

Explainable AI for Intelligence Analysis

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Abstract:- Explainable artificial intelligence (XAI) is becoming increasingly crucial in intelligence analysis as it addresses key ethical, legal, and security concerns such as transparency, accountability, and trust. This paper presents a systematic review of the literature on XAI in intelligence analysis and sheds light on the challenges and limitations of AI in this field. It also details the current state of XAI and various techniques used to make AI systems more explainable. The study evaluates existing research on XAI for intelligence analysis, identifies areas for future research, and discusses the implications of the results. Notably, the systematic review of academic and professional literature was conducted using several databases such as Google Scholar, IEEE Xplore, ACM Digital Library, and Scopus. It was limited to articles published between 2019-2023. The results emphasize the significance of a multidisciplinary approach to the development and application of XAI in intelligence analysis.

Keywords:- Explainable artificial intelligence (XAI), intelligence analysis, transparency, accountability, trust, techniques, challenges, limitations, multidisciplinary approach.

I. INTRODUCTION

The use of artificial intelligence (AI) has skyrocketed in recent times and has revolutionized numerous fields, including intelligence analysis [1][2][3]. However, with the increased usage, concerns have been raised about transparency, accountability, and trust in decision-making [4][5] [6]. At this point, explainable artificial intelligence (XAI) is integrated. XAI provides a means to make AI decisions transparent and justifiable to stakeholders [7]. In intelligence analysis, decision-making is often based on large amounts of data and complex algorithms.

In such cases, it is crucial that the reasoning behind the AI's decisions is clear and trustworthy [7][8]. XAI ensures that ethical and legal standards are met, and public trust in the technology is maintained [9]. Researchers and practitioners have acknowledged the importance of XAI in intelligence analysis, leading to multiple studies and initiatives aimed at developing XAI systems [9]. But, there remains a need to review the current state of XAI in this field and evaluate existing research.

In this paper, the researcher aims to examine XAI in intelligence analysis by systematically reviewing the recent and academic literature. The findings from the literature will discuss the challenges and limitations of using AI in this field, the current state of XAI, and the techniques used to make AI systems more explainable. Besides, the findings will include a summary of existing research, identifying areas for future research, and discussing the implications of findings for the field. More importantly, the systematic literature review for this paper is based on articles published between

2019-2023 and was conducted using databases like Google Scholar, IEEE Xplore, ACM Digital Library, and Scopus.

II. PROPOSED METHODOLOGY

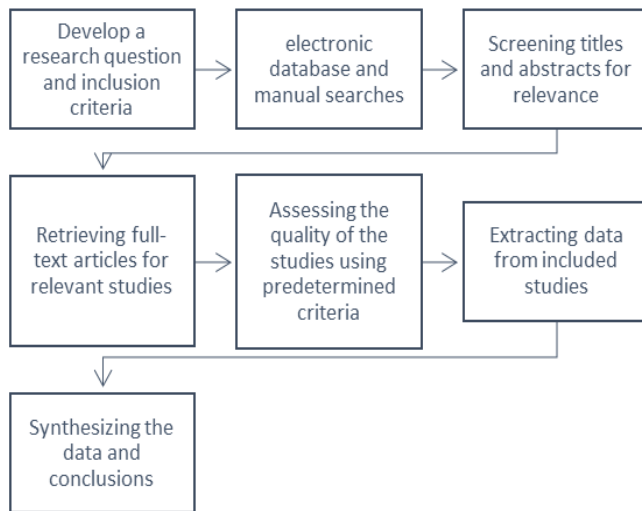
The methodology used in this paper is a systematic review of the literature. This approach provides a comprehensive and systematic assessment of the existing research on a specific topic [10]. A systematic review of the literature was conducted to assess the current state of XAI in intelligence analysis. The search was performed using several databases, including Google Scholar, IEEE Xplore, ACM Digital Library, and Scopus, with the keywords "Explainable Artificial Intelligence," "XAI," "Intelligence Analysis," and "Transparency." The search was limited to articles published between 2019 and 2023, and the inclusion criteria were articles that addressed the use of XAI in intelligence analysis. A total of 18 articles were used for the analysis. The articles were reviewed to identify the challenges and limitations of using AI in intelligence analysis, the current state of XAI in the field, the techniques and approaches used to make AI systems explainable, and the existing research on XAI in intelligence analysis. The articles were also evaluated to identify opportunities for future research and the implications of the findings for the field of XAI in intelligence analysis. By reviewing the existing research, the researcher identified the field's current state, the challenges and limitations of using AI, and the opportunities for future research. This approach also allowed the researcher to synthesize and evaluate the existing research, providing valuable insights for XAI in intelligence analysis.

