SMART AMBULANCE MANAGEMENT SYSTEM – AI AND HUMAN INTERFACE TECHNOLOGY IN SMART CITIES USING AI & MACHINE LEARNING

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Abstract- ***This project introduces an fresh approach leveraging IoT technology and ML models to revolutionize patient monitoring in ambulances. A wearable health monitoring device equipped with IoT capabilities tracks vital signs, including body heat, pulse rate, and breathing patterns during various activities. Machine learning algorithms analyse collected data to accurately identify patient activities. Additionally, an intuitive application interfaces with the IoT device, allowing real-time data visualization and analysis for healthcare providers. The project aims to improve emergency medical response by delivering personalized, accurate patient data, enhancing decision-making, and potentially transforming the landscape of ambulance-based healthcare services.***

keywords- Smart Health, Emergency, Patient Care and Monitoring , Intelligent Ambulance, Smart City

I. INTRODUCTION

The landscape of medical services is undergoing a paradigm shift with the advent of cutting-edge technology. In this context, the "Intelligent Ambulance" project emerges as a pioneering initiative, aiming to revolutionize patient care through the fusion of Internet of Things (IoT) devices and machine learning algorithms.

Traditionally, ambulances serve as crucial conduits for delivering immediate medical attention to those in need. However, the scope for real-time, comprehensive patient monitoring during transit has been limited. Addressing this gap, our project introduces an innovative approach leveraging IoT-enabled health monitoring devices embedded with sophisticated sensors capable of tracking and transmitting vital signs and activity data seamlessly.

The cornerstone in this project lies in the incorporation of ML algorithms that meticulously analyse the continuous stream of data acquired by these devices.

By discerning and identifying various patient activities and nuances within their vital signs, these algorithms promise to unlocka new dimension of accuracy and insight in on-the-go patient care. Complementing these technological advancements is an intuitive application interface designed to synergize with theIoT devices. This interface empowers healthcare providers with a visual dashboard showcasing real-time data insights, fostering informed decision-making and facilitating prompt interventions during critical moments.

II. LITERATURE SURVEY

Literature survey is an important step in the software development process as it provides essential information and insights for enhancing and improving existing approaches. In the current project, many researches have been studied to gather relevant information. The following section highlights the key researches those have influenced the proposed in the field of object tracking and detection.

Year	Title	Author	Objectives	Advantages	Disadvantages
2016	Future selection using data gain for improved structural based alert correlation	T.A Alhaj M.M Siraj	The aim is to develop and implement an system for gaining data for improved structural based alert correlation for future	- Low cost: Uses a simple interface and hardware. - Flexibility: Allows you to perform all action.	-Performance degrades in complex backgrounds - Accuracy drops to 40%
2017	Deep clustering via joint convolution auto Encoder embedded and relative entropy minimization	K.G Dizaji A.Herandi	Approach employees auto encodes to obtain a representational structures of the locations	- A distance matrix was developed and used as input to genetic algorithm. Distance matrix based approach provided better results on comparing with the models using forecasting technique.	- Even though the approach using distance functions was developed earlier, it application and popularity are limited by high dimensionality and dataset space.
2018	A Deep convolution auto encoder with embedded clustering	A.Alqahtani J.Deng	Learns the feature representations and assigns clusters concurrently through deep auto encoders	- Real-time processing accuracy is good - Ease of use: It is very easy to use and understand	- Accuracy and reliability depend on different conditions.
2018	Simulation Based Prediction of the near future emergency medical system state	T.A Granberg H.T.N Nguyen	Developed a simulation based predictive model to gauge the emergency ambulance demand in an area using multiple regression model.	- Quantitative Analysis: Multiple regression allows for the inclusion of multiple predictor variables, enabling a more comprehensive analysis of factors. - Prediction Accuracy: When the model is well-designed and the variables are appropriately chosen and weighted, regression models can provide reasonably accurate predictions.	-Assumption of Linearity: Regression models assume a linear relationship between predictors and the outcome variable. -Overfitting : There's a risk of overfitting the model to the training data, where the model performs well on training data but poorly on new, unseen data.
2019	Automatic Ambulance Management System with patient monitoring using IOT.	R.T Iype	Developed to monitor the real time data such as pulse, body temperature of a patient present in the ambulance	- Easy to monitor the condition of the patient from remote distance to medicate the patient according to the condition	- The accuracy of the devices is not fully accurate and the synchronization of the devices is also critical.

Year	Title	Author	Objectives	Advantages	Disadvantages
2019	Big Data, Social Physics and Spatial Analysis	T.J Barnes M.W Wilson	The data is collected from city infrastructure using the medical data of the peoples	- Ease of Interpretation: Regression models offer a clear understanding of the relationship between the predictors and the ambulance demand, making it easier to explain to stakeholders and decision-makers.	- Limited Scope: While regression models can be useful, they might not capture all influencing factors accurately. model's reliability.
2020	Smartcity's Ambulance System Using Concept of Big data and IOT.	A.Dumka A. Sah	Sophisticated Healthcare Programs are required in system	- Improved Patient Care: Healthcare programs enable better diagnostics, personalized treatments, and advanced care, leading to improved patient outcomes.	- Costly Implementation: The setup and maintenance of healthcare programs require substantial investment in technology, training, and infrastructure
2020	Predicting Crash Injury With Machine Learning Algorithm Synchronized with Clustered Technique	K. Assi S.M Rahman	Proposed Machine Learning models for predicting accidents vs non predicting patterns in crash sites using gaussian mixture models and SVM.	- Real-time processing accuracy is good - Ease of use: It is very easy to use and understand	- Accuracy and reliability depend on different conditions.
2020	Analysing factors associated with fatal road crashes	P. Tiwari H. Dao N.G Nguyen	Approach that uses a machine learning hybrid ensemble classifier derived from decision tree and identify risk factors	- Robustness: Hybrid ensembles can handle a variety of data patterns and uncertainties, making them more robust in capturing complex relationships within the data.	- Hyperparameter Tuning: Configuring hyper parameters for both the decision trees and the ensemble requires careful tuning, adding complexity to the modeling process. -Interpretability: As the ensemble grows in complexity, interpreting the overall decision-making process becomes more challenging compared to a single decision tree.
2022	From clustering to clusters explanation via neural networks	J. Kauffmann M. Esders L. Ruff	Developed a system using the real time data to understand the clusters explanation neural network	- Helps to understand the present condition of the patient in the ambulance it also helps to manage the data collected by the IOT devices	- To maintain the accuracy of the devices is challenging and it is also complicated to control and synchronize the IOT devices via neural networks

III. CONCLUSION

An Internet of things- (IoT-) enabled health monitoring device was designed using the ML models to track patient's activities such as running, sleeping, walking, and exercising, different vitals during these activities such as body temperature and heart rate, and patient's breathing pattern during such activities. ML Models were used to identify different activities of the patient. Currently, the ML models are used to detect cough and healthy breathing only. A web app was also designed to track the data uploaded by the proposed devices. +e proposed health monitoring device developed in this project did not cause any discomfort to the patient. We can easily remove and worn again whenever required without any assistance. +e obtained results revealed that the proposed system can be very helpful in monitoring the patients remotely. In the near future, we will extend the proposed device for other kinds of diseases. Additionally, in this article, no ML model is proposed. Therefore, we will try to design our own lightweight ML model to obtain better results.

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