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Medalert AI: An intelligent emergency health monitoring and smart doctor dispatch system

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Abstract: An Intelligent Emergency Health Monitoring and Smart Doctor Dispatch System is an advanced healthcare solution designed to enhance rapid response and decisionmaking during medical emergencies. The system integrates artificial intelligence, Internet of Things (IoT) sensors, and realtime data analytics to continuously monitor a patient's vital signs such as heart rate, blood pressure, oxygen saturation, and body temperature. By analyzing these parameters, Med altert AI can detect abnormal patterns and predict potential health risks before they become lifethreatening .The core feature of Med altert AI is its intelligent alert mechanism, which automatically notifies emergency services, caregivers, and nearby medical professionals when critical conditions are identified. Unlike traditional emergency systems that rely on manual reporting, this platform ensures instant, accurate, and automated communication. The smart doctor dispatch module uses AIbased algorithms to locate and assign the most suitable and nearest available medical professionals based on specialization, availability, and distance, significantly reducing

response time. Med altert AI also includes a centralized dashboard that allows hospitals and emergency responders to access realtime patient data, medical history, and location information. This enables healthcare providers to prepare appropriate treatment even before reaching the patient. The system is designed to be scalable and adaptable, making it suitable for hospitals, elderly care

centers, remote areas, and home healthcare environments .By combining continuous health monitoring, predictive analytics, and intelligent resource allocation, Med altert AI aims to minimize delays in emergency care, improve patient survival rates, and reduce the burden on healthcare infrastructure. It represents a step toward smarter, faster, and more reliable emergency healthcare services, ensuring that patients receive timely medical attention with precision and efficiency.

Keywords: Intelligent Healthcare System, Emergency Health Monitoring, Smart Doctor Dispatch, Artificial Intelligence (AI), Internet of Things (IoT).

1.Introduction

Rapid response and prompt medical care play highly effective roles in saving lives during health emergencies. Delays in diagnosing lifethreatening situations, the absence of uptodate information of patients, and poor coordination of emergency response and medical staff can lead to life threatening situations or deaths. The conventional emergency medical response systems rely solely on reporting, periodic monitoring, and delayed decision making, which might not always be effective in lifethreatening situations or emergencies. Additionally, the latest developments in Artificial Intelligence and Internet of Things have made it possible to achieve dramatic breakthroughs in the area of emergency medical care systems. Wearable IoT sensors facilitate continuous health monitoring of patients and enable the acquisition of vital physiological inputs such as heart rate, blood pressure, oxygen saturation levels, and body temperature in real time. By integrating these latest developments in data analytics, potential abnormal patterns and lifethreatening medical risks can also be identified in advance and prior to their transformation into life threatening situations. This paper presents a novel approach in developing an effective emergency response system, and for this purpose, it proposes the design of ‘Med Alert AI – An Intelligent Emergency Health Monitoring & Smart Doctor Dispatch System.’To overcome the Med Alert AI: An Intelligent

Emergency Health Monitoring & Smart Doctor Dispatch System. This novel system combines the predictive analytics capabilities of AI with the IoTenabled health monitoring system to disadvantages of current emergency response solutions, the following article introduces the concept of detect emergencies automatically, accurately, and instantly. As soon as the critical health conditions are identified, the system automatically triggers the notification to the emergency services, caregivers, as well as the available local medical professionals instantly without any human intervention. A critical feature of the proposed system is the smart doctor dispatching mechanism enabled through the usage of sophisticated AI algorithms that can automatically detect & dispatch the appropriate & closest available medical professional according to the respective specialization & location proximity. This smart feature makes the emergency response even faster & ensures the urgent & specialized medical care to the patients instantly.

Furthermore, the central dashboard facility provides all the emergency services & hospitals realtime access to the vitals & location information of the patients even before their visit with the integration of continuous monitoring capabilities, predictive intelligence, and automated resource management, the vision of Med Alert AI is to augment efficiency within emergency healthcare delivery and improve survival chances for patients. Its scalability and flexibility would enable proper functionality within a range of settings like hospitals, home healthcare services, senior healthcare centers, and other remote areas for the overall development of intelligent emergency healthcare solutions.

2.Literature Review

2.1 In emergencies, the 911 call center service is of utmost importance. The 911 call center plays a pivotal role in ensuring appropriate and timely response to emergencies. This quick response centers results in saving lives and mitigating critical situations. Multiple frameworks have been developed to improve the effectiveness and efficiency of 911 services. Some studies improve the efficacy of emergency services by integrating ML techniques (Mitchell, 1997).

2.2 Shukhman and Shukhman (2022) discusses the potential of ML and NLP in enhancing the efficiency of unified duty and dispatch services. The authors explore various methods of text classification for automatic categorization of emergency messages into three classes: fire service, ambulance service, and

police service. Maletzki et al. (2023) proposed approach builds on the Ontology and DataDriven Expert System (ODDES) and suggests that calltakers could benefit from applying multiple AI methods to address different inference issues and provide comprehensive analytical support.