A. ALGORITHM /FLOWCHART

- i. Develop a straightforward research question and inclusion criteria: "What is the current state of Explainable artificial intelligence (XAI) in Intelligence Analysis?" and include articles published between 2019 and 2023 that address the use of XAI in intelligence analysis.
- ii. Conduct electronic database searches using keywords.
- iii. Screen titles and abstracts for relevance and retrieve full-text articles for studies that meet the inclusion criteria.
- iv. Assess the quality of the studies using predetermined criteria, such as the methodology used, the sample size, the results and conclusions, and the study's limitations.
- v. Extract relevant data from included studies, such as the challenges and limitations of using AI in intelligence analysis, the current state of XAI in the field, the techniques and approaches used to make AI systems

- explainable, and the existing research on XAI in intelligence analysis.
- vi. Synthesize the data and make viable conclusions, such as identifying opportunities for future research and the implications of the findings for the field of XAI in intelligence analysis.
 - vii. Evaluate the results of the systematic review to determine the current state of XAI in intelligence analysis and identify gaps and opportunities for future research.

B. BLOCK DIAGRAM OF THE FLOWCHART



III. RESULT ANALYSIS

The systematic review of the literature on XAI in intelligence analysis identified 18 articles that met the inclusion criteria. The results of the studies showed that AI systems are increasingly being used in intelligence analysis, but their use has significant challenges and limitations [1][4][5][7]. For example, AI systems lack transparency, making it difficult for human analysts to understand how the systems arrived at their conclusions [4][5][8][11][12][13]. This lack of transparency can lead to errors and biases, which can seriously affect intelligence analysis [12][13].

To address these challenges and limitations, XAI techniques and approaches have been developed to make AI systems more transparent and explainable [14][15]. These techniques include feature visualization, model-based explanations, and rule-based explanations, among others [16]. The studies employed for the analysis showed that these XAI techniques effectively improve the transparency and explainability of AI systems, making it easier for human analysts to understand how the systems arrived at their conclusions [16][17].

The studies also showed that XAI in intelligence analysis is still in its early stages, and there is a significant opportunity for future research [18]. For example, there is a need for more research on the effectiveness of XAI techniques in real-world intelligence analysis applications and the development of new XAI techniques that can handle the complexity of real-world intelligence analysis problems [18]. Overall, the systematic

literature review depicted that AI systems are increasingly used in intelligence analysis, but their use has significant challenges and limitations. As such, different XAI techniques and approaches have been developed to address these challenges and limitations, but there is still a significant opportunity for future research in this field. Consequently, the results of this systematic review provide valuable insights into the current state of XAI in intelligence analysis and identify opportunities for future research.

IV. CONCLUSION

In conclusion, the role of explainable AI in intelligence analysis is of utmost importance in the current technological era. The development of AI has greatly impacted intelligence analysis, allowing for improved efficiency and accuracy. However, the limitations and challenges faced by AI systems pose a significant hindrance to their widespread adoption. The review results revealed various techniques and approaches to make AI systems explainable, such as transparent models, post-hoc, and interactive explanations. The review also identified several gaps in the field, including the need for more robust evaluation methods and the integration of human judgment in AI systems. Based on that, future research should focus on filling the identified gaps and developing more advanced techniques to make AI systems more transparent and accountable. The highlighted limitations and challenges faced by explainable AI systems should also be continuously addressed to ensure their widespread adoption and integration into intelligence analysis processes.

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