Forum: United Nations Commission on Science and Technology for Development (UNCSTD)

Issue: Augmenting Disaster Response Efforts through the Application of AI

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Introduction

Applying AI to recover from disasters, such as floods, tornados, and earthquakes, is a complicated and multifaceted issue. This document aims to inspect the potential AI has on augmenting disaster response efforts and provide recommendations for promoting global peace and sustainable development. The application of AI to disaster response presents an evolutionary opportunity to tackle this issue, permitting real-time data analysis, increasing decision-making, and amplifying resource distribution. This helps by decreasing human workload, assisting high-risk areas, enhancing neutral communication, and boosting situational awareness. While AI does have its benefits in recovering from a disaster, it is also essential to take note of the disadvantages. It is important to note that many developing countries lack the necessary tools for AI development resulting in a digital gap. Furthermore, AI programs lack human emotion and oversight leading to inappropriate recommendations or overlooking critical information.

Definition of Key Terms

Augmenting

To enhance something.

DAHiTrA

Damage Assessment using High-Resolution Satellite Images

Background Information

Over the past few years, natural disasters along with human-made disasters have been growing rapidly posing an immediate threat to the lives of both civilians and rescuers. In response, AI has emerged as a transformative tool with the capability to enhance disaster response effectiveness. By applying AI in various methods including but not limited to real-time data analysis, increasing decision-making, and amplifying resource distribution. An article administered in 2023 by Deloltte Center for Government Insights, revealed that AI companies should tailor AI programs to characterize accurate conclusions on any given scenario while constantly absorbing new information. Nonetheless, operating AI to assist in disaster recovery comes with its drawbacks for instance AI-programs can excel in a certain task with high precision yet often lacking the ability to adapt to another.

Major Parties Involved

United States:

The US has taken AI-driven disaster response to a whole new level, as witnessed in the 2017 disaster brought about by Hurricane Harvey. DAHiTrA is one such system that uses various models of AI in making quick analysis of high-resolution satellite imagery of the damages, mere hours after the disaster. This enables emergency response teams to more precisely identify those areas that are most damaged, hence prioritizing recovery operations to which even resources are allocated. AI technologies have been applied for monitoring mobility patterns and disruptions in main infrastructure, thereby supporting the planning of evacuations and improving access to

basic services in the period following a disaster. This creates better situational awareness in real-time, hence enhancing the efficiency of recovery while allowing the community to recover faster and more resiliently from disasters.

Japan:

Japan has incorporated AI technology in its response to disasters, particularly those involving tsunamis and earthquakes. Following the 2011 Great East Japan Earthquake, the local government of Sendai City initiated the development of an AI-assisted Unmanned Aircraft System to enhance evacuation processes. Drones fitted with infrared cameras fly over affected areas, capturing real-time images that help the authorities carry out damage assessments and guide the entire evacuation process. This is accompanied by a private wireless network to ensure the reliability of communication in such circumstances. Further, AI has applications in predictive modeling for enhancing early warning systems and disaster preparedness in the Kuril and Japan Trenches. While these innovations are serving to improve Japan's resilience to disasters, such pioneering methods will doubtless set higher standards for disaster risk reduction across the world.

China

China has also utilized intelligence technology in handling disasters through its updated emergency platform introduced in 2018. Automated systems analyze real-time information, from weather sensors and satellite images to predict the impact of events, like floods and earthquakes ahead of time and issue timely alerts. This AI-powered solution assists authorities in taking action and effectively distributing resources for response and sustainable recovery efforts.`

Mexico

In the specific case of the September 19, 2017, Puebla-Mexico City earthquake, Mexico used advanced technologies such as satellite imagery and terrestrial observations to assess damage. AI can further utilize these efforts by automating the data analysis and identifying the most affected area more quickly. In **seismic engineering, AI will be able to enhance the site-response analysis and predict the building performance based on ground conditions. AI systems can also accelerate the restoration of critical infrastructures by detecting problems on time for efficient optimization. Also, AI could be used to refine the fragility models used in predicting structural damage from events and therefore assist in the prioritizing of repairs. All in all, this will enhance decision-making, hasten recovery, and consequently reduce the impact caused by future disasters.

