

Artificial Intelligence in Conflict Early Warning Systems: Prospects and Challenges for Peacebuilding in Africa

Akinwale Victor, Ishola ¹; Anya Adebayo, Anya ²; Kelechi Adura, Anya ³;
Eke Kehinde Anya ⁴

¹Department of Peace, Security and Humanitarian Studies, University of Ibadan

²Department of Political Science, Obafemi Awolowo University Ile-Ife

³Computer science, Landmark University Omu-Aran Nigeria

⁴Scottish Power Headquarters, Glasgow

Abstract: The growing sophistication of violent conflicts in Africa has increased the search of predictive mechanisms to optimizing prevention and peacebuilding. Thus, this paper examined how Artificial Intelligence (AI) can be integrated in Conflict Early Warning Systems (CEWS), assessing its opportunities and constraints to peacebuilding in Africa. Based on the existing literature on the early warning systems, AI-based analytics and peace and security governance, the paper frames AI as a socio-technical and non-neutral instrument built into the institutional and political systems. It examines the effectiveness of machine learning, natural language processing, predictive modelling and digital mediation technologies in predicting conflict, providing real-time analysis and strategies to deal with conflict proactively. The study analyses that AI-based early warning systems present substantial possibilities in enhancing predictive capabilities, empowering situational awareness, and reinforcing regional and sub-regional peace structures which help make more informed and timely decisions. The study concludes that while AI-powered solutions have a potential to facilitate mediation procedures and enhance ceasefire surveillance with the usage of real-time digital devices, there are also major structural and governance limitations which includes data quality and lack of data, inconsistency in verification, resource, modelling, and the persistent warning-response gap that restrict the performance of AI in conflict prevention. The study therefore recommends that AI should be adopted responsibly, with good governance practices, and strong alignment to local knowledge and institutional realities in Africa.

Wordcount:227

Keywords: Artificial Intelligence, Conflict Early Warning & Peacebuilding

Introduction

Prevention of conflicts and early warning have gradually become key principles of modern peacebuilding practice. The significance of such anticipatory violence has been clearly understood in a world of prolonged wars, multidimensional security risks, and weak political transitions, which is more efficient and less expensive than handling the consequences of the violence after it exists. Early warning mechanisms are thus important mechanisms of informing preventive diplomacy, responding in time, and facilitating sustainable peacebuilding activities in societies prone to conflicts. In this regard, artificial intelligence (AI) has become a leading tool in larger discussions on anticipatory governance and security decision-making. The development of machine learning, predictive analytics, and natural language processing has increased the ability to identify large and diversified data sets in real-time, predict much earlier signs of conflict and escalation trends. It is claimed by proponents that AI-based systems have the potential to improve the speed, accuracy, and scale of conflict early warning, which reinforces the preventive aspect of peacebuilding. Nevertheless, there are other issues with governance, accountability, and the political implications of algorithmic decision-making in security-related environments that these technologies provoke.

The conflict situation in Africa highlights the urgency and the complexity of such developments. The continent is still undergoing diverse types of violent conflicts such as insurgencies, communal conflicts, election related conflicts, and resource conflicts. Even though national, regional and continental early warning systems are in place, there are still major gaps in the timeliness of data gathering, predictive, and transferring warning to response. The deployment of advanced early warning tools is also complicated by structural constraints like the poor institutional capacity, as well as unequal access to data, and the use of external-developed technologies. It is on this background that this position paper explores the implementation of artificial intelligence into conflict early warning systems with regards to the opportunities and challenges of peacebuilding in Africa. It goes further to argue that although AI does present substantial opportunities to improve conflict prevention, it is not an apolitical or strictly technical solution. Thus, the validity and usefulness of AI in conflict situations is dependent on a number of factors which include but not limited to, a context-sensitive design, ethical governance, and adherence to the peacebuilding priorities in the particular area.

