Quantum Pulse:
Journal of AI, Data Science & Systems Engineering
ISSN: 3108-1061 | Volume 2 Issue 1 January – June 2026 | QP12

ADVANCED PREDICTIVE ANALYTICS FOR EARLY CARDIAC ARREST DETECTION IN NEWBORN INFANTS

[#1]**Dr. PEDDI KISHOR,** ***Associate Professor & HOD, Department of CSE,***
[#2]**Dr. CHADA SAMPATH REDDY,** ***Associate Professor, Department of CSE,***
[#3]**ARSHIYA TABASSUM,** ***Department of CSE,***
SREE CHAITANYA INSTITUTE OF TECHNOLOGICAL SCIENCES, KARIMNAGAR, TG.

ABSTRACT: A medical emergency that is both common and terrifying is unexpected cardiac arrest in infants. The most effective care and treatment for these infants can only be administered if they are discovered at an early stage. In recent years, scientists have been conducting research to identify potential biomarkers and symptoms of neonatal cardiac arrest in order to create more precise and efficient diagnostic tools for early detection. Echocardiography and computed tomography are two of the numerous imaging modalities that have the potential to identify cardiac arrest at an early stage. The objective of this research is to rapidly identify neonatal cardiac arrest in the CICU by constructing a cardiac machine learning model (CMLM) that employs statistical models. The integration of the neonate's physiological data enabled us to ascertain the frequency of cardiac arrests. Predictive models for cardiac arrest were developed using two statistical modeling techniques: logistic regression and support vector machines. The proposed procedure will be implemented by the CICU to expedite the detection of neonatal cardiac arrest. In the training (Tr) comparative zone, the proposed CMLA achieved a 0.912 delta-p, 0.894 FDR, 0.076 FOR, 0.859 prevalence threshold, and 0.842 CSI. The CMLA that was recommended in the testing (Ts) comparison zone had the following values: 0.896 delta-p, 0.878 FDR, 0.061 FOR, 0.844 prevalence threshold, and 0.827 CSI. As an outcome, neonatal cardiac arrest-related mortality and morbidity will be diminished.

Keywords: *Neonatal Cardiac Arrest, Predictive Analytics, Machine Learning, Early Detection, Physiological Signal Monitoring, Deep Learning, Neonatal Intensive Care Unit (NICU).*

1. INTRODUCTION

Early detection is of the utmost importance due to the potentially fatal consequences of a newborn cardiac arrest. Signs such as cyanosis, reduced responsiveness, a racing heart, and difficulty breathing are frequently observed. The risk is elevated in instances of preterm birth, low birth weight, and maternal health issues. Auscultation and pulse oximetry, which are components of routine monitoring, can assist in the early detection of issues. Logistic regression, support vector machines, artificial neural networks, and naive bayes are statistical models that assist in clinical decision-making and risk forecasting. Machine learning improves early detection by identifying subtle changes that individuals may overlook through the analysis of large volumes of critical data. Additionally, it facilitates the identification of high-risk cases and enables immediate intervention. This method generally improves accuracy, expenses, and newborn survival rates.

Paper Available at: www.qpjournal.org
DOI : https://doi.org/10.65713/qpv2i112

Quantum Pulse:
Journal of AI, Data Science & Systems Engineering
ISSN: 3108-1061 | Volume 2 Issue 1 January – June 2026 | QP12

This proposed system improves neonatal healthcare by detecting cardiac arrest more accurately and earlier through the use of cutting-edge machine learning techniques. Real-time risk assessment and timely medical intervention alerts are facilitated by the continuous evaluation of vital signs and patient history. Finally, this enables physicians to make more informed, timely decisions, which enhances the efficiency of treatment and the survival rates of newborns. The system is more dependable than traditional monitoring methods because it constantly monitors critical health parameters and eliminates the possibility of human error. This integration into hospital monitoring systems could be advantageous for critical care physicians and nurses.

2. LITERATURE SURVEY

Sashidhar et al. (2020): Implemented feature engineering and machine learning methodologies to predict the pulse status during cardiac arrest. In order to identify significant trends, the authors analyze data collected during resuscitation procedures. The model is beneficial for determining whether a pulse is present in a life-threatening situation. Clinical decision-making is improved as a result of the system's capacity to enhance prediction accuracy. Consequently, a greater number of patients survive, and life-saving treatments are more effective.

Kim et al. (2020): In an effort to anticipate the consequences of a cardiac arrest, Kim et al. (2020) proposed a computational model that is motivated by physiological principles. In order to improve the precision of predictions, the model integrates biological processes and clinical data. It considers a variety of physiological factors when estimating the likelihood of recovery. The data generated by the system can be advantageous for the planning of care in the aftermath of a cardiac arrest. The outcome predictions are more precise, which is beneficial for the complex healthcare decision-making systems.

