



American International University-Bangladesh (AIUB)

Department of Computer Science Faculty of Science & Technology (FST)

Research Methodology Assignment

Submitted By

Semester: Summer_21_22		Section: J	
Serial	Student Name	Student ID	Total Marks
01	Md. Tamim Rahman Fatmi	17-35691-3	

The assignment will be Evaluated for the following Course Outcomes

CO1: Formulate and Compose a Research proposal considering complex research activities, background studies, and following standard guidelines.	Total Marks (20)	
Problem Analysis: Background information of the research area and definition of the key research terms.	[5 Marks]	
Literature Review: Existence research within the problem area (other's work). The comprehensiveness, correctness, and discussion of the related works in relation to the topic and as a background motivation for the study.	[5 Marks]	
Research Objective: Research aim relation with the problem area within existence research. Formulation of Motivation and Research Question	[5 Marks]	
Research Contribution: Impact on the society and make a difference	[5 Marks]	

CO2: Design and compose a Research article after conducting mock research on a given topic by leveraging a research method.	Total Marks (20)	
Abstract: The relevance, completeness, and conciseness of the abstract in relation to the research topic.	[5 Marks]	
Research Method: Discussion on the research method, its appropriateness and detail on data collection, analysis, and synthesis.	[5 Marks]	
Result Analysis: Discussion the research finding and argument on the novelty of the results.	[5 Marks]	
Submission and Formatting: Article Structure, References, Citation, Style, Font size, Alignment, Grammar, Spelling, etc.	[5 Marks]	

A Review on The Use of Artificial Intelligence in Agricultural Field

Md. Tamim Rahman Fatmi
Department of Computer Science
American International University – Bangladesh
tamimprime@gmail.com

ABSTRACT

Agricultural field plays an important role in our society from the very beginning of mankind. Not only on the economy but also the very existence of mankind depends on the prosperity of the agricultural field. Not to mention the rapid increase of the population all over the world which is also making a great impact on the cultivational lands because of the increase of urbanization. The cultivational lands are decreasing more and more day by day. Farmers are also shifting to other professions in order to income more money. At this point, it is high time to consider the facts and build a new way in which growing more paddy will be able to possible in limited lands by using artificial intelligence as an ally. The use of artificial intelligence is increasing in the agricultural field day by day as we speak but it has not been fully operational in many countries because of its high costing. Many farmers who still do farming in the old traditional ways, do not know the proper ways to install the applications of the synthetic intelligence techniques. Many reaches have been done in order to increase the applications of the artificial intelligence in the agricultural fields. But the real-life implementation of the applications of techniques like using drones or robots for weeding, cultivating, watering and collecting the paddy from the fields have not fully accomplished in all over the world. This paper has been written as a review over all of the researches done on use of artificial intelligence in agriculture. Finding out the gap between the theoretical researches and the implementations of those researches in real and the biggest limitations of this technology are the main goals of this review paper.

Keywords: Artificial Intelligence, Machine Learning, Synthetic Intelligence Techniques in Agriculture, Farming.

INTRODUCTION

Since the dawn of humanity, agricultural fields have played a significant part in our culture. The health of the agricultural sector has an impact not just on the economy but also on humanity as a whole.

Problem Background

The fast urbanization that is occurring in response to the rising population has a significant influence on agricultural fields. The amount of land suitable for farming is reducing every day. Farmers are also leaving farming for other occupations in an effort to increase their income. It is now imperative to weigh the available data and devise a novel strategy for expanding paddy cultivation on scarce land by utilizing artificial intelligence.