Conceptual and Analytical Framework

Conflict Early Warning Systems (CEWS)

Conflict Early Warning Systems (CEWS). Conflict Early Warning Systems (CEWS) are technological and institutional systems that are created to detect and address the dangers of political violence and armed conflict. These systems have changed significantly over the

past decades adding more advanced data collection methods and analytical methods that enhance their predictive ability. By design CEWS are created to track and analyze various conflict indicators to predict possible escalations and intervene promptly (Ishola et al., 2025). They are not limited to detection and their purpose is also to assist structured conflict management processes by using informed decisions. The literature also conceptualises CEWS as processes of gathering data in a systematic manner, analysis, and production of time-bounded actions in response to the emerging threats of violent conflict. In this aspect, their efficiency lies not only in the accuracy of analysis but also in their applicability to the local actors and their ability to improve practical preventive and response measures to conflicts (Aeby, 2024). This focus highlights the functional aspect of early warning, the connection between information collection and action that is sensitive to the context. CEWS are on the other hand defined as the mechanisms which are used in giving timely warnings intended to anticipate and avoid violent conflict before it escalates (Wondemagegnehu, 2009). The preventive reasoning behind the systems is thus core since early warning is meant to curb the human and material costs of a delayed response. More precisely, in the context of state-based armed conflict, CEWS are also intended to forecast this risk by incorporating a variety of different data sources (Pepper, 2014). Collectively, the literature introduces CEWS as institutionally entrenched but data-driven systems that unite monitoring, analysis, and response towards the goal of efficient conflict prevention. Their development is a wider move towards an anticipatory approach in the management of peace and security.

Artificial intelligence and its relevance to conflict prediction and analysis

The role of artificial intelligence (AI) in conflict prediction and analysis has been highlighted as an important topic to consider especially due to its role in enhancing the early warning systems and enhancing the development of data-driven decision-making. AI supplements the ability of conflict management systems to promote proactive approaches to deal with the emergence of threats. Using artificial intelligence, machine learning, and natural language processing technologies, AI systems can process large volumes of data and define the possible patterns of conflict escalation and the main participants in them. This integration does not only help predictive evaluations of conflict dynamics, but also helps in making more structured and transparent decisions. The AI systems are based on the big data analytics that help detect the first signs of the conflict and therefore allow the decision-makers to take the pre-emptive measures and mitigate the risk of the conflict development (Ullah et al., 2025). Moreover, the methods of sentiment analysis and natural language processing can be used to analyse the opinions of the population and social processes, which are essential factors in predicting the possibility of instability (Joshi,

2025). These analytical tools can be used to gain a deeper comprehension of the changing tensions in the society that may culminate in violent conflict.

AI has also shown applicability in dispute resolution processes other than prediction. Negotiation systems which are mediated with AI use game theory, as well as reinforcement learning to enhance the outcomes of dispute resolution, and the resolution rates of such systems are higher than that of conventional methods (Joshi, 2025). Additionally, digital mediation devices such as satellite imagery to track ceasefire deals offer real-time information on conflict settings and aid in the continual efforts in conflict management (Selamet et al., 2025). The literature also demonstrates the growing role of AI in predicting a conflict and mechanisms to manage it, which confirms its significance in the context of modern peace and security.

Positioning AI as a socio-technical, non-neutral tool in peace and security governance

In policy and technical contexts, artificial intelligence is frequently discussed as a goal and efficiency-enhancing tool that can help to make better decisions in the complicated security setting. Nevertheless, in the context of peace and security governance, AI cannot be conceptualized as a technology that is neutral and value-free. Instead, it is best understood as a socio-technical system - one that is influenced by human decisions, institutional agendas, political concerns, and the social situations under which it is implemented and created. This is a critical view when evaluating the role of AI in early warning of conflicts and peacebuilding.

