

AI Assistant for Emergency First Aid Guidance

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Abstract

The AI Assistant for Emergency First Aid Guidance is designed to provide immediate, accurate, and situation-specific medical assistance during life-threatening emergencies. The system allows users to describe symptoms or emergency situations using natural language interaction and receive structured first aid instructions in real time during critical times when professional medical assistance may be delayed. In order to interpret user input categorize medical intents and produce suitable first aid instructions the suggested solution makes use of machine learning (ML) and natural language processing (NLP). TensorFlow and NLTK are used in the development of the model which is trained on a structured dataset of emergency medical intents and related responses. Cardiopulmonary resuscitation (CPR) wound care burn treatment allergic reactions and other urgent medical situations are just a few of the emergency situations it efficiently detects and handles. The AI-based assistant provides dynamic adaptive and continuously improving responses based on model training and optimization in contrast to traditional static first aid manuals or predefined emergency programs. The system guarantees accessibility usability and quick deployment across a variety of user groups by incorporating the chatbot into web and mobile platforms. It reduces panic and response time while guiding users through crucial first-response procedures as a virtual emergency companion. When required the assistant can also suggest getting in touch with a medical professional. This study shows how AI-driven conversational systems can revolutionize emergency healthcare management by raising public awareness facilitating quicker response times and improving overall safety results.

Keywords: *Emergency First Aid System, Machine Learning (ML), Natural Language Processing (NLP), Emergency First Aid System, Healthcare Chatbot, Intent Classification, TensorFlow.*

1.INTRODUCTION

Medical emergencies are unforeseen circumstances that call for prompt attention precise decision-making and intervention. Before professional medical assistance is available situations like burns fractures allergic reactions cardiac arrest or serious injuries frequently require prompt first aid measures. However many people dont know enough about first aid or get scared in an emergency which causes them to react incorrectly or slowly. Delays of this kind can seriously deteriorate a patients health and in extreme situations have potentially fatal outcomes. To enhance patient safety and results it is crucial to offer quick access to trustworthy first aid advice and

medical services. In order to improve accessibility accuracy and efficiency intelligent systems are increasingly being incorporated into healthcare solutions due to the quick development of artificial intelligence (AI) machine learning (ML) and natural language processing (NLP). Conversational systems driven by AI especially chatbots have become useful tools for providing information and support in real time. Through the use of natural language processing (NLP) techniques these systems are able to decipher user input in natural language determine the queries context and intent and offer relevant situation-specific answers. There is a chance to close

the gap between an emergency and expert medical assistance thanks to this technological advancement.

This crucial need is addressed by the AI Assistant for Emergency First Aid Guidance. The system is intended to function as an intelligent chatbot that can deliver timely trustworthy and thorough first aid instructions in an emergency. Machine learning models trained on structured datasets with a variety of medical intents and responses power the systems Python-built backend. When a user uses text or voice to describe symptoms or an emergency situation the NLP-based model evaluates the input determines the type of emergency and provides situation-specific first aid instructions. Even for users who have no prior medical knowledge this method guarantees timely accurate and context-aware assistance. The system integrates a Flutter-based mobile application that supports cross-platform functionality on both Android and iOS devices to guarantee accessibility and usability. People can communicate with the AI assistant at any time and from any location thanks to its user-friendly interface. The assistant reduces anxiety and facilitates informed decision-making by responding promptly with clear instructions when users communicate verbally or via text. The system functions as a digital first responder assisting users in the critical early stages of medical emergencies before expert help arrives by fusing Flutter's responsive and interactive frontend with Python's intelligent backend processing.

The system expands its capabilities by incorporating a Doctor Appointment and Management Module in addition to offering first aid guidance. Patients frequently have trouble finding local doctors who are available or making timely consultation appointments in emergency or urgent care situations. Longer wait times and inconvenience for both patients and healthcare providers result from the inefficiency and error-proneness of manual appointment scheduling. The suggested system uses

intelligent recommendation systems and location-based services to overcome these difficulties. Physicians can register manage available time slots update their availability status and specify their GPS location using the doctor management platform. Using machine learning-driven recommendations based on availability workload and proximity patients can look for doctors in their area. Users can view the current locations of doctors and navigate effectively thanks to integrated mapping features. In order to maintain accuracy and dependability throughout the platform an administrative panel also guarantees the methodical management of users physicians healthcare categories and medical advice content.

