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Exploring GeoAI:

A Multifaceted Approach to Health, Urban Planning, and Social Science

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ABSTRACT:

In this study we will address to the technological revolution in upcoming time for the study of geography. As so far in technological revolution this study will highlight the phase of integration of technology especially in the work with A.I (Artificial intelligence) in geography. Study will denote the changes in geography learning, after the complete integration of A.I in geography. Soon the processes of analyzation, predictions and other major objectives will directly done by A.I . The study has a descriptive nature addressing the enhancement of technology in geography and its multidisciplinary and interdisciplinary Nature. The study aims to discuss about the merits and demerits of technological enhancement in geography.

KEYWORDS :

GEO A.I , Artificial intelligence , Geospatial , Geography ,Learning geography

INTRODUCTION:

This document delves into the innovative world of Geospatial Artificial Intelligence (GeoAI), a burgeoning field that merges geographic data with artificial intelligence to address complex issues in health, urban planning, and social science. We will explore the concept, applications, and the transformative potential of GeoAI, as well as its role in various sectors and the challenges it faces.

METHODOLOGY:

The methodology of present work will include secondary data the collection of data the secondary data collected through research papers of Indonesia , Madison , India , Turkey and etc. The data is collected from several research papers of different research students and authors . The research includes collaboration of all information from research papers and made an attempt to present to information in a single research paper.

Introduction to GeoAI

One of the latest promising innovations is the use of geospatial-based artificial intelligence, or GeoAI, which combines geographic data and artificial intelligence (Kamel Boulos et al., 2019). The basic concept of GeoAI involves collecting geographic data such as maps, satellite images, and weather data, which are then analysed by AI algorithms to identify health-related patterns, relationships, and trends (Mesko, 2017). GeoAI can help in monitoring the spread of infectious diseases, predicting disease incidence, mapping health resources, and understanding health behaviour patterns based on location (Kaur et al., 2021) Data such as satellite imagery, geographic maps and environmental data are not always freely available or easily accessible, especially in developing countries (Manakane et al., 2023). Limited data availability can limit the ability to develop effective GeoAI applications in healthcare (Kamel Boulos et al., 2019).

GeoAI in Urban Planning and Natural Resource Management

In addition, GeoAI also has a significant role in urban planning and natural resource management (Manakane et al., 2023). By combining geographic data with sophisticated data analysis, GeoAI can help in planning transportation, water distribution, and land management more efficiently (Rakuasa et al., 2023). It also helps in identifying optimal locations for new infrastructure or development projects. In addition, GeoAI is also applied in socio-economic monitoring and analysis. For example, it can be used to understand population mobility, consumption patterns, and the economic impact of changes within a given region.

Geo A.I's Role in the Health Sector

One of the main roles of geographic data in health is disease mapping and epidemiology (Kamel Boulos & Le Blond, 2016). Geographic data allows researchers and health practitioners to track the spread of diseases, identify epidemic hotspots, and understand disease transmission patterns in different regions (McAllister et al., 2017). This information is invaluable in controlling outbreaks, planning vaccinations, and allocating health resources efficiently.

Historical Developments in AI and GeoAI

1 Early Speculations Major AI developments included theoretical speculations in the 1950s and 1960s (see Buchanan 2005).

2 1980s Breakthroughs Artificial neural networks (ANN), heuristic search, knowledge-based expert systems, neurocomputing, and artificial life in the 1980s.

3 1990s Innovations Genetic programming, fuzzy logics, and development of hybrid intelligent systems in the 1990s.

4 2000s Advances Ontology and web semantics for geographic information retrieval (GIR) in the 2000s.

AI in Cartography and Mapping

Recent research demonstrates great potential for implementing AI techniques, especially deep learning for cartographic design and map style transferring (see Xu and Zhao 2018; Kang, et al. 2019; Huang, et al. 2019), detection and extraction of map features, symbols, and texts (Li and Hsu 2020; Duan, et al. 2018; Duan, et al. 2020; Xie, et al. 2020; Yan, et al. 2020), and cartographic generalization (Touya, et al. 2019; Feng, et al. 2019). These directions for the use of AI in cartography are outlined as follows. First, the use of generative adversarial networks (GAN) can be extended to other mapping contexts, such as helping cartographers deconstruct the most salient stylistic elements that constitute the unique look and feel of existing designs and using this information to improve cartographic designs. Second, the topology of geographic features needs to be well retained and the map symbols and texts may require separate pattern recognition models from styling to get better outcomes. Finally, integration of AI with cartographic design may fully or partially automate the map generalization process.