AI systems are a socio-technical tool, which means they are a product of the assumptions that they are made with, the data upon which they are trained, and the goals that they are designed to optimise. These decisions define the kind of indicators of violence that become prioritised, the populations that become visible or invisible, the interpretation and communication of risk to decision-makers in conflict early warning situations. The constraints of data, past bias, and disparate digital representation, especially agglomerated in most African situations, can thus determine AI outputs in a way that recreates the original imbalance of power or marginalises local perceptions of insecurity. Also, AI implementation with regard to peace and security governance has political consequences that are not limited to technical performance. Conflict risk algorithms have the potential to affect the allocation of resources, policy focus, and intervention direction, in effect determining the kind of security issues that are prioritised and those that are marginalised. In cases where these systems are designed or manipulated by external forces, they can help to increase dependency and reduce local ownership of peacebuilding. This poses important concerns of accountability, transparency and sovereignty in the management of the AI-based early warning systems.

The acknowledgement of AI as a non-neutral tool also represents the significance of human judgment and institutional responsibility during peacebuilding. The AI-generated insights are not political decision making; they mediate it. In the absence of strong governance structures, moral protections, and context awareness, the use of algorithmic forecasting will lead to the de-politicisation of fundamentally political struggles or the justification of technocratic reactions to the violence they do not take into account the structural contexts underpinning it. The fact that AI is a socio-technical and non-neutral tool thus offers an essential analytical basis behind this paper. It allows considering both the opportunities and obstacles of AI-based conflict early warning in Africa more critically, as well as strengthening the thesis that to build the responsible peace, it is necessary not only to be technologically innovative, but also inclusive in governance, context-sensitive, and normative.

Artificial Intelligence in Conflict Early Warning Systems

Early warning systems (EWS) have gradually been supplemented with artificial intelligence technology and further augmented with machine learning, natural language processing (NLP), and predictive analytics to improve their analytical and predictive capabilities. The technologies facilitate processing of huge and intricate datasets to create timely notifications to enhance preparedness, city resilience, and safety of citizens in crisis situations. In conflict and disaster-related settings, AI-driven systems increase the size and rate of early detecting systems. Machine learning applications are the key to this change. The past and the future are analysed and projected using modelling methods like support vector machines and neural networks, thereby improving the accuracy of the early warning systems (Yadav, 2025). In addition, machine learning facilitates real-time data processing since it interprets the data reported by the Internet of Things (IoT) sensors and satellite images to contribute to the evaluation of the situation within a short time frame and early alerts in case of crisis (Subrahmanyam, 2025). These capabilities are useful in increasing responsiveness and minimizing delays in the detection of emerging threats.

The natural language processing also enhances early warning system by enabling unstructured data sources to be analyzed. NLP methods are applicable to detect new threats and evaluate the general mood of the people through information mining of social media feeds, news articles, and other online data to offer important information on crisis response plans (Tundis et al., 2025). In addition to the analysis, NLP can also be applied to generate specific and context-based alerts to the audience and enhance the effectiveness of communication in the case of an emergency (Lamsal and Kumar, 2020). The latter is complemented by predictive analytics which combines various sources of data in order to perform risk assessment and predict the possible consequences of the crisis. Predictive analytics can help to mitigate and proactively plan by evaluating vulnerabilities and

preparing probable scenarios (Nagawa, 2025). Even more advanced analytical models can be used to simulate scenarios to ensure that the stakeholders are ready to react efficiently to different possible crisis scenarios (Subrahmanyam, 2025). The above literature reveals that AI can be used to strengthen early warning systems with more predictive modelling, real-time data processing, structured analysis of unstructured information and forward-looking simulation of scenarios. These technological abilities strengthen the strategic impact of AI in the modern conflict and crisis management systems.