This project's main goal is to create an intelligent integrated healthcare system that shortens response times increases accessibility to medical services and improves emergency preparedness. The system bridges the gap between prompt emergency response and expert medical consultation by fusing AI-driven first aid assistance with organized healthcare access and appointment scheduling. In conclusion this study shows how location-based services mobile computing AI and NLP can revolutionize emergency healthcare management. In addition to enabling people to act quickly in medical emergencies the suggested system simplifies healthcare coordination which eventually improves patient outcomes raises public awareness of first aid procedures and increases the effectiveness of contemporary healthcare delivery systems.

II. RELATED WORK

1. Presented at the 6th International Conference on Inventive Research in Computing Applications (ICIRCA) in 2025 the paper Intelligent First Aid Assistance: Exploring the Capabilities and Limitations of FirstAid-AI explores an AI-based web platform that uses natural language

interaction to offer first aid guidance. The systems design usability response time and accuracy in providing emergency instructions are all assessed in this study. Although the findings show how well AI can provide prompt first aid assistance the authors also point out that it has limitations in terms of decision accuracy and coverage of intricate medical situations. The potential and difficulties of AI-driven first aid systems are highlighted in this work which encourages the creation of more sophisticated and comprehensive emergency medical solutions. Two. An intelligent emergency response system that uses artificial intelligence to provide first aid recommendations is proposed in the paper AI First Aid Recommender: A Smart Artificial Emergency Response System based on Intelligence which was presented at the 2025 IEEE 7th International Conference on Computing Communication and Automation (ICCCA). The application of deep learning techniques for assessing emergency situations and producing suitable guidance is highlighted in the study. The systems main goal is to increase response time and decision-making precision in emergency scenarios. The work highlights the significance of incorporating cutting-edge machine learning models into digital first aid platforms by showcasing how intelligent systems can improve emergency healthcare support by utilizing AI-based recommendation mechanisms.

2. In a recent scoping review that was published in the International Journal of Medical Informatics Birkun (2026) critically evaluated the dependability of generative artificial intelligence (GenAI) tools in giving laypeople advice on first aid and resuscitation. The study examined 19 studies that assessed the suitability

accuracy and completeness of emergency instructions produced by artificial intelligence. Results showed that a sizable percentage of GenAI responses included errors missing steps or potentially dangerous false information underscoring the serious risks connected to unsupervised AI advice in emergency situations. To guarantee the safe implementation of AI-driven first aid systems the review highlights the necessity of clinical supervision validation procedures and international regulatory cooperation. This study emphasizes how crucial it is to take accuracy and dependability into account when creating AI-based emergency support systems.

3. The CONNECT-AI system an AI-powered digital platform intended to improve prehospital emergency care is presented in the study A Novel Artificial Intelligence-Enhanced Digital Network for Prehospital Emergency Support: Community Intervention Study published in the Journal of Medical Internet Research (2025). In order to support first aid guidance predict patient severity and suggest the best transfer hospitals the system combines 5G communication IoT devices real-time video and voice transmission and machine learning algorithms. The authors showed improvements in certain patient groups especially those with fever or respiratory symptoms and decreased mortality in system-guided hospital transfers through a community-based intervention study conducted in South Korea with over 14000 patients. This study provides a solid basis for future AI-based emergency response systems by highlighting the potential of AI-enabled decision support and real-time data sharing to maximize emergency transport efficiency and resource allocation.