Timeline of Key Events

Date	Description of Event
2011	After the Tohoku earthquake, Japan invested in AI to disclose damages on houses releasing in the continuous use of AI to distinguish the locations of the houses that were washed away by the following Tohoku tsunami
2013	The US invested $787 million in AI for the Hurricane Sandy recovery by restoring

	national parks and coastal marshes, wetlands, shoreline; and enhancing flood resilience. That same year the Sandy Recovery Improvement Act (SRIA) of 2013 was signed by President Obama, to improve the rescue methods carried out by the Federal Emergency Management Agency (FEMA). Key changes by the SRIA include : Disaster Relief Fund Reporting - National Strategy to Reduce Costs on Future Disasters - Community Disaster Loans - Declarations for Federally Recognized Tribal Governments Individual Assistance Declaration Factors - Debris Removal Program Alternative Procedures.
2018	Indonesia suffered a major loss to an earthquake that resulted in a tsunami quickly after, despite building the IndonesianTsunami Early Warning System (InaTEWS) in 2004 due to the fact the magnitude of the earthquake damaged the digital infrastructure

	and communication network.
2023	After years of being the most disaster-prone country, the Philippines decided to utilize AI in disaster recovery. AI-powered models could analyze weather patterns, history of disasters data in order to predict a disaster before they occur.
2023	The double earthquake that hit eastern Turkey and westerian Syria showcased how AI was able to assist in the journey of recovery for instance : the use of social media - meta permitting a safety check feature - Microsoft Turkey allowing all their technology to be freely accessible to people in disaster zones - search and rescue teams creating their own WhatsApp helpline.

Previous Attempts To Resolve This Issue

Numerous efforts are addressing this global issue however 4 main trials stood out :

1. **AI in Flood Prediction Using Satellite Data**

AI models based on machine learning use satellite data to predict floods by identifying patterns in the weather, river levels, and amount of rainfall. For instance, NASA's AI-powered Flood Prediction System works by monitoring satellite data on a real-time basis to issue warnings for authorities to plan and mitigate the effects of flooding;

2. **AI in Earthquake Early Warning Systems**

   AI helps the earthquake early warning system through seismic data processing by detecting the slightest tremors that could result in alerts, sometimes seconds before shaking begins. In Japan, AI models help out with early warning by enabling people to move into safety or cover to reduce casualties and damage;

3. **AI in Logistics and Resource Distribution**

   AI-augmented disaster response during the 2010 Haiti earthquake by helping to identify places most urgently in need of assistance. AI analyzed satellite images and real-time data for the optimization of chains of distribution for food, water, and medical supplies to get them quickly to where they were required;

4. **AI in Damage Assessment and Recovery Planning**

   AI applies satellite images to detect damage and prioritize it after the disaster. For instance, destruction mapping using AI in Puerto Rico after Hurricane Maria helped authorities rapidly distribute resources and plan reconstruction projects faster to speed up the pace of recovery.

Possible Solutions

1. **Faster data labeling**

AI humanitarian work is being made to become more human-centered, where AI helps human effort to be quicker and more efficient. One such project uses satellite imagery of roofs in India where low-income households are vulnerable to disasters to assist in disaster response. faster data labeling means the acceleration of AI model training, which also accelerates disaster management efforts. He continued to warn that only clean and unbiased data are necessary for monitoring and sustaining models that will give proper results on one hand and the other;

2. **AI-Powered Predictive Analytics for Early Warning Systems**

Predictive analytics powered by AI is among the strongest tools of disaster preparation and response. It makes predictions of events like flooding, hurricanes, and earthquakes using satellite, sensor, and weather pattern data and sends warnings so that pre-prevention may be staged, including evacuation. Real-time processing of data by AI, in turn, enhances response efforts through the use of drones and robots to assess damage for the delivery of aid in hard-to-reach areas. Thus, predictive abilities combined with quick responses make AI a valuable tool for reducing the effects of disasters and saving lives;

3. **Autonomous Drones for Damage Assessment and Search & Rescue**

Drones are an important tool in disaster response and a core help for damage assessment and search and rescue. Large areas can be covered within a short period, and real-time data is provided through these, helping in locating victims and the level of damage. They are integrated with sensors like thermal imaging, which helps in pinpointing survivors where the human body cannot reach. Whereas the role of these flying machines in

mapping and rescue is very clear, further explorations in post-disaster healthcare and victim identification will add to the important means they can make a difference. As technology continues to evolve, so will drones undoubtedly feature more and more crucially in disaster management.

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