Prospects of AI-Driven Early Warning for Peacebuilding in Africa

The introduction of the artificial intelligence into the conflict early warning systems has a high potential of enhancing the peacebuilding in Africa, especially where violence is rapidly developing and the capacities of the institutions to respond are frequently limited. When properly managed and developed, AI-based systems have the potential to increase the anticipatory aspect of peacebuilding through enhancing the quality, timeliness, and strategic relevance of early warning data. Among the most often mentioned benefits of the application of AI-enabled early warning, the possibility of enhancing the predictive quality and real-time examination of the process in the conflict can be named. Using machine learning and predictive analytics, AI systems are able to analyze large and heterogeneous data, such as event data, social media activity, and satellite imagery and open-source intelligence, at a scale and speed that is impossible to humans. This enables the earlier identification of trends related to a conflict escalation including a change in rhetoric, trends in mobilisation or spatial clusters of violent events. Such predictive capacity can be used in African contexts, where fluid and localised forms of violence are prevalent, to promote earlier and more specific preventive measures.

The early warning systems based on AI also lead to the improvement in situational awareness of policymakers, peace practitioners, and security institutions. These systems have the potential to offer more detailed and dynamic evaluations of changing risks by combining data across various sources, minimising the use of disaggregated or slow reporting. Better situational awareness boosts preventive diplomacy by empowering regional bodies, governments and international allies to work in advance with vulnerable populations, to mobilize mediation operation or redefine policy responses before violence simplifies. On the institutional level, AI gives the prospects to strengthen regional and sub-regional peace and security structures. Early warning systems were long ago included in the African Union and sub-regional organisations, but they are predominately susceptible to the problem of data integration, analytical capabilities and timely response. These systems can be enhanced through AI-based tools that provide more evidence-based and coordinated decision-making through better data management, trend analysis, and strategic forecasting, at the different levels of governance.

Notably, AI-based early warning also has the potential of more localised and community-informed peacebuilding. Going hand in hand with participative data gathering and the local knowledge, AI systems can be used to reveal early signs of violence that could be missed by state-centered or externally motivated surveillance systems. The AI models have the capacity to consider community-based reports, local media analysis, and culture-based tension indicators in order to produce contextual information. This presents an alternative of increasing local ownership, instilling trust in early warning technologies and aligning technological innovation to grassroots peacebuilding. These opportunities indicate that AI will have a positive impact on the process of conflict prevention and peacebuilding in Africa. Yet, the achievement of these advantages is conditional upon intentional attempts to match technological potentiality with institutional capacities, ethical governance, and local environment-factors which is of essential relevance in evaluating the potential of AI-based early warning systems as well as its constraints.

Challenges and Limitations

The adoption of Artificial Intelligence (AI) into early warning system (EWS) environments to prevent conflicts poses a major challenge limiting its overall potential to be effective. Although AI has significant potential to improve the predictive accuracy and speed of response, there still exist structural, technological, and political constraints to the successful implementation of AI in conflict prevention systems. One of the weaknesses is associated with the quality of data and its availability. The key to successful AI-based early warning is high-quality and complete and verifiable datasets. Yet, the overwhelming majority of the EWS deal with incomplete data that can be characterized by the existence of missing data points, reporting discrepancies, and data integrity issues (Muggah and Whitlock, 2022; Palihapitiya et al., 2024). Moreover, the low quality of the verification and analysis may lead to wrong results and, thus, affect the validity and usefulness of information generated by AI (Palihapitiya et al., 2024). The unavailability of these data directly affects the predictive validity of AI systems in conflict settings.

Implementation of AI in early warning is also more complex because of political and institutional processes. One of the most persistent problems is the warning-response gap, where indicators of a potential conflict are not converted into an effective and timely response due to a lack of political will of stakeholders interested in the issue (Muggah and Whitlock, 2022; Ishola et al., 2025). When the AI systems are able to produce plausible risk scores, the lack of dedication to preventive actions makes it much less practical. In addition to the above, a lack of collaboration and coordination among actors who are to monitor EWS may lead to disjointed implementation and ineffectiveness of the systems (Ishola et al., 2025). The performance of AI-enabled early warning systems is also limited by technological constraints. The interrelation between conflict factors, including both

endogenous and interdependent nature of political violence, typically provides modeling issues that AI systems might fail to capture sufficiently (Muggah and Whitlock, 2022). Predictive models can also simplify complex socio-political processes thus restricting analysis accuracy. Moreover, the other limitation to the adoption and long-term usage of advanced AI technologies is resource constraints, especially in the context of lower capacity institutions (Palihapitiya et al., 2024). The scarcity of financial, technical and human resources inhibits the capacity of organisations to implement, sustain and perfect AI-based systems. In general, the literature suggests that although AI has significant opportunities in early warning of conflicts, its use is limited by data constraints, political stagnation, institutions fragmentation, modeling, and resource shortages. All of these factors influence the range of possibilities of AI to contribute to the process of conflict prevention.