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5. The paper titled “Emergency Aid Hub for Instant First Aid and Emergency Call” presented at the 2024 International Conference on Emerging Technologies in Computer Science for Interdisciplinary Applications (ICETCS) proposes an Android-based mobile application designed to provide immediate first aid guidance and quick access to emergency services. The system integrates features such as one-tap emergency calling, first aid instructions with animations, chatbot-based assistance, health article updates, and e-commerce support for purchasing first aid kits. The application emphasizes accessibility, including support for illiterate users through visual content, and leverages technologies such as Android Studio, Firebase, NLP-based chatbot integration, and real-time databases. This work demonstrates the effectiveness of mobile-first platforms in enhancing emergency preparedness and highlights the importance of user-friendly design and integrated communication features in first aid assistance systems.
6. The study titled “A case-specific psychological first aid AI recommendations app for rescue and first responders” published in the European Journal of Psychotraumatology (2025) presents an AI-powered chatbot designed to assist first responders in delivering Psychological First Aid (PFA) during traumatic events. The system provides real-time, case-specific recommendations aligned with established PFA frameworks such as the WHO model, SIX Cs model, and PIES principles. Using a handcrafted case database and semantic matching techniques, the chatbot generates structured, protocol-based responses within 5–7 seconds. The study emphasizes ethical AI design, decision-support functionality (not replacement of professionals), multilingual accessibility, and adherence to evidence-based cognitive activation strategies. While demonstrating strong potential to enhance scalability and standardization of PFA delivery, the authors acknowledge limitations related to dataset bias, cultural sensitivity, and the need for further clinical validation of effectiveness.
7. A Natural Language Processing Framework for Hotel Recommendation Based on Users' Text Reviews, Authors: Lavrentia Aravani, Emmanuel G Pintelas, Christos Pierrakeas, P. E. Pintelas, This study describes a hotel recommendation system that analyzes customer text reviews using cutting-edge artificial

intelligence namely Deep Learning and Natural Language Processing with BERT. By classifying reviews as Bad Good or Excellent the framework offers customized hotel recommendations based on user preferences and past reservations. The findings demonstrate how this strategy greatly enhances the user experience by providing customized hotel booking recommendations.

8. A comprehensive AI-driven emergency decision-support system that integrates several large language models (LLMs) such as ChatGPT Gemini and Claude and is refined using real-world emergency cases is proposed in the study Integrated AI Medical Emergency Diagnostics Advising System which was published in Electronics in 2024. Under time and resource constraints the system focuses on early detection of critical conditions like sepsis stroke and myocardial infarction. The model improves diagnostic accuracy over individual AI engines by utilizing cloud-based data warehousing multimodal inputs (text medical images and voice) and transfer learning. The study focuses on collaborative AI-human decision-making in which medical experts make the final decision while the system offers probabilistic diagnoses and treatment recommendations. Nevertheless there are certain drawbacks such as the need for additional validation in a variety of clinical settings and the dependence on small emergency datasets.
9. In the article "Development of a first aid smartphone app for use by untrained healthcare workers" published in the The African Journal of Information and Communication (2017), Spies et al. describe the creation of a mobile-based Clinical Decision Support System (CDSS) intended to assist inexperienced

medical personnel in emergency scenarios. The system uses a rule-based decision-tree approach and is based on the WHO Integrated Management of Adolescent and Adult Illness (IMAI) guidelines to help users without requiring prior diagnostic knowledge. By comparing the tools recommendations with actual documented emergency cases the study assessed it. Initially it achieved a procedural correlation of up to 69.5 percent and it was further refined through expert validation. This CDSS-driven app leads users through symptom-based structured questioning in contrast to traditional first aid apps that require users to diagnose conditions beforehand. However drawbacks like the absence of visual aids restricted real-world deployment and reliance on internet connectivity were noted underscoring the need for additional improvement and validation.

