

THE IMPORTANCE OF FORWARD-LOOKING INTEGRATION OF ARTIFICIAL
INTELLIGENCE, COMPUTER AND GEOGRAPHICAL SCIENCES IN PREVENTING
AND ADDRESSING GLOBAL NATURAL AND CLIMATIC DISASTERS

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<https://doi.org/10.5281/zenodo.15305430>

Abstract. *This article examines the synergy of artificial intelligence, computer science, and geographical sciences in addressing natural and climate disasters. The paper analyzes the capabilities of modern technologies in forecasting, preventing, and managing the impacts of global catastrophes. Examples are given from the world experience of leading states as a technological instruction and effective functioning.*

Keywords: *artificial intelligence, climate disasters, GIS, forecasting, risk management, information systems, integration.*

ВАЖНОСТЬ ПЕРСПЕКТИВНОЙ ИНТЕГРАЦИИ ИСКУССТВЕННОГО
ИНТЕЛЛЕКТА, КОМПЬЮТЕРНЫХ И ГЕОГРАФИЧЕСКИХ НАУК В
ПРЕДОТВРАЩЕНИИ И ЛИКВИДАЦИИ ГЛОБАЛЬНЫХ ПРИРОДНЫХ И
КЛИМАТИЧЕСКИХ КАТАСТРОФ

Аннотация. *В статье рассматривается синергия искусственного интеллекта, компьютерных и географических наук в борьбе с природно-климатическими катастрофами. Проанализированы возможности современных технологий в прогнозировании, предотвращении и управлении последствиями глобальных катастроф.*

Приведены примеры из мировых опытов ведущих государств в качестве технологической инструкции и эффективного функционирования.

Ключевые слова: *искусственный интеллект, климатические катастрофы, ГИС, прогнозирование, управление рисками, информационная система, интеграция.*

Introduction

Large-scale natural and climatic disasters represent one of the most urgent threats to humanity. Against the background of the increasing number of natural disasters caused by climate change, there is a growing need to find effective methods to prevent them and minimize their consequences. Traditional approaches to their prevention are becoming insufficient. The integration of the latest technologies: artificial intelligence (AI), geographic information systems (GIS) and computer science tools is of particular importance in the context of digital transformation.

The relevance of the topic is due to the need to create integrated models and systems capable of predicting disasters and responding to them promptly. In this regard, the Decree of the President of the Republic of Uzbekistan instructed the Ministry of Digital Technologies to provide technical assistance to the Climate Centre and environmental diplomacy departments to create a system for the collection and storage of cross-sectoral data until 1 November 2024.[1].

Theoretical aspects of interdisciplinary integration of sciences in the context of global challenges

Modern global challenges require an interdisciplinary approach. Natural and climatic disasters are complex phenomena in which various aspects intersect: from physical processes in the atmosphere to social vulnerability of the population. Timely resolution of emerging problems requires an integrated consideration of the situation. Integration of sciences is defined as the unification of knowledge and methods from different fields to solve complex problems [2].

The integration of AI, computer and geographical sciences allows many factors to be taken into account when modelling and forecasting such events. This approach allows us to go beyond traditional scientific analyses and build more accurate and adaptive models.

Artificial Intelligence as a tool for predicting and responding to natural disasters

AI is used to process large amounts of data on climate, earthquakes, floods and other disasters. Machine learning can identify patterns, predict events and recommend actions. An example is the DeepMind system, which has developed algorithms for more accurate precipitation prediction. [3]

In addition, AI is actively used in satellite monitoring and analysis of images and large volumes of data, including climate models and allowing rapid identification of fire hotspots, flood zones and other threats. For example, in Australia, AI systems are used to predict forest fire risk based on climate models and observation data.[4]

Another example of this type of advanced technology is Google's AI for Disaster Response, which uses deep learning algorithms to detect areas of risk early.[5]

The importance of geographical sciences in climate analysis and modelling

Geographical sciences, including geographic information systems (GIS), play a key role in spatial analysis. They make it possible to build risk maps, model the spread of disasters and identify vulnerable areas. Geography provides spatialisation of data, which is critical for the development of disaster prevention measures. An example is the Global Risk Data Platform project created by the United Nations Development Programme, which uses GIS technologies to assess disaster risk around the world [6].

GIS technologies are used for hazard mapping and disaster management. When combined with AI, they can create accurate models of the effects of natural disasters. An example is a project in India that uses GIS and AI for flood forecasting.[7].



pic-1. GIS.

Computer technologies and big data in early warning and monitoring systems

Modern computer technologies allow real-time collection and processing of data from multiple sources: satellites, weather stations, sensors. Big Data and cloud computing create the basis for building early warning systems that can instantly analyse the situation and provide recommendations for action.

For example, the Google AI for Disaster Management system uses seismic sensor data for earthquake alerts and can warn users a few seconds before the impact [8]. This can buy valuable time to save lives.

Synergetic effect of interdisciplinary approach

New solutions are born at the intersection of sciences. The combination of AI, GIS and Big Data makes it possible to create intelligent systems capable of self-learning and adaptation. Such systems can not only predict disasters, but also model the consequences of different intervention scenarios, suggesting optimal response strategies.

An example is IBM's Weather Company platform, which combines AI, climate data, and GIS to provide accurate forecasts and risk assessments for businesses and governments. [9]

In addition, the NASA SERVIR Programme is an example of international collaboration that uses GIS, satellite technology and AI to monitor natural hazards. Also important is the Firecast project, used in Latin America for fire prediction using AI. [10]

Conclusion

The integration of artificial intelligence, computer and geographical sciences opens new horizons in the prevention and mitigation of natural and climatic disasters. The synergy of these disciplines makes it possible to create intelligent systems capable of responding quickly and effectively to global challenges. The development of such an approach requires interdisciplinary co-operation, investment in research and the widespread adoption of innovative technologies.

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