Advantages and Disadvantages of Artificial Intelligence

Artificial intelligence is of two words one is Artificial and second is intelligence, artificial means manmade and intelligence means the capacity of thinking, So we can define the artificial intelligence the branch of computer science by which we can develop intelligent machines who can behave like human, think like human and make decisions as per the logic program in memory. , one among the booming technologies of computing is AI which is prepared to make a replacement revolution within the world by making intelligent machines. The Artificial Intelligence is now all around us. It is currently working with a spread of subfields, starting from general to specific, such as self-driving cars, playing chess, proving theorems, playing music, Painting, etc.

The goal of AI : -

To build the computers then they can see, hear, walk, talk, and feel. A main thrust of AI is the building of computer functions normally clustered with human intelligence, such as thinking, learning, and problem solving. That’s why John McCarthy coined the term artificial intelligence at MIT in 1956.

Geo A.I Techniques and Applications

Geo A.I is a combination of AI and Geography and it evolves as AI research develops. AI, a current buzzword, is about developing machine intelligence that mimics the way humans recognize and reason about the world. Machine learning is a subset of AI. Different from other general algorithms, machine learning algorithms have the ability to learn the mapping from input data to the output results without the need for explicitly programming the analytical rules. Deep learning is a breakthrough technique of machine learning, representing the use of multiple connected neural network

layers for pattern recognition in a more intelligent manner. According to the purposes of different tasks, data-driven GeoAI methods can be classified into clustering, classification and regression. Clustering is an exploratory data analysis strategy for grouping points (or features that can be simplified into points) based on their similarity (see chapter by Helderop and Grubesic, this book). It is basically an unsupervised learning technique. Popular clustering techniques include distance-based clustering, density-based clustering and graph-based clustering. Distance-based methods measure the similarity of points based on the 'distance' between them. This measure can be geographical when the points are georeferenced, or a similarity metric may be calculated from one or more attributes of the points. Classification and regression AI techniques have been widely leveraged for supporting classification tasks, namely the prediction of data into different categories. If these categories involve discrete class labels, the technique is called classification. When the predicted labels are in a continuous value range, it is called regression. In general, classification is a supervised learning method, which means that ground-truth labels for some sample data are needed to train the model so that it can gain the ability to capture the mapping function between the input and output for the prediction of new observations.

Technology Integration in Education

Access to technology in education institutions has been a substantial factor to enrich and change the teaching process (Çoklar, Kılıçer & Odabaşı, 2007). The relationship between teaching and technology has strengthened when the necessity of learning by doing and experience perception has developed on the basis of an effective learning environment that would address to different human senses. Hence in parallel with the higher number of senses are addressed through teaching, education becomes further effective and the learning process can take place in a quick and permanent manner (Çelik, 2007: 29). "Using" and "integrating" technology is different from one another. The use of technology in classes does not necessarily mean being integrated (Koehler & Mishra, 2005). Using technology refers to the activities that can impart information to students. These technologies consist of activities such as informative web sites, PowerPoint presentations, slide shows. In such uses, student interaction is none or negligible. On the other hand technology integration requires students' active participation. Interactive software and web sites are rich in terms of user/student's interaction and they allow the learner to understand the subject better (Matheison, 2011). International Society for Technology in Education (ISTE) has defined technological integration as "the inclusion of technology to the process as reachable as other educational tools by making technology a part of educational functions to increase learning in a significant content or in an interdisciplinary context" Technology integration is not solely concerned about using technology; it is rather a term connected with the content and effective teaching practices (Tondeur, Kershaw, Vanderlinde & Braak, 2013). Technology Integration Planning Model developed by Roblyer (2006) has defined the planning stages of integration process and has generally presented for the use of teachers the main conditions for integrating technology to teaching. Adaptation and integration approaches, resistance shown towards technology, budget inadequacy, institutional priorities, demography of the students, institutional culture, leadership issue, the process variability followed through adaptation process are viewed as the definers of the process of technology-integrated teaching (Nworie, 2011).

CONCLUSION:

The study revolves around upcoming changes which will occur by interferences of A.I in technology and how it going to affect the human occupation and its result on environment, teaching world. The study aims to review challenges for human population and its social , cultural and economic aspects. Enhancement of technology is

rapidly showing its potentials which is leading for several changes in human geography as well as for physical geography. The shows several aspects which will show several aspects which will show upcoming drastic changes in human lifestyle and environment.

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