10. The study by Sumangal Bose et al. published in Cureus (2026) explores the role of artificial intelligence in supporting clinical decision-making within intensive care units (ICUs). The authors present a structured narrative review highlighting how AI-driven systems enhance diagnostic accuracy, predictive monitoring, and workflow efficiency in critical care environments. The paper emphasizes the integration of machine learning, natural language processing, and predictive analytics to assist healthcare professionals in high-acuity settings. It also addresses ethical concerns such as algorithmic bias, interpretability, accountability, and the need for human oversight. The findings reinforce the importance of explainable and context-aware AI systems that augment rather than replace clinical judgment, supporting the safe and

responsible implementation of AI in healthcare practice.

11. The study titled “AI-based Chatbot for Healthcare” by Soham Sirpurwar et al. published in the International Journal of Engineering Research & Technology (IJERT, 2025) presents a rule-based healthcare chatbot designed to provide preliminary symptom analysis and disease guidance. Unlike deep learning-based systems, the proposed model focuses on predefined medical rules and structured symptom–disease mappings to ensure transparency and interpretability. The system integrates Natural Language Processing (NLP) techniques with an inference engine to process user queries and achieved high performance metrics, including over 94% accuracy in symptom classification. The authors emphasize reliability, low computational cost, and suitability for resource-constrained environments, while also acknowledging limitations in handling complex or ambiguous medical scenarios. This work demonstrates the practical effectiveness of rule-based chatbot systems for basic healthcare assistance and triage support.

III. METHODOLOGY

The methodology of the proposed AI Assistant for Emergency First Aid Guidance is designed to provide real-time, accurate, and context-aware medical assistance during emergency situations. The system integrates Natural Language Processing (NLP), Machine Learning (ML), and mobile application technologies to ensure fast and reliable response delivery. The overall workflow is structured as follows:

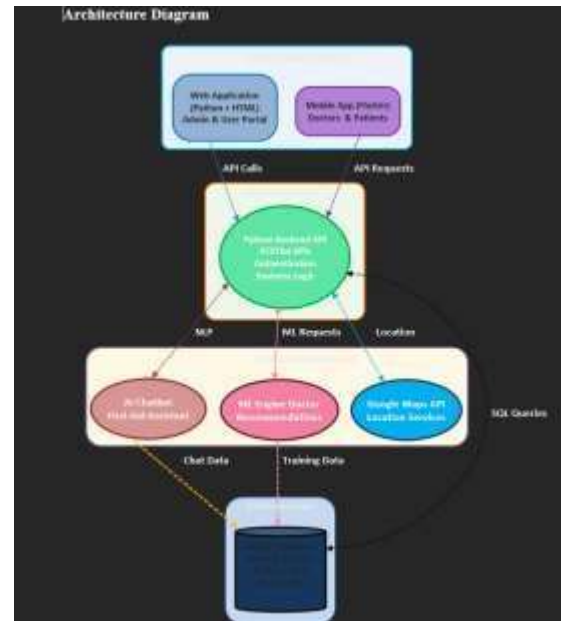


Figure1: Architectural Diagram

1. Data Collection and Dataset Preparation

With predefined medical intents like CPR instructions wound care burns fractures choking allergic reactions and other urgent conditions a structured dataset of medical emergency scenarios was created. There are several training phrases and matching first aid responses for every intent. To facilitate effective training the dataset was arranged in JSON format.

2. Text Preprocessing

User inputs undergo several NLP preprocessing steps to improve model performance:

Tokenization – Splitting sentences into words.

Stopword Removal – Eliminating irrelevant common words.

Lemmatization/Stemming – Converting words to their root forms.

These steps reduce noise and standardize text input.

3. Model Training

The processed dataset is used to train a neural network model using TensorFlow. The architecture includes:

Input layer (Bag-of-Words representation)

Hidden dense layers with activation functions

Output layer representing emergency intent classes

The model is trained using supervised learning techniques and optimized to minimize classification error.

4. Intent Classification

When a user describes symptoms or an emergency situation, the trained model classifies the input into the most relevant medical intent category based on probability scores.

5. Response Generation

Once the intent is identified, the system retrieves structured, step-by-step first aid instructions from the response dataset. The responses are designed to be clear, concise, and easy to follow during high-stress situations.