Related Studies

The world's populace is expected to be about 10 billion by 2050, boosting agrarian order-in a circumstance of humble money related improvement by some place within the extend of 50% differentiated with 2013 (FAO, 2017). The United Nations Food and Farming Organization states that the world's populace would rise by an extra 2 billion in 2050, though at that time, the expanded arrive zone for cultivating will exclusively account for 4% (Dengel, 2013). Artificial Intelligence, also known as AI, is one of the troublesome innovations that has changed forms and advancements within the field of science, innovation, and trade in later a long time (Shah et al., 2019). The improvement of AI has come about in streams of investigate (Dengel, 2013). The examination of occasions and their relationship over time, and the explore for connections between marvels that will cause common deductive or inferential rules (Dengel, 2013). In both cases, this inquiries about points to clarify past scenes and foresee future occasions (Ahir et al., 2020). Almost 37.7% of add up to arrive surface is utilized for trim generation. From work era to commitment to National Wage, agribusiness is imperative (Ahir et al., 2020). The increase of farming has come about in a noteworthy increment within the per-capita salary of the provincial community (Mogili and Deepak, 2018). Hence, putting a more prominent accentuation on rural division will be levelheaded and apposite (Mogili and Deepak, 2018). For nations, like India, the agricultural segment accounts for 18% of GDP and gives business to 50% of the country's workforce (Mogili and Deepak, 2018). Advancement within the rural segment will boost the country advancement, further leading toward rustic change and inevitably coming about within the auxiliary change (Ahir et al., 2020). Advanced Agribusiness faces colossal challenges (Ruiz-Real et al., 2020). Today, the rural division has developed into an exceedingly competitive and globalized industry, where ranchers and other characters have to consider neighborhood climatic and geographic perspectives as well as global environmental and political variables in arrange to guarantee economic survival and feasible generation (Ruiz-Real et al., 2020). Nourishing a growing world populace inquires for persistent increments in food generation, but arable arrive remains a restricted resource (Kakkad et al., 2019). New demands for bio vitality or changing count calories preferences put extra strains on agricultural generation, whereas settlement and transport expend expanding offers of land (Ahir et al., 2020). Expected and perceptible changes in worldwide climate, shifting rainfall designs, worldwide warming, dry seasons or the expanding recurrence and term of extraordinary climate occasions imperil conventional generation zones and bring modern dangers and uncertainties for worldwide gather yields (Dengel, 2013). With the appearance of innovation, there has been watched an emotional change in numerous of the businesses over the globe (Kakkad et al., 2019). Shockingly, farming, in spite of the fact that being the slightest digitized, has seen force for the improvement and commercialization of agrarian innovations (Kundalia et al., 2020). Artificial Intelligence (AI) has started to play a major part in day by day lives, amplifying our discernments and capacity to adjust the environment around us (Gandhi et al., 2020). The weight on the agribusiness division will increment with the proceeding extension of the human populace and so Agri-technology and exactness cultivating have picked up much significance in today's world (Gandhi et al., 2020). This are moreover named as advanced horticulture which suggests the utilize of hi-tech computer frameworks to calculate distinctive parameters such as weed discovery, trim forecast, abdicate discovery, trim quality and numerous more machine learning methods (Liakos et al., 2018). This paper includes the advances utilized for the mechanized water system, weeding and showering to upgrade the efficiency and decrease the work stack on the agriculturists. Different robotized soil detecting procedures are examined (Wall and King, 2004).

Research Objectives

Artificial intelligence is utilized in agriculture more and more frequently as we speak, but due to its expensive cost, many nations have not fully embraced it. Many farmers who continue to practice old-fashioned farming methods lack knowledge about how to properly install programs utilizing synthetic intelligence techniques. Numerous efforts have been made to expand the use of artificial intelligence in agricultural fields. However, the use of methods like deploying drones or robots for weeding, planting,

watering, and collecting the paddy from the fields has not yet been fully realized around the world. This essay serves as a survey of all previous studies on the application of artificial intelligence in agriculture. The main objectives of this review study are to identify the gaps between theoretical research and its practical application, as well as the biggest technological restrictions.

The most investigate questions which are to discover in this inquire about are:

1. How much efficient and accurate the reviewed papers and journal articles have been? (Based on the implementation of the application.)
2. Which one is the most common and unbearable limitation of all? (Based on the limitations of the reviewed journal articles and research papers.)

Research Contributions

The goal of this paper is to review the remaining gaps of the research papers which have done their research on this topic till now. The general farming people will be the one who will get the most out of this research. They will be able to use efficient techniques and applications in order to achieve the best result in farming business using the least amount of investment. Moreover, the way population is rising in all over the world and decreasing farming land gradually because of the accommodation for the people, the entire world would be benefited by the results of this research paper. The research objectives are to finding out the gaps and limitations because of which other proposed ideas could not be implemented of the reviewed research papers. We hope this paper would be able to provide necessary data which could be used for further development of the world's agricultural field using Artificial intelligence in various applications and techniques.

METHODOLOGY

An organized technique is used to assemble and analyze a number of research papers or publications for the SLR, which is a type of literature review. An SLR's goal is to provide a comprehensive summary of the literature that is relevant to a particular research question and is easily accessible (Cruz-Benito, 2016). Data are initially gathered from databases at this stage. A total of 556 papers are chosen as the initial collection of papers using specific keywords. The DDLP approach, forward search, and backward search were used to search the paper. Seven papers are then chosen as the final ones after the procedure of exclusion and inclusion.

