Forum: Second Youth Assembly (YA2)

Issue: Transforming the Use of AI to Detect/Predict the Occurrence of Natural Disasters

Chairs: Fatimah Binte Mustafa, Mariam Abdelmaksoud, & Lamar Hussam M.Al Amoudi

Introduction

Natural disasters pose significant threats to human life, property, and the environment. As climate change escalates the frequency and intensity of such events, it becomes increasingly vital to seek innovative solutions. Artificial Intelligence (AI) presents a unique opportunity to enhance early detection and prediction methodologies, ultimately allowing communities to prepare and respond more effectively. This document outlines the importance of transforming AI use in this context and emphasizes the need for international cooperation, investment, and research improvements.

Definition of Key Terms

Artificial Intelligence (AI)

AI refers to the simulation of human intelligence in machines that are programmed to think and learn. This technology enables systems to recognize patterns, make decisions, and improve over time without human intervention.

Natural Disasters

Natural disasters are catastrophic events that occur due to natural processes of the Earth, which can cause damage to life, property, and ecosystems. Examples include hurricanes, earthquakes, floods, and wildfires.

Predictive Analytics

Predictive analytics is the process of using data to forecast future outcomes. The process uses data analysis, machine learning, artificial intelligence, and statistical models to find patterns that might predict future behavior.

Disaster Management

Disaster management tackles the human, material, economic, or environmental impacts of said disaster; it helps with the preparation for, respond to, and learn from the effects of major failures. Though often caused by nature, natural disasters can have human origins.

Disaster Resilience

Disaster resilience is the ability to prevent, withstand, and recover from the harmful impacts of natural hazards on people, places, and the natural environment. Resilience can be developed through knowledge, understanding, and practices on precautionary measures for upcoming natural disasters.

Background Information

Historically, natural disasters have resulted in substantial economic losses and humanitarian crises. The challenge lies in predicting these disasters accurately to enact timely interventions. With advancements in technology, AI has emerged as a powerful tool that can analyze vast amounts of data, thus improving forecasting accuracy. Despite its potential, the integration of AI in disaster prediction is not yet widespread, and various barriers such as funding, data availability, and technological development hinder its implementation.

Major Parties Involved

Government Agencies

They are key in policy-making, resource allocation, and implementing regulations related to disaster preparedness and response. They play a crucial role in funding AI initiatives and improving infrastructure.

Local Governments

These agencies are responsible for on-the-ground disaster preparedness and response efforts, focusing on community needs and utilizing AI tools for local risk assessments.

Research Institutions

Academic research departments are instrumental in developing AI models for disaster prediction and can offer fresh insights through innovative research methodologies.

National Laboratories

These institutions conduct high-level research with a focus on applying scientific advancements to practical challenges, including natural disaster forecasting.

Non-Governmental Organizations (NGOs)

Organizations such as Oxfam and the World Wildlife Fund (WWF) play significant roles in advocating for policy changes and implementing programs that promote community resilience against natural disasters.

Local NGOs

Grassroots organizations help engage communities and ensure that AI-driven initiatives reflect the needs and priorities of those directly affected.

Technology Companies

New companies focusing on AI innovations for disaster management can bring agility and creativity, partnering with larger firms and research bodies to accelerate advancements.

Established Tech Corporations

Companies like Google and Microsoft incorporate AI in their tools and platforms, offering cloud services and advanced analytics capabilities that can be deployed for disaster prediction.

Communities at Risk

For local Populations, residents of disaster-prone areas are critical stakeholders; their understanding of risks and needs should shape AI solutions. Engaging these communities can lead to more effective and relevant applications of technology.

Community Leaders

Leaders can facilitate communication between technical experts and local populations, advocating for tools and strategies that reflect the community's reality.

Timeline of Key Events

Date	Description of Event
December 26, 2004	The devastating Indian Ocean earthquake and tsunami led to significant advancements in global tsunami warning systems and promoted the use of technology for disaster prediction.
May 19, 2013	The first International Workshop on Disaster and Emergency Medicine is held, focusing on the integration of innovative technologies like AI and data analytics in emergency management strategies.
March 18, 2015	The Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted by UN member states during the Third UN World Conference on Disaster

	Risk Reduction held in Sendai, Japan, recognizing the importance of technology and data in disaster risk management.
July 2019	The California Institute of Technology (Caltech) developed an AI model that can predict earthquakes by analyzing seismic data with significant advancements in earthquake prediction capabilities.
August 2020	The NASA Earth Science Technology Office begins the "Deep Learning for Earth Science" initiative to apply AI in various areas, including disaster response efforts.
May 2021	The United Nations Office for Disaster Risk Reduction (UNDRR) released a report emphasizing the role of technology, including AI, in disaster risk reduction, part of the UNDRR's 2021-2030 Strategic Framework.
April 2023	The European Space Agency (ESA) launches the Copernicus Sentinel-3 satellite, enhancing capabilities to monitor natural disasters through remote sensing technology.

