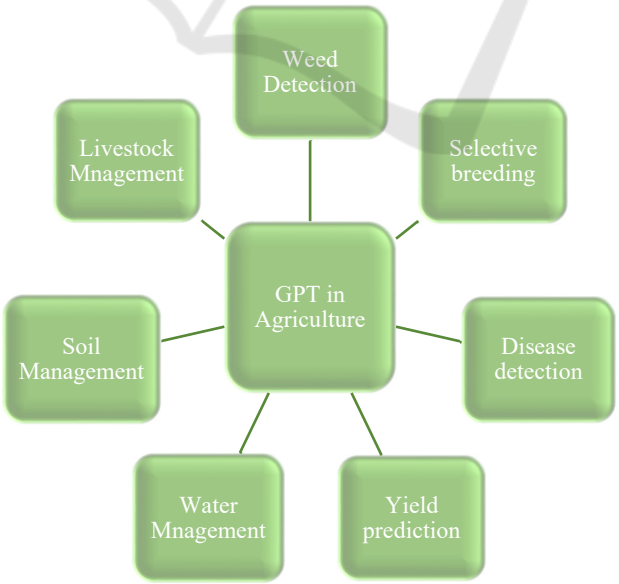

Figure 3: Uses of GPT in Agriculture.

2 MATERIALS AND METHODS

The following study was conducted at Assam Agricultural University, Jorhat. The university is a roof of many colleges across the state. The research was conducted at College of Agriculture, Assam Agricultural University, Jorhat with the post graduate and Doctoral scholars of the academic year 2023-24. Ex-post facto study design was used for this research. From the total of 262 students 50 were selected randomly and the data were collected using a well-structured and pre-tested interview schedule. The scale was developed for the study which is designed in a way to study about AI among the respondents holistically.

3 RESULTS AND DISCUSSION

Table 1: About Artificial Intelligence among the respondents.

S. No	Statements	Frequency (50)	Percentage (100%)
1.	Gender		
	Female	16	32
	Male	34	68
2.	Prefer to receiving information through AI		
	Yes	41	82
	No	9	18
3.	Frequency of using AI		
	Daily	16	32
	Weekly twice	19	38
	Weekly once	10	20
	Fortnight	5	10
4.	Years engaged in using AI		
	1 Year	29	58
	2 Years	11	22
	3 Years	6	12
	>3 Years	4	8
5.	Anticipated year of boom for AI		
	1 Year	12	24
	2 Years	25	50
	3 Years	8	16
	>3 Year	5	10
6.	Need for training among the students related to AI		
	Yes	50	100
	No	0	0
7.	Interested in receiving training related to AI		
	Yes	47	94
	No	3	6
8.	Importance of AI among Farmers		
	Very high	29	58
	High	12	24
	Less	6	12
	Very less	3	6

Table 1 provides information on awareness, knowledge, preference, usage and training needs of the respondents regarding AI. It shows that 68 percentage of the respondents were male and 32 percentage of them were female. 82 percentage of the respondents prefer AI in receiving any kind of information while 18 percentage of them were skeptical in their preference for AI. Higher number of respondents were found to be using AI weekly twice (38%), followed by daily users (32%). 20 percentage of the respondents engage in using AI weekly once followed by 10 percentage of the respondents who use AI at fortnightly interval. The percentage of respondents using AI for the past one year were found to be high (50%), succeeded by those who have been using it for at least two years (22%). Less percentage of the people were found to be using AI for three years (12%) and very minimum of them were using it for more than three years (8%).

From the table 1, it is also known that half of the respondents (50%), anticipate that AI will experience a boom in the field of technology in two years, followed by those who had anticipated one year (24%). Every respondent of the study felt the need for training among the students regarding the field of AI and were accepting that learning the know-how of AI will be useful for better study experience and performance in their stream. 94 percentage of the respondents were found to be interested in receiving AI training right away, while the remaining 6 percent were hesitant in receiving such trainings. 58 percentage of the respondents contemplated that importance of AI among the farmers was very high, followed by 24 percentage of them who felt high importance. Only 6 percentage of the respondents had the opinion that the importance of AI among the farmers is very less.