Systematic Literature Review (SLR):

An activity flow is used to illustrate how the SLR process is carried out using a variety of sources and techniques. The schematic, which is displayed in the diagram below, contains every step of the process. Total of 33 papers are initially chosen from various databases. Keywords are looked for during the search process in a paper's title and abstract. When searching for keywords, the operators "and" and "or" for instance (Artificial Intelligence AND Agricultural field A Synthetic Intelligence Techniques in Agriculture AND Applications of Artificial Intelligence for Agriculture AND survey on agricultural technology in use). After receiving 11 papers from the forward search, 12 papers were deemed appropriate by DDLP, while 10 papers were discovered via the backward search. Some criteria were used to improve the papers. Six papers that were discovered not to be in English were taken off, five papers from the same version were changed and the modified document was counted as the final paper. Seven papers are irrelevant, and one papers were dropped since it is from a different region. It is realized that two papers have different study designs. Twelve papers were left over after this process, from which data were retrieved. The final papers that were chosen discuss about use of many applications and techniques of artificial intelligence in the field of agriculture.

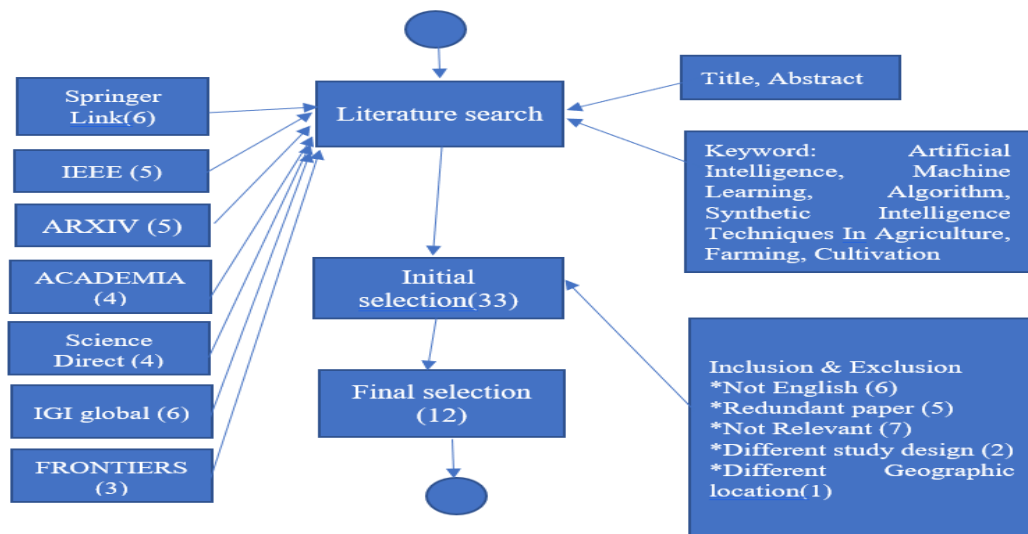


Figure: Activity flow of SLR.

RESULTS AND ANALYSIS

Research Data/Results

Table: 1: Extracted data from the final 12 papers.

Serial	Reference	Extracted Information
01	Ahir et al., 2020	<ul style="list-style-type: none"> Trim generation uses almost 37.7 percent of the total surface area that arrives. Agribusiness is crucial from a work era to devotion to the National Wage
02	Dengel, 2013	<ul style="list-style-type: none"> The United Nations Food and Agriculture Organization estimates that by 2050, there will be an additional 2 billion people on the planet, but only 4% of them will be living in the extended agricultural arrival zone.
03	FAO, 2017	<ul style="list-style-type: none"> The world's populace is expected to be about 10 billion by 2050, boosting agrarian order-in a circumstance of humble money related improvement by some place within the extend of 50% differentiated with 2013.
04	Gandhi et al., 2020	<ul style="list-style-type: none"> Lack of technical knowhow in farmers will work as barrier of adopting Artificial Intelligence in Agriculture industries.
05	Kakkad et al., 2019	<ul style="list-style-type: none"> The process of adopting technology like artificial intelligence is very tedious and time-consuming process.
06	Kundalia et al., 2020	<ul style="list-style-type: none"> By increasing technologies threat of data privacy and security is also increasing as a result, artificial intelligence is no exception.
07	Liakos et al., 2018	<ul style="list-style-type: none"> Cyber-attacks and data leaks can put farmer's data and the authentication of the AI technology they will be using in danger.
08	Mogili and Deepak, 2018	<ul style="list-style-type: none"> For countries like India, the agricultural sector contributes 18% of the country's GDP and employs 50% of the workforce.
09	Ruiz-Real et al., 2020	<ul style="list-style-type: none"> There is still work to be done in determining the boundaries

		<p>of AI use.</p> <ul style="list-style-type: none"> • Given current constraints, safety in AI is crucial, and immediate action is required. • The majority of AI detractors also raise ethical concerns about its implementation, not just in terms of how it eliminates the notion of privacy, but also from a philosophical standpoint.
10	Shah et al., 2019	<ul style="list-style-type: none"> • Given the recency of AI development, the field of philosophy of AI is still in its nascent stages.
11	Talaviya et al., 2020	<ul style="list-style-type: none"> • This inability to adapt draws attention to a serious security weakness that has not yet been adequately fixed. While "tricking" these data models occasionally can be entertaining and safe (like mistaking a toaster for a banana), in severe circumstances (like defense objectives), it could endanger lives.
12	Wall and King, 2004	<ul style="list-style-type: none"> • Even though technological development has been accelerating recently, we still have to work around some hardware constraints like restricted compute resources (for RAM and GPU cycles). Given the costs associated with creating such specialized and exact gear, existing businesses once again enjoy a major edge. • Prediction or decision models require data to be successfully trained. As many have stated, data has replaced oil as one of the most in-demand commodities today. It is now a new form of money. Large corporate entities currently control vast amounts of data.

