



Real-Time Patient Monitoring Using Apache Spark and Kafka

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Problem Statement

Traditional systems struggle with real-time data processing

Critical care demands timely alerts

Scalability challenges with large sensor data

Need low-latency, scalable processing

System Objectives



Continuous physiological data collection



Abnormal pattern detection



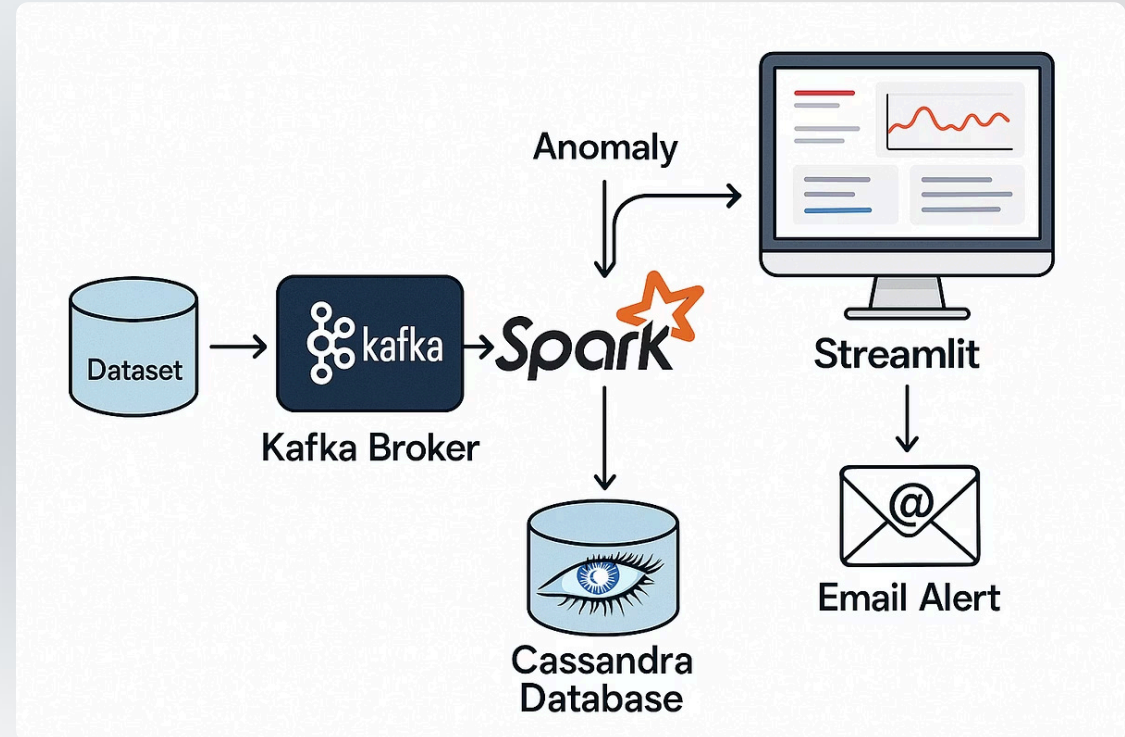
Immediate alert delivery



Data storage for analysis

Proposed Methodology

- 1 Data Ingestion using Kafka
- 2 Real-Time Processing using spark
- 3 Alert Generation on Mail
- 4 Data Storage using Cassandra
- 5 Visualization using Streamlit
- 6 Threshold Based Analysis



Frameworks and Tools



Apache Kafka

Streaming and ingestion



Apache Spark

Real-time analytics and processing



Hadoop HDFS / Cassandra

Scalable storage solutions



Streamlit

Visualization and web interface

Real-Time Processing with Apache Spark



Batch processing of patient signals in real-time.



Threshold based anomaly detection



Integration with Kafka Streams and the detected anomaly column is appended to the dataset stored on Cassandra.