Figure 4 shows the six anticipated challenges in using AI as perceived by the respondents. These challenges were ranked by the respondents based on their opinions and past experiences. Each challenge was given a rank between 1 and 6 by all the respondents i.e., each challenge will be having 50

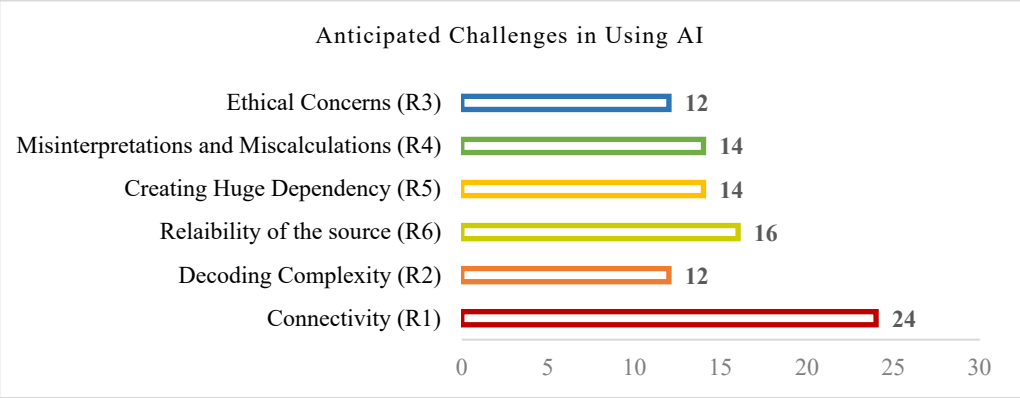

Figure 4: Anticipated challenges in Using Artificial Intelligence.

responses. Among them, connectivity was ranked first by 24 of the respondents out of 50. This proves that connectivity in using AI as an obvious challenge among all the others. The second rank was largely given to decoding complexity by 12 respondents, succeeded by ethical concern which was ranked third by 16 of them. The language of some sites is simple, whereas some are complex, of which the users might have felt difficult to understand and interpret. Ethical concern is a serious issue these days regarding AI since the technology can be used for any kind of purpose. The data and other information the user entered might become a threat to him or her one day which will automatically crush the trust of AI among the users. The same number of respondents (14) ranked Misinterpretations and Miscalculations as fourth and creating huge dependency as fifth. With AI providing information about everything, there might be a chance where it can pose a threat to other sources of information, especially books, journals, radio, newspapers etc. Finally, the sixth rank was given to reliability of the source by 12 respondents. Since the source of information is not mentioned in AI, the un shown authenticity of the information can be viewed as a challenge.

4 CONCLUSION

Introduction of AI has changed the picture of human life on earth. The sixth sense of humans has created something equivalent to its capacity. This has its own merits and demerits. It embodies machine intelligence capable of perceiving and comprehending the surrounding environment, culminating in the production of the most efficient and productive outcomes. AI has reduced human drudgery far more than expected and proved to be precise and worthy. But at the same time people are losing their jobs because of AI. AI is a two-sided sharp knife which should be handled with care. The use of AI in agriculture is humongous when it comes to aspects like weed management, selective breeding, disease detection, yield prediction and management of soil, water and livestock. It also encourages spray reduction which yields good quality produce as well as fertile soil. Leveraging the immense benefits from these virtual tools to farmer doorsteps will produce a valuable revolution in agriculture. It is also known from the conducted research that the use of AI among the students is also quite inevitable and more progressive as every respondent felt the need to explore AI. Many of the students were curious about knowing the technical know-how of AI. Many were already using it and some had a minimum two years of experience in using AI. They also anticipate AI to have a boom in a year or two. It is thus useful for everybody in general and also for agriculture in specific. Students, research scholars, scientists, officials, all kinds of stakeholders, farmers etc. are the beneficiaries of AI technology. To cherish the true potential of this virtual tool in farming sectors it is mandatory to understand its benefits and limitation for its real time application. Some bottlenecks of AI including errors in decoding, misinterpretations and miscalculations, ethical concerns etc. needs to be explored for effective upscaling. This calls for the need of experts in the field who knows to handle these tools since the manpower is scarce for the time being. Meanwhile, there is a need to set boundaries for using AI and accessing its functions. Streamlining AI is important, as recently the European Union and America had passed a new law on AI. Research on AI

in agriculture is still not sufficient and need to be explored. Further studies have to be conducted on enforcing policies and laws regarding the development and use of AI in every field including agriculture for streamlining its use and reduce its harms. Thus, the Ever Energetic and Enthusiastic AI is highly potential and it can further be potentialized with the help of human minds which created it in the first place.

5 AREAS OF FUTURE RESEARCH

- Comprehensive assessment of Artificial Intelligence in agriculture and its allied sectors.
- Training needs in knowing AI to overcome the developmental lacunas.
- Formulation of an ethical framework for using Artificial Intelligence among the citizens of India.
- Integration of Artificial Intelligence and Indigenous Technical Knowledge for better infusion and development.
- Study on the use of AI among the farmers, researchers and the government officials and ways to harness its true potential.

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