Analysis and Discussion

Certain aspects of AI development have made it very difficult to break into this industry. Given the expense, technical, and hardware requirements, developing AI requires significant capital, which raises entry barriers. The minds behind its invention are probably primarily employed by big tech if this issue continues. In the past, technological revolutions have facilitated the entry of new actors and their innovative ideas. The businesses that make up what is today known as big tech (Amazon, Google, Facebook, Apple, and others) began in exactly this manner. The impact they have had on society is evident, even though we are only just starting to understand the implications of their immense power. It is only reasonable to assume that allowing fresh businesses and ideas to flourish from a new generation will produce favorable results. The divide between those in power and those who don't can get worse as AI develops. It might also widen the gap between those people who have AI and the unfortunate ones who don't. The future might have humans with AI vs humans without, as opposed to humans versus AI. Ironically, while it could be the most obvious effect of AI growth, I don't believe it will be the most important. The philosophical ramifications of AI, in my opinion, are the most significant. Although the thought of such technology forcing us to reevaluate the most fundamental principles of our existence is intimidating, I believe that this experience will be completely humbling. It will ideally result in shocking revelations with repercussions that go beyond specific people and businesses.

CONCLUSION

In agriculture, artificial intelligence (AI) not only helps farmers automate their operations, but it also, to a significant extent, solves the resource shortage through precise cultivation for a higher and better crop

output. AI is generating significant prospects in agriculture and related industries as modern agriculture becomes more complicated. Future technological advancements will benefit AI in agriculture by enhancing machine learning and AI-based goods and services like training data for agriculture, drones, and automated machine production. This will give this industry more beneficial applications and help the world deal with issues related to food production for the growing population.

REFERENCES

- Ahir, K., Govani, K., Gajera, R., & Shah, M. (2020). Application on virtual reality for enhanced education learning, military training and sports. *Augmented Human Research*, 5(1), 1-9.
- Dengel, A. (2013). Special Issue on Artificial Intelligence in Agriculture. *KI - Künstliche Intelligenz*, 27(4), 309-311.
- Fao, I. F. A. D., & UNICEF, W. (2017). The state of food security and nutrition in the world. *Rome, Italy: Food and Agriculture Organization of the United Nations*.
- Gandhi, M., Kamdar, J., & Shah, M. (2020). Preprocessing of non-symmetrical images for edge detection. *Augmented Human Research*, 5(1), 1-10.
- Kakkad, V., Patel, M., & Shah, M. (2019). Biometric authentication and image encryption for image security in cloud framework. *Multiscale and Multidisciplinary Modeling, Experiments and Design*, 2(4), 233-248.
- Kundalia, K., Patel, Y., & Shah, M. (2020). Multi-label movie genre detection from a movie poster using knowledge transfer learning. *Augmented Human Research*, 5(1), 1-9.
- Liakos, K. G., Busato, P., Moshou, D., Pearson, S., & Bochtis, D. (2018). Machine learning in agriculture: A review. *Sensors*, 18(8), 2674.
- Mogili, U. R., & Deepak, B. B. V. L. (2018). Review on application of drone systems in precision agriculture. *Procedia computer science*, 133, 502-509.
- Ruiz-Real, J. L., Uribe-Toril, J., Torres Arriaza, J. A., & de Pablo Valenciano, J. (2020). A Look at the past, present and future research trends of artificial intelligence in agriculture. *Agronomy*, 10(11), 1839.
- Shah, G., Shah, A., & Shah, M. (2019). Panacea of challenges in real-world application of big data analytics in healthcare sector. *Journal of Data, Information and Management*, 1(3), 107-116.
- Talaviya, T., Shah, D., Patel, N., Yagnik, H., & Shah, M. (2020). Implementation of artificial intelligence in agriculture for optimisation of irrigation and application of pesticides and herbicides. *Artificial Intelligence in Agriculture*, 4, 58-73.
- Wall, R. W., & King, B. A. (2004). Incorporating plug and play technology into measurement and control systems for irrigation management. In *2004 ASAE Annual Meeting* (p. 1). American Society of Agricultural and Biological Engineers.