Previous Attempts to Resolve this Issue

Several initiatives have been undertaken to integrate advanced technologies into disaster management. Notable efforts include the following:

1. The establishment of AI forecasting models by research institutions globally, such as those developed by the University of Melbourne that predict flood risks;
2. Collaborative projects between national meteorological services and tech companies, like the partnership between The Weather Company and IBM for predictive analytics;

3. Workshops and conferences, including those hosted by the UNDDR, aimed at promoting knowledge-sharing regarding AI applications in natural disaster management.

Possible Solutions to Resolve this Issue

To enhance the effectiveness of AI in predicting natural disasters, the following solutions are proposed:

1. Investment in Research and Development

Increase funding for AI research focused on disaster prediction to develop more sophisticated models. Governments and private-sector companies should allocate resources to this critical area;

2. Data Sharing Initiatives

Create an international platform for sharing disaster-related data among governments, NGOs, and tech companies. A centralized database could help in enhancing AI training datasets and result in better predictive outcomes;

3. Capacity Building

Conduct training sessions for local authorities in disaster-prone regions on utilizing AI tools for prediction and response. Collaboration with educational institutions for curriculum development could facilitate this;

4. Public Awareness Campaigns

Educate communities on the benefits of AI use in disaster preparedness to encourage community engagement. Initiatives similar to those undertaken by NGOs like the Red Cross can play a vital role in achieving this goal.

Bibliography

Disaster Resilience Education Tasmania. (2020, February 26). *What is disaster resilience?* Disaster Resilience Education Tasmania. https://disasterresiliencetas.com.au/teachers/what-is-disaster-resilience/

European Space Agency. (2016, February 16). *ESA - Third Sentinel satellite launched for Copernicus*. European Space Agency. https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Sentinel-3/Third_Sentinel_satellite_launched_for_Copernicus

Hutchison, A. (2023, December 29). *How machine learning might improve earthquake prediction*. MIT Technology Review. https://www.technologyreview.com/2023/12/29/1084699/machine-learning-earthquake-pr

ediction-ai-artificial-intelligence/

Kao, C.-L., Chien, L.-C., Wang, M.-C., Tang, J.-S., Huang, P.-C., Chuang, C.-C., & Shih, C.-L. (2023, March 24). *The development of new remote technologies in disaster medicine education: A scoping review*. PubMed Central. https://pmc.ncbi.nlm.nih.gov/articles/PMC10080133/

NASA ESTO. (2023, January 3). *EARTH SCIENCE TECHNOLOGY OFFICE*. NASA ESTO. https://esto.nasa.gov/files/AnnualReports/ESTO_Annual_Report_2023.pdf Piché, S. (2019, September 15). *Disaster Management*. Physiopedia. https://www.physio-pedia.com/Disaster_Management

Ramsayer, K. D. (2021, April 23). *NASA Data Helps Build Resilience as Disasters Grow More Intense*. NASA. https://www.nasa.gov/centers-and-facilities/goddard/nasa-data-helps-builds-resilience-as disasters-grow-more-intense/

Sun, W., Bocchini, P., & Davison, B. D. (2024, September 3). *Applications of artificial intelligence for disaster management*. Computer Science & Engineering. https://www.cse.lehigh.edu/~brian/pubs/2020/natural_hazards/applications-of-AI-for-disaster-management.pdf

UNESCO. (2023, July 28). *New ocean observing technologies to advance vital Tsunami Warning Systems*. UNESCO. https://www.unesco.org/en/articles/new-ocean-observing-technologies-advance-vital-tsunami-warning-systems

UNISDR. (2015). *Sendai Framework for Disaster Risk Reduction 2015 - 2030*.

PreventionWeb.net.

https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf UN Office for Disaster Risk Reduction. (2022, November 19). *Global Assessment Report on Disaster Risk Reduction (GAR)*. UNDRR. https://www.undrr.org/gar

WMO Members. (2021, April 1). *White Paper on the future of weather and climate forecasting*. World Meteorological Organization WMO. https://wmo.int/news/media-centre/white-paper-future-of-weather-and-climate-forecasting-0

World Meteorological Organization. (n.d.). *World Meteorological Organization (WMO) - AI for Good*. AI for Good. https://aiforgood.itu.int/about-ai-for-good/un-ai-actions/wmo/ World Meteorological Organization. (2023, December 18). *Harnessing Emerging Technologies for Disaster Risk Reduction*. World Meteorological Organization WMO. https://wmo.int/media/magazine-article/harnessing-emerging-technologies-disaster-risk-reduction