2.3 Another study (Tollinton et al., 2020) investigates the predictive power of free text notes made by call handlers in combination with Medical Priority Dispatch System (MPDS) codes. By utilizing a bagofwords approach and vectorized text representations, the research demonstrates that incorporating unstructured free text data significantly enhances the prediction of patient conveyance compared to using structured data alone.

3. Exiting system

Some of the current emergency response system designs try to address, to varying extents, issues related to decision support, data integration, and automation to optimize the functioning of 911 call centers. Some of these include the Next Generation 911 solution, which provides an upgrade to and an extension of traditional 911 infrastructure by supporting and facilitating voice, text, image, and video communication from various entities to Public Safety Answering Points. While there are many benefits to this solution, data interpretation is mostly performed by human operators. The second widely used solution is Medical Priority Dispatch System (MPDS), a mechanism employed by emergency medical dispatchers for call categorizing based on specific protocols. MPDS contains standardized sets of questions and determinant codes designed to ensure decisionmaking at the dispatching stage. Though efficient, MPDS relies on a rulebased approach that requires a considerable amount of manual entry of data and judgment on the part of the call operator and has little learn capability with past data and unstructured input in the form of text comments. CAD systems also form part of the heart of current emergency services. Typically, a CAD platform will bring together caller information, location data, resource availability, and incident history to support the decisions made in dispatch. Some of the modern CADs feature basic analytics and geospatial optimization. However, advanced AIdriven inference, natural language understanding, and predictive modeling remain absent or poorly implemented. Commercial tools like RapidSOS and NICE Inform have further advanced the area of emergency response by providing realtime aggregations of data from cell phones, IoT devices, as well as thirdparty systems. While these tools are helpful in providing greater location accuracy as well as context

to the emergency operator, it is primarily an area related to data aggregation. although current solutions such as NG911, MPDS, CAD, and data aggregation tools have greatly enhanced operations involving emergencies, it was noticed that there was no integrated approach using ML and NLP methodologies for autonomous emergency type classification, predictive analysis, and dynamic decision support. This acts as a driving force behind studying and developing novel solutions using ML and AIbased solutions to improv emergency calls at 911 operations.

4. Proposed system

The limitations identified in most of the existing emergency response systems form the foundation for the development of this work, which proposes an Intelligent AIdriven Emergency Call Analysis and Decision Support System for 911 call center operations. Traditional emergency response frameworks, while effective to a degree, often rely heavily on manual protocols, rulebased decisionmaking, and human judgment. These approaches face challenges in handling large volumes of calls, interpreting unstructured data such as freetext notes or caller descriptions, and providing predictive insights that could improve operational efficiency. The proposed system is designed to address these gaps by integrating Machine Learning (ML), Natural Language Processing (NLP), and realtime data analytics, thereby enabling autonomous emergency classification, predictive assessment, and dynamic decision support for calltakers and dispatchers. The system is capable of ingesting multimodal emergency data, ensuring that information from all relevant sources is utilized for accurate situational awareness. This includes voice calls, which are processed through advanced speechtotext models to convert spoken language into structured text data. It also incorporates SMS messages, freetext notes recorded by call handlers, and other structured metadata, including incident location, time of occurrence, caller history, and historical incident records. By combining structured and unstructured data, the system achieves a holistic view of each emergency, improving both accuracy and response prioritization. To effectively analyze unstructured textual data, the system uses advanced NLP preprocessing techniques, including tokenization, lemmatization, named entity recognition, and semantic feature extraction. These techniques allow the system to interpret the caller’s intent, identify critical keywords, and extract actionable information from often ambiguous or incomplete textual inputs. By converting raw text into meaningful semantic representations, the system overcomes the

limitations of traditional rulebased frameworks, which are unable to interpret nuanced language or contextual information. A critical component of the proposed architecture is the Emergency Type Classification Module, which utilizes machine learning algorithms to automatically categorize incoming incidents. Incidents are classified into categories such as medical emergencies, fire emergencies, police emergencies, or hybrid cases involving multiple types of response requirements. Unlike rulebased systems such as MPDS, which rely on static decision trees and manual protocols, this MLdriven module learns from historical patterns and continuously improves its accuracy. This adaptive learning enables the system to recognize emerging trends, unusual incidents, or combinations of emergencies that would be challenging for traditional systems to classify correctly. To improve operational efficiency, the system also incorporates a Predictive Risk and Severity Assessment Module. This module estimates the urgency and potential outcomes of each incident using predictive analytics and historical data modelling. Specifically, it predicts response priority, likelihood of patient conveyance, potential risk of escalation, and resources required for effective handling. These predictions allow dispatchers to make informed, timesensitive decisions that improve both the speed and quality of emergency response, particularly during highcallvolume scenarios or resourceconstrained periods. Another key feature of the system is the Dynamic Decision Support Engine, which integrates predictive insights with realtime resource availability from ComputerAided Dispatch (CAD) systems. The engine provides actionable recommendations to calltakers, including suggested response units, optimal dispatch sequences, and followup questions tailored to the context of the emergency. This module is designed as a human intheloop system, ensuring that while AI provides decision support, the final authority remains with trained emergency personnel. This approach balances automation with human oversight, maintaining accountability and operational control. The proposed system is also equipped with a closedloop learning and feedback mechanism.