O'Shea et al. (2021): This investigation introduces a deep learning-based approach to the identification of neonatal seizures by utilizing multi-channel EEG signals (O'Shea et al., 2021). The authors utilize an entirely convolutional neural network to detect anomalous brain activity patterns. The model exhibits exceptional precision in real-time monitoring scenarios. The importance of early detection in averting severe repercussions is underscored. This method serves as an illustration of the potential of artificial intelligence in the development of critical care and monitoring systems for newborns.

Gupta (2022): This paper investigates the use of pattern recognition algorithms based on machine learning to identify neonatal cardiac arrest. The model analyzes physiological signals to detect anomalous patterns. Classification algorithms are implemented to optimize detection accuracy. The system enables the early identification of high-risk cases. Neonatal outcomes are enhanced through the promotion of early medical intervention.

Gupta et al. (2023): Propose a framework for the early detection of cardiac arrest in infants admitted to intensive care units that is based on statistical models and machine learning. The writers concentrate on physiological signals, including blood pressure, heart rate, and oxygen levels. The model employs predictive analytics to identify patterns that occur prior to cardiac

Paper Available at: www.qpjournal.org
DOI : https://doi.org/10.65713/qpv2i112

Quantum Pulse:
Journal of AI, Data Science & Systems Engineering
ISSN: 3108-1061 | Volume 2 Issue 1 January – June 2026 | QP12

arrest incidents. Thank you to the system's improved early warning capabilities, clinicians are capable of taking immediate preventative action. The likelihood of survival is significantly enhanced by the reduction in the time required to obtain a diagnosis and initiate treatment.

Baghdadi et al. (2023): conducted research on the most advanced machine learning methods for the early detection and diagnosis of cardiovascular disease. The authors employ a variety of algorithms to ascertain the most effective predictive models. The system's processing of extensive medical data yields enhanced diagnostic accuracy. It enhances the sensitivity and specificity of the detection of heart-related diseases. The primary objective of the investigation is to examine the extent to which artificial intelligence can enhance the efficacy of healthcare and reduce the number of fatalities.

Grebovic et al. (2023): conducted a paper that explores the utilization of machine learning models to analyze statistical data in healthcare applications. Regression, clustering, and classification are among the numerous methodologies that the authors have described. These models are essential for the analysis of intricate medical datasets. The importance of data-driven strategies for healthcare prediction systems is underscored by the paper. One may construct models to identify neonatal cardiac arrest in addition to this.

Narsamma et al. (2024): Describe a machine learning-based approach to the early detection of cardiac arrest in newborns. The heart rate, oxygen saturation, and temperature are examined by this model. Supervised learning is employed to classify risk levels. The technology assists physicians in the early detection of potentially life-threatening diseases. It improves the monitoring of patients and the outcomes for newborns.

Indumathi et al. (2024): Conducting a paper that employs machine learning techniques to identify infant heart failure at an early stage. The model employs medical data to identify potential risk factors. Predictive analytics can identify anomalies before they pose a threat. The system not only supports preventative treatment programs but also assists in clinical decision-making. It brings to light the importance of AI in pediatric healthcare systems.

Zapata-Cortes et al. (2024): Conduct an exhaustive investigation into the use of machine learning models for the early detection of illnesses. The writers investigate a variety of algorithms, including neural networks and decision trees. The paper illustrates their ability to manage complex medical datasets. Additionally, concerns regarding the interpretability of models and the quality of the data are addressed. The results indicate that healthcare systems would benefit from the implementation of AI-based solutions.

Divya et al. (2024): This paper examines the most recent machine learning techniques for predicting future cardiac risks (Divya et al., 2024). The authors sift through extensive healthcare datasets in search of patterns that have never been observed before. The model facilitates the early identification of patients who are at a high risk. It underscores the significance of preventive healthcare measures and prompt action. The paper underscores the importance of predictive analytics in the reduction of mortality rates.

Soumya et al. (2025): Utilized clinical data to develop a machine learning model that can predict the occurrence of cardiac arrest in newborns. The health parameters are investigated by the authors through the use of classification algorithms. The system is capable of detecting

Paper Available at: www.qpjournal.org
DOI : https://doi.org/10.65713/qpv2i112

Quantum Pulse:
Journal of AI, Data Science & Systems Engineering
ISSN: 3108-1061 | Volume 2 Issue 1 January – June 2026 | QP12

indicators of potential heart problems. It promptly notifies physicians and nurses to enable them to respond appropriately. When contrasted with conventional methodologies, the model enhances the precision of predictions.

