



Artificial Intelligence and Disasters Management: Approaches and Strategies

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Abstract

Artificial intelligence (AI) is transforming crisis management by enabling rapid data processing, predictive analytics, and informed decision-making for disasters, cyber threats, and pandemics. Key applications include scenario modeling, big data analysis, relief team support, and public communication.

Keywords: Emergency, Evacuation, Hospitals, Crisis.

Dear Editor,

Today, artificial intelligence (AI) is widely recognized as one of the most important and innovative tools in disasters management. As crises become increasingly complex, ranging from natural disasters to cyber threats and global pandemics, there is a pressing need for tools that can swiftly process vast amounts of information and facilitate intelligent decision-making^{1,2}.

Applications of Artificial Intelligence in Disasters Management:

1. Scenario Modeling and Forecasting

AI employs machine learning and big data analytics to predict crises by analyzing historical and real-time data, such as weather patterns, seismic activity, and social media trends³. For instance:

- **Flood forecasting:** AI integrates rainfall data, river levels, and topography to predict flood risks accurately⁴.
- **Earthquakes:** AI identifies hazardous zones and estimates shaking intensity using geological data⁵.

- **Pandemics:** AI models track disease spread by analyzing infection patterns and demographic factors⁶. These capabilities enable simulations of disaster scenarios, vulnerability assessments, and refined response strategies.
- 2. **Big Data Processing and Analysis:** During disasters, data surges from sources like sensors, social media, and satellite imagery overwhelm human processing capacity. AI bridges this gap through:
 - **Natural language processing (NLP):** Extracts critical information from texts (e.g., SOS locations, urgent needs, infrastructure damage)⁷.
 - **Image analysis:** Evaluates satellite/aerial imagery to identify affected areas and prioritize relief⁸.
 - **Graph analysis:** Maps relationships between entities to optimize resource flows. AI synthesizes these inputs into real-time dashboards, aiding decision-makers in

allocating resources efficiently—e.g., prioritizing aid based on social media trends ⁷.

3. Supporting Relief Teams

AI enhances field operations via:

- **Drones/UAVs:** Survey damage, assess hazards, and locate survivors.
- **Route optimization:** AI calculates safe, efficient paths for responders amid blocked roads.
- **Rescue robots:** Operate in hazardous environments to locate victims.
- **Resource allocation:** AI matches medical teams and supplies with high-need areas ^{8,9}.

4. Public Awareness and Communication

AI mitigates misinformation and streamlines outreach through:

- **Chatbots:** Provide 24/7 updates on shelters, safety, and emergency contacts.
- **Rumor detection:** Flags false claims on social media, reducing panic.
- **Personalized alerts:** Tailors warnings by location and need.
- **Education tools:** Interactive platforms train civilians in crisis response ¹⁰.

In conclusion, the application of AI in disasters management not only enhances the effectiveness and efficiency of processes at all stages, from prevention to recovery, but can also lead to life-saving outcomes, reduced casualties and injuries, and minimized financial losses. This technology has the potential to become an integral part of disasters management systems in the near future, making investment in its research, development, and implementation essential for improving societal preparedness and resilience against future crises. However, alongside these benefits, challenges remain, including the need for high-quality and reliable data, concerns related to privacy and data security, and the necessity for training and upgrading staff skills. Overcoming these challenges will require cross-sectoral collaboration among government, industry, academia, and non-governmental organizations.

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Conflict of Interest Disclosures

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Authors' Contributions

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Declaration of Generative AI and AI-assisted technologies

None.

References

1. Andrae S. Artificial Intelligence in Disaster Management: Sustainable Response and Recovery. In *Cases on AI-Driven Solutions to Environmental Challenges 2025* (pp. 73-114). IGI Global Scientific Publishing.
2. Farrokhi A, Shirazi F, Hajli N, Tajvidi M. Using artificial intelligence to detect disaster related to events: Decision making in B2B by artificial intelligence. *Industrial marketing management*. 2020 Nov 1;91:257-73.
3. Sun W, Bocchini P, Davison BD. Applications of artificial intelligence for disaster management. *Natural Hazards*. 2020 Sep;103(3):2631-89.
4. Ali MH, Asmai SA, Abidin ZZ, Abas ZA, Emran NA. Flood prediction using deep learning models. *Int J Adv Comput Sci Appl*. 2022;13(9):972-81.
5. Zhao AP, Li S, Cao Z, Hu PJ, Wang J, Xiang Y, Xie D, Lu X. AI for science: predicting infectious diseases. *Journal of safety science and resilience*. 2024 Mar 15.
6. Khoshmohabat H, Bizari D, Mehrvarz S, Soleymanitabar A. Application and Capabilities of Artificial Intelligence in the Management of Traumatic Patients. *Journal of Military Medicine*. 2023 Mar 21;25(1):1675-80.
7. Cheng Y, Lee J, Qiao J. Disaster communication in the age of AI: Navigating opportunities, challenges, and future horizons. *Media and disaster communication*. 2024:172-94.
8. Swaminathan A, Lypez I, Mar RA, Heist T, McClintock T, Caoili K, Grace M, Rubashkin M, Boggs MN, Chen JH, Gevaert O. Natural language processing system for rapid detection and intervention of mental health disaster chat messages. *NPJ Digital Medicine*. 2023 Nov 21;6(1):213.
9. Farsath KR, Jitha K, Marwan VM, Jouhar AM, Farseen KM, Musrifia KA. AI-Enhanced Unmanned Aerial Vehicles for Search and Rescue Operations. In *2024 5th International Conference on Innovative Trends in Information Technology (ICITIT) 2024* Mar 15 (pp. 1-10). IEEE.
10. Branda F, Stella M, Ceccarelli C, Cabitza F, Ceccarelli G, Maruotti A, Ciccozzi M, Scarpa F. The Role of AI-Based Chatbots in Public Health Emergencies: A Narrative Review. *Future Internet*. 2025 Mar 26;17(4):145.