Policy, Governance, and Normative Pathways for Responsible AI-Enabled Conflict Early Warning in Africa

The increasing incorporation of artificial intelligence into the conflict early warning systems has extensive implications on the peacebuilding practice and security governance in Africa. Although AI has technical efficiencies, its substantial role in preventing conflicts should rely on its responsible integration into the current institutional frameworks, decision-making procedures, and normative obligations to peace, accountability and inclusion. One of the key implications to the peacebuilding practice is that there is a necessity to responsibly incorporate AI tools in the African peace and security institutions. AI early warning systems are not to substitute but supplement the existing procedures and human skills. Successful integration involves matching AI outputs with institutional requirements, operational facts, and response capabilities to prevent the generation of warnings that are impossible to implement. In the absence of these alignments, the technological sophistication will become a threat towards further widening the old gap between the early warning-early response.

It is also critical to find a balance between technological innovation and human judgment and local knowledge. The nature of conflict is highly contextual and based on historical grievances, political interests, and relations that cannot be described solely by a set of data-driven models. Human analysts, peace practitioners, and community actors thus continue to be essential in the process of interpolating AI-generated information, verifying risk analysis and deciding what to do about it. The integration of the local knowledge into AI-based early warning systems improves the legitimacy, contextual accuracy and trust among the vulnerable communities. Governance, accountability, and transparency are also required in the expansion of AI application in peace and security governance. There must be clear standards used to direct data collection, design of models, decision making

authority and oversight mechanisms. In the absence of a strong governance system, AI-based systems can become amplifiers of bias, facilitators of surveillance or blame shifting the responsibility of policy-making based on the output of algorithms. Ethical integrity and public trust thus demand transparent processes and accountability structures.

The activities of the regional organisations and the international partners in defining these lines of governance are very crucial. Bodies such as the African Union and sub-regional organisations should be allowed to provide normative guidance and coordinate and standardise AI use in early warning. At the same time, any global collaborators should be concerned with equitable cooperation to enhance African ownership, capacity building and co-development of AI-based tools, rather than develop technological dependencies or outsourced security concerns. Normatively, the paper seeks to drive forward the argument that AI utilization in conflict early warning should be informed by the principles of responsibility, inclusivity, and contextual sensitivity. AI is meant to be a supportive tool of peacebuilding- not a replacement of political discretion, political dialogue, or locally based conflict prevention tools. The policies of the African states and regional entities must thus focus on the aspects of ethics, institutional capacity building and the pathways of sustainable adoption that should be inclusive of the varied conflict landscapes and peacebuilding priorities of Africa. AI-based early warning of conflict can be of value in preventing peacebuilding by anticipating and addressing it early, ensuring good governance, human agency, and fair partnerships. The absence of this is, however, liable to reinforcing the existing inequalities and jeopardize the very peace it is designed to defend.