After each incident, outcomes such as response effectiveness, resource utilization, and patient or public outcomes are fed back into the system. This continuous learning process allows the ML models to refine their predictions, improve emergency classification, and adapt to evolving emergency trends over time. This selfimproving capability ensures that the system remains effective even as emergency patterns and operational requirements change. the proposed AIdriven framework enhances existing emergency response infrastructures,

including NG911, MPDS, and CAD systems, by embedding intelligence, automation, and predictive decisionmaking into the current workflows. By reducing the cognitive load on calltakers, minimizing manual data entry, improving response prioritization, and providing accurate predictive insights, the system significantly improves the efficiency, reliability, and effectiveness of 911 emergency call processing. In effect, this approach has the potential to reduce response times, optimize resource allocation, and ultimately save more lives during critical emergency situations.

5. Result

The proposed Intelligent AIDriven Emergency Call Analysis and Decision Support System is expected to bring substantial improvements to 911 call center operations by addressing the limitations of current emergency response systems. Through the Emergency Type Classification Module, the system will automatically categorize incoming incidents into medical, fire, police, or hybrid emergencies with high precision. Unlike traditional rulebased frameworks, this module will adaptively learn from historical patterns, enabling it to detect emerging trends, rare incident types, and complex combinations of emergencies that may otherwise be misclassified, thereby ensuring appropriate and timely dispatch. The Predictive Risk and Severity Assessment Module will further enhance operational efficiency by estimating critical parameters such as the urgency of the incident, probability of patient conveyance, potential risk of escalation, and required resources. These predictive insights allow dispatchers to make informed, datadriven decisions even under high call volumes or resource constraints, improving both the speed and quality of response. Complementing these capabilities, the Dynamic Decision Support Engine integrates predictive analytics with realtime resource availability from CAD systems to provide contextaware recommendations, including optimal dispatch sequencing, unit allocation, and followup questions for calltakers. By maintaining a humanintheloop approach, the system balances automation with human oversight, reducing cognitive load while preserving accountability and control. In addition, the closedloop feedback mechanism allows the system to continuously learn from incident outcomes, refining classification and prediction accuracy over time and adapting to changing emergency patterns and operational requirements. Collectively, these features are expected to reduce response times, optimize allocation of emergency resources, minimize human errors, and enhance the overall reliability and consistency of emergency

operations. By integrating AIdriven intelligence and predictive decision making with existing infrastructures such as NG911, MPDS, and CAD, the system is anticipated to not only improve the efficiency of emergency call processing but also contribute to better operational decisionmaking, improved patient and public outcomes, and ultimately, the saving of more lives during critical emergence.

6. Conclusion

The proposed Intelligent AIDriven Emergency Call Analysis and Decision Support System has the potential to fundamentally transform the way 911 call centers operate by addressing critical gaps in existing emergency response systems. By leveraging advanced machine learning techniques, the Emergency Type Classification Module ensures accurate and adaptive identification of medical, fire, police, and hybrid emergencies. Unlike traditional rulebased systems, the proposed approach continuously learns from historical and real time data, enabling it to recognize rare, complex, and evolving incident patterns, thereby reducing misclassification and improving the timeliness of emergency responses. the Predictive Risk and Severity Assessment Module enhances decisionmaking by estimating urgency, escalation risk, likelihood of patient conveyance, and resource requirements. These predictive insights empower dispatchers to prioritize incidents effectively, especially during periods of high call volumes or limited resource availability. The Dynamic Decision Support Engine strengthens operational efficiency by integrating predictive analytics with realtime CAD data to generate contextaware recommendations, such as optimal unit allocation, dispatch sequencing, and structured followup questions for calltakers. This support significantly reduces cognitive load while maintaining a humanintheloop framework that ensures transparency, accountability, and professional judgment. the system's closedloop feedback mechanism enables continuous performance improvement by learning from incident outcomes and operational feedback. This adaptability allows the system to evolve alongside changing emergency patterns, policies, and community needs. When integrated with existing infrastructures such as NG911, MPDS, and CAD systems, the proposed solution enhances interoperability without disrupting current workflows. Overall, the Intelligent AIDriven Emergency

Call Analysis and Decision Support System is expected to reduce response times, optimize resource utilization, minimize human error, and improve consistency in emergency operations. Ultimately, its implementation can lead to better patient and public outcomes, strengthen emergency services, and contribute to saving more lives during critical situations.

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