ValueHealth
Accelerate patient health outcomes

Proactive AI Patient Engagement for Chronic Diseases

Team Members and Role

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