Conclusion

This move towards more artificial intelligence use in conflict early warning systems reflects a broader shift to anticipatory policy in the governance of peace and security. As evidenced in this paper, AI also has a very great potential to further improve the process of conflict prevention and peacebuilding in Africa, with the expanded predictive capabilities, real-time analysis, and enhanced situational awareness taking the central stage. Coupled with regional and local peace architectures, AI-based early warning technologies can aid more responsive and preemptive actions against new threats of violence. Nevertheless, the paper has also shown that artificial intelligence is not a neutral or merely technical tool. Its use in conflict early warning is determined by the availability of data, design preferences, institutional settings, and power dynamics, which all affect the prioritisation of whose insecurities should be addressed, and preventive action should be taken. The uncritical use of AI in Africa, with its diversity of conflict dynamics and structural constraints, stands the risk of recreating the existing inequalities, becoming dependent on outside forces, and creating a space between early warning and effective response. The central argument in this paper is that AI is to be conceptualized and regulated as a socio-technical instrument

that can complement, but not replace human judgment, political decision-making, and local knowledge. Responsible integration needs good governance structures, ethical values and sustainable investment in institutional and human potential. It also requires fair relationships with locally owned and contextually guided partnerships to long-term sustainability and not the short-term technological solutions. Finally, the importance of artificial intelligence in conflict early warning does not lie in predictive complexity in isolation, but the manner in which it is integrated with the inclusive, responsible, and context-sensitive approaches to peacebuilding. Having approached AI as a tool to complement, rather than amend the normative grounds, of conflict prevention, African states, regional organisations and partners have the potential to harness it, without undermining the values of the principles of sustainable peace.

References:

1. Aeby, M. (2024). High expectations: Civil society participation in conflict early warning and response systems of the AU, ECOWAS and IGAD. *South African Journal of International Affairs*, 1–24.
2. Ishola, A. V., Anya, A. A., Anya, K. A., & Anya, E. K. (2025). Beyond Forecasting: Reimagining Early Warning Systems amid the Sahel Crisis for Sustainable Africa-EU Peacebuilding. *African Journal of Humanities and Contemporary Education Research*, 20(1), 134–146.
3. Joshi, S. (2025). *Artificial Intelligence in Conflict Resolution: A Comprehensive Review of Techniques and Applications*.
4. Lamsal, R., & Kumar, T. V. V. (2020). *Artificial Intelligence and Early Warning Systems* (pp. 13–32). Palgrave Macmillan, Singapore.
5. Muggah, R., & Whitlock, M. A. (2022). Reflections on the Evolution of Conflict Early Warning. *Stability: International Journal of Security and Development*, 10(1).
6. Nagawa, J. I. (2025). Artificial Intelligence in Predictive Healthcare Analytics. *International Academic Association Journal of Biological Sciences*, 13(1), 67–74.
7. Palihapitiya, M., Khan, S., Ahmed, F., Shenouda, B., & Nelson, E. L. (2024). Addressing Critical Gaps in Data Collection and Analysis in Atrocities Prevention Early Warning Systems. *Journal of Peacebuilding and Development*.
8. Pepper, A. (2014). Gender Analysis as a Predictor in Conflict Early Warning Systems: Theories from the Ivory Tower. *Kaleidoscope History*, 5(9), 158–168.
9. Selamet, M. S., Prakoso, L. Y., & Risahdi, M. (2025). Artificial Intelligence for Peace and Conflict Resolution. *Indonesian Journal of Interdisciplinary Research in Science and Technology*, 3(8), 847–858.

10. Subrahmanyam, S. (2025). The Role of AI in Crisis Management and Disaster Response. *Advances in Electronic Government, Digital Divide, and Regional Development Book Series*, 227–260.
11. Tundis, A., Hummel, M., Gunkel, J., & Savaglio, C. (2025). AI-Based Concepts for Crisis Propagation Forecasting and Early Warning in Urban Areas. 805–811.
12. Ullah, M. U., Saleem, S., & Munir, A. (2025). Artificial Intelligence in Conflict Prediction and Prevention: Opportunities and Risks for International Peace and Security. *Global Social Sciences Review*, 10(I), 192–200.
13. Wondemagegnehu, D. Y. (2009). An exploratory study of harmonization of conflict early warning in Africa.
14. Yadav, H. (2025). Early Natural Disaster Prediction Using Machine Learning: A Comprehensive Review. *Indian Scientific Journal Of Research In Engineering And Management*, 09(04), 1–9.