Saraswathi et al. (2025): Employ a combination of machine learning and statistical models to detect neonatal cardiac arrest at an early stage. The system identifies significant predictive factors by analyzing intensive care data. Consequently, there will be a decrease in the number of false alarms and an improvement in the detection rate. This model enables neonatal intensive care units to monitor vital signs in real time. The efficiency of clinical decision-making is enhanced.

Sruneethi & Jyothi (2025): A predictive system that employs machine learning and statistical analysis is proposed. The model considers a variety of physiological parameters to identify potential warning signals of cardiac arrest. In an effort to optimize performance, it prioritizes feature selection and data preprocessing. In healthcare environments, the system generates predictable results. It is recommended that neonatal care and early intervention be enhanced.

Li (2026): A deep learning-based approach for the early prediction of cardiac arrest is introduced, which employs time-series vital sign data. The model analyzes data from continuous patient monitoring to identify risk trends. It employs intricate neural networks to improve the accuracy of its predictions. The system enables healthcare providers to receive real-time alerts. Consequently, this leads to enhanced patient safety and the development of advanced predictive healthcare systems.

3. SYSTEM ANALYSIS

EXSTING SYSTEM

Diabetes, coronary artery disease, and hypertension are frequently the causes of heart failure, which is characterized by the heart's inability to pump an adequate amount of blood. Atrial fibrillation, an irregular heartbeat that reduces blood flow, can exacerbate heart failure symptoms such as fatigue and shortness of breath. Research has shown that longer hospital stays and increased mortality in older patients with acute heart failure are associated with functional decline due to age, co-morbidities, and fragility. In order to identify patients who are at a high risk during their stay, hospitals employ predictive methods such as regression tree analysis and classification. Furthermore, clinical tools such as the Vasoactive-Inotropic Score (VIS) are utilized to forecast patient outcomes following surgery, and phenomapping is employed to organize heart failure patients based on their clinical and biological characteristics in order to improve diagnosis and treatment.

DISADVANTAGES

- It is not always straightforward to manage intricate, large datasets.
- A substantial amount of data is necessary to generate a forecast that is dependable.
- Performance is contingent upon accurately labeled data.

PROPOSED SYSTEM

The proposed system utilizes machine learning to predict and identify neonatal cardiac arrest at an early stage. The model is capable of detecting minor changes and hazards prior to

Paper Available at: www.qpjournal.org
DOI : https://doi.org/10.65713/qpv2i112

Quantum Pulse:
Journal of AI, Data Science & Systems Engineering
ISSN: 3108-1061 | Volume 2 Issue 1 January – June 2026 | QP12

traditional methods by analyzing critical signs such as heart rate, breathing patterns, and oxygen levels. This method improves survival rates by promptly identifying infants who are at risk and facilitating their intervention. Personalized care is also promoted by more effective data analysis.

ADVANTAGES

- The symptoms of a cardiac arrest can be accurately and automatically identified.
- detects minute fluctuations in vital signs.
- Early identification of infants who are at a high risk
- enables the provision of prompt medical care.
- Reduces the time and expenses associated with monitoring

4. RESULTS

Fig 1 : Service Provider Login

Fig 2 : Dataset Trained and Tested Accuracy Results

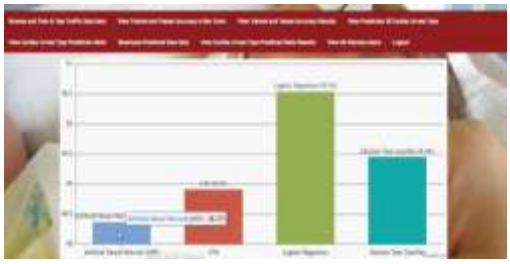

Fig 3 : Dataset Trained and Tested Accuracy Results in Barchart

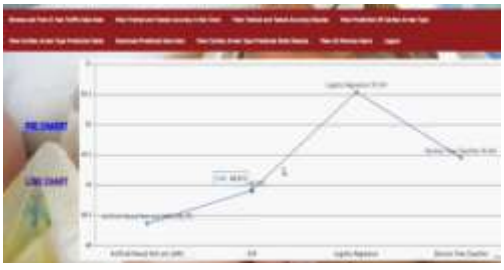

Fig 4 : Dataset Trained and Tested Accuracy Results in Linechart

Paper Available at: www.qpjournal.org
DOI : https://doi.org/10.65713/qpv2i112

Quantum Pulse:
Journal of AI, Data Science & Systems Engineering
ISSN: 3108-1061 | Volume 2 Issue 1 January – June 2026 | QP12

Fig 5 : User Login

Fig 6: Prediction Of Cardiac Arrest Type

5. CONCLUSION

The utilization of these models to create patient-specific interventions may enable the development of more effective treatments. It may also be feasible to predict potential complications in newborns or fetuses by optimizing the proposed machine learning algorithm. Medical professionals can ascertain the probability of specific cardiac abnormalities prior to the delivery of a baby in order to enhance prenatal interventions. Two additional potential applications of the proposed machine learning algorithm are enhanced diagnosis and treatment. By reviewing patient records from the past, physicians can acquire more current and accurate information, which enhances their diagnostic capabilities. It could lead to improved patient outcomes, earlier interventions, and less expensive treatments.