Anomaly Detection and Alerts



Threshold based analysis



Abnormal pattern recognition

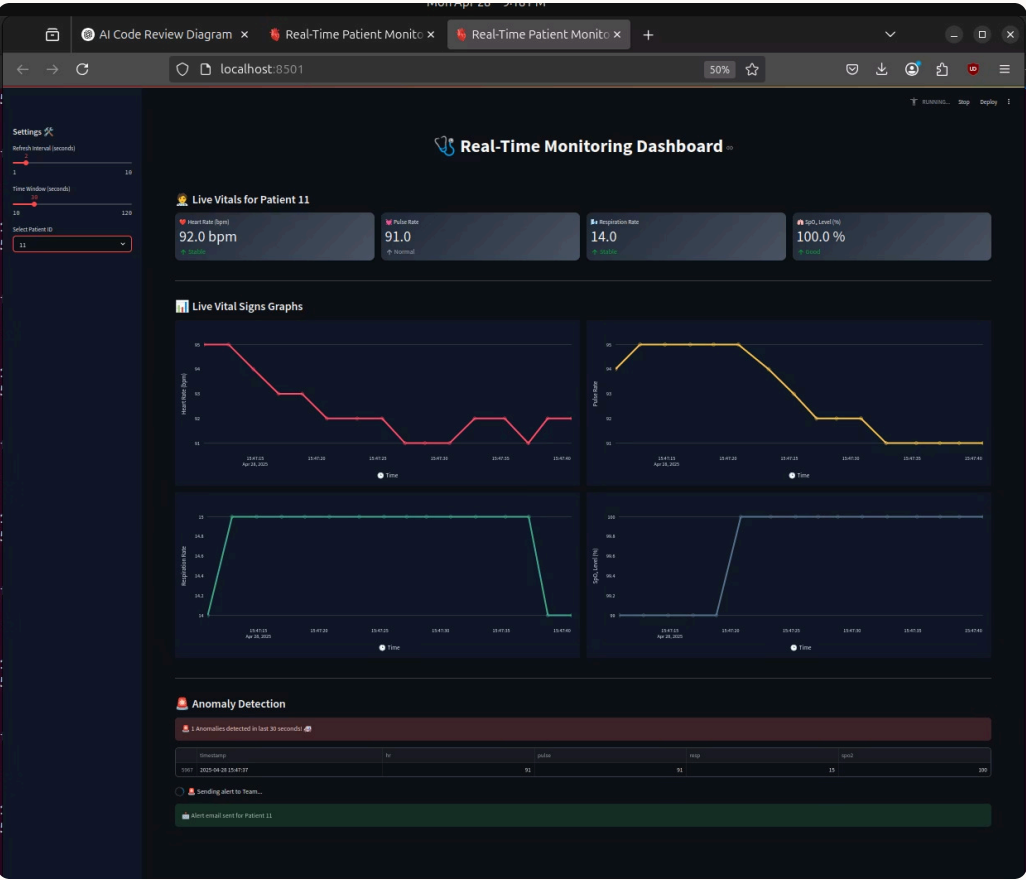


Real-time alerts on mail



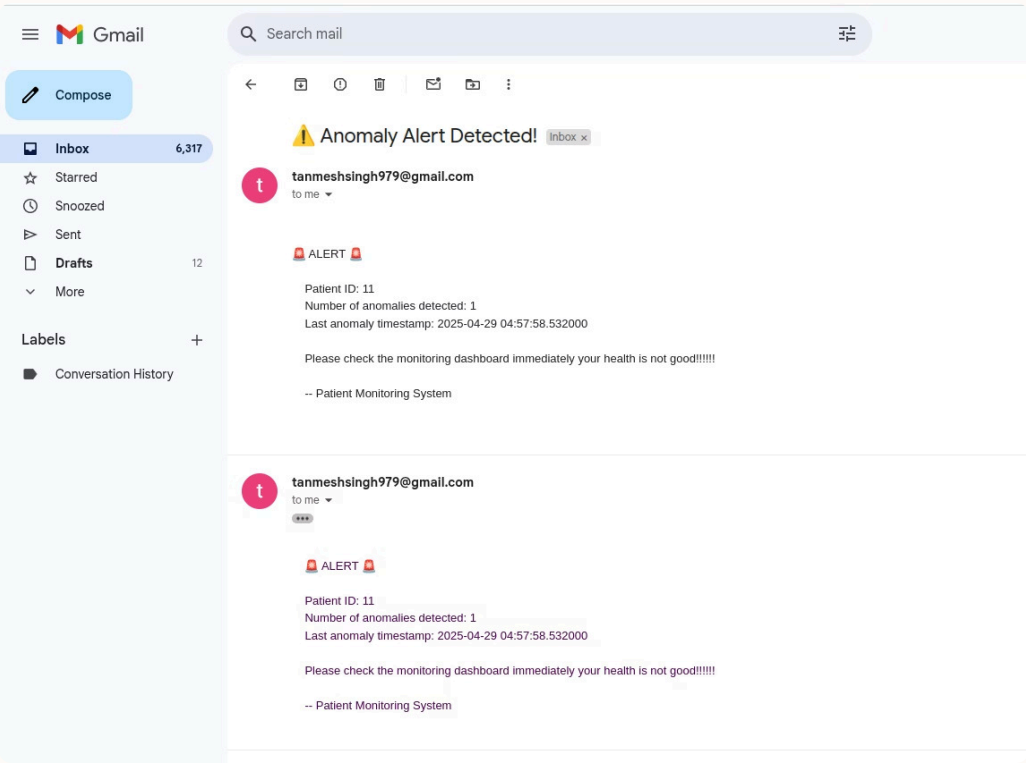
Dashboard visualization with alerts

Screenshots



Dashboard Overview

Real-time display of patient vital signs and anomaly alerts.



Alert Notification

Email alert generated for detected abnormal patient condition.

Conclusion



A **real-time patient monitoring system** using **Apache Spark** and **Kafka** offers a **scalable, low-latency**, and **reliable** solution for critical healthcare needs.



By combining **big data frameworks** with **machine learning**, healthcare providers can not only respond faster but also **analyze historical trends** for better future diagnosis.



The system ensures **continuous monitoring, quick anomaly detection**, and **instant alerts**, enabling faster interventions and potentially saving lives.



This project highlights how **modern data engineering tools** can revolutionize **healthcare monitoring** in real-world scenarios.