6. Integration with Mobile Application

The backend AI model is integrated into a Flutter-based mobile application. Users can interact via text or voice input. The system provides immediate guidance and, when necessary, recommends contacting emergency medical services or nearby doctors.

7. Doctor Appointment and Location Module

The system includes GPS-based location services to help users find nearby doctors. Machine learning-based recommendations rank doctors based on

proximity, availability, and specialization. An admin panel manages doctors, users, and medical content.

IV. TECHNOLOGIES USED

The suggested system combines several technologies to guarantee cross-platform accessibility intelligent processing and real-time interaction.

1. Python Programming Language

Python is the main backend language used for API integration NLP processing and machine learning model implementation.

2. TensorFlow

The neural network model for emergency prediction and intent classification is designed trained and implemented using TensorFlow.

3. Natural Language Processing Libraries

Tokenization stop word elimination and text normalization are all accomplished with NLTK (Natural Language Toolkit). Data preprocessing and structured dataset management are done with NumPy and Pandas.

4. Flutter Framework

A cross-platform mobile application that works with both iOS and Android devices is developed using Flutter. It guarantees an interface that is both responsive and easy to use.

5. Firebase / Database System

Used for real-time database management, user authentication, doctor profile storage, and appointment scheduling.

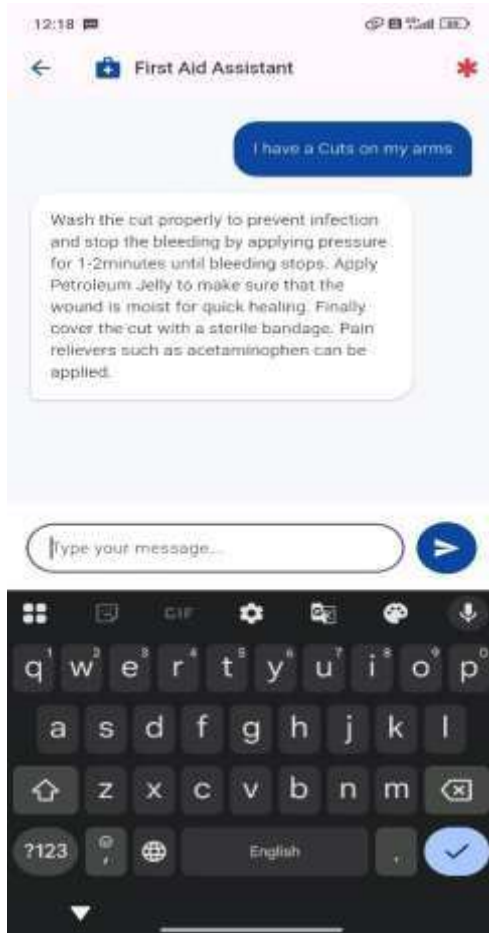
6. GPS & Location Services

Integrated to identify nearby healthcare providers and facilitate navigation using mapping services.

7. REST APIs

APIs are used to enable communication between the AI backend and the mobile frontend, ensuring smooth data exchange.

V Result



VI. CONCLUSION

The potential of artificial intelligence to revolutionize emergency healthcare management is exemplified by the proposed AI Assistant for Emergency First Aid Guidance. The system offers precise situation-specific first aid instructions in real time by combining mobile computing machine learning and natural language processing technologies. The AI-powered assistant in contrast to conventional static first aid manuals provides dynamic and adaptive responses based on user input greatly lowering panic and reaction times in

emergency situations. By bridging the gap between prompt first aid response and expert medical consultation the addition of a doctor appointment and GPS-based healthcare recommendation module further improves the system. Emergency support is accessible at any time and from any location thanks to the cross-platform Flutter application which guarantees accessibility across a variety of user groups. All things considered this study shows how intelligent conversational systems can raise public awareness give people the confidence to act in an emergency and speed up medical intervention. To further improve accuracy and dependability in life-threatening situations future improvements might include multilingual support voice-based AI interaction real-time sensor integration and ongoing model improvement.

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