REFERENCES

1. Gupta, K., Jiwani, N., Pau, G., & Alibakhshikenari, M. (2023). A Machine Learning Approach Using Statistical Models for Early Detection of Cardiac Arrest in Newborn Babies in the Cardiac Intensive Care Unit. IEEE Access, 11, 60516–60538.
2. Soumya, K., Anjana, B., Raj, J. A., Nikhil, C., & Pranavi, G. (2025). Cardiac Arrest in Newborn Babies Using Machine Learning. International Journal of Engineering Research & Technology (IJERT), 14(06).
3. Saraswathi, U., Noorullah, R. M., & Reddy, A. R. M. (2025). A Machine Learning Approach Using Statistical Models for Early Detection of Cardiac Arrest in Newborn Babies in the Cardiac Intensive Care Unit. International Journal of Medical Informatics.
4. Sruneethi, C., & Jyothi, P. (2025). A Machine Learning Approach Using Statistical Models for Early Detection of Cardiac Arrest in Newborn Babies. International Journal of Scientific Research in Computer Science Engineering and Information Technology (IJRSCSEIT).

Paper Available at: www.qpjournal.org
DOI : https://doi.org/10.65713/qpv2i112

ISSN: 3108-1061 | Volume 2 Issue 1 January – June 2026 | QP12

5. Narsamma, G., Jaffer, M., & Miryabbelli, J. (2024). Early Detection of Cardiac Arrest in New Born Babies Using Machine Learning. International Research Journal in Engineering and Technology (IRJET).
6. Indumathi, N., Meera, J. P., Upadhyay, S., & Gupta, J. S. (2024). Early Heart Failure Recognition for Infants Using Machine Learning. Proceedings of International Conference on Smart Healthcare Systems.
7. Zapata-Cortes, O., Arango-Serna, M. D., Zapata-Cortes, J. A., & Restrepo-Carmona, J. A. (2024). Machine Learning Models and Applications for Early Detection. Sensors, 24(14), 4678.
8. Baghdadi, N. A., Abdelaliem, S. M. F., Malki, A., Gad, I., Ewis, A., & Atlam, E. (2023). Advanced Machine Learning Techniques for Cardiovascular Disease Early Detection and Diagnosis. Journal of Big Data, 10(1), 144.
9. Grebovic, M., Filipovic, L., Katnic, I., Vukotic, M., & Popovic, T. (2023). Machine Learning Models for Statistical Analysis. International Arab Journal of Information Technology, 20(3A), 505–514.
10. O'Shea, A., Lightbody, G., Boylan, G., & Temko, A. (2021). Neonatal Seizure Detection from Raw Multi-Channel EEG Using a Fully Convolutional Architecture. arXiv preprint arXiv:2105.13854.
11. Sashidhar, D., Kwok, H., Coult, J., Blackwood, J., Kudenchuck, P., Bhandari, S., & Rea, T. (2020). Machine Learning and Feature Engineering for Predicting Pulse Status During Chest Compressions. arXiv preprint arXiv:2008.01901.
12. Kim, H. B., Nguyen, H., Jin, Q., Tamby, S., Romer, T. G., Sung, E., Liu, R., Greenstein, J., Suarez, J. I., Storm, C., Winslow, R., & Stevens, R. D. (2020). A Physiology-Driven Computational Model for Post-Cardiac Arrest Outcome Prediction. arXiv preprint arXiv:2002.03309.
13. Gupta, K. (2022). Pattern Recognition of Cardiac Arrest in Neonates Using Machine Learning Techniques. International Journal of Engineering and Management Studies.
14. Li, Y. (2026). Early Prediction of Cardiac Arrest Based on Time-Series
15. Vital Signs Using Deep Learning. JMIR Formative Research, 10(1), e78484.
16. Divya, G., SravanKumar, M. N., JayaDharani, T., Pavan, B., & Praveen, K. (2024). Deciphering Cardiac Destiny: Unveiling Future Risks Through Cutting-Edge Machine Learning Approaches. arXiv preprint arXiv:2409.15287.

Paper Available at: www.qpjournal.org
DOI : https://doi.org/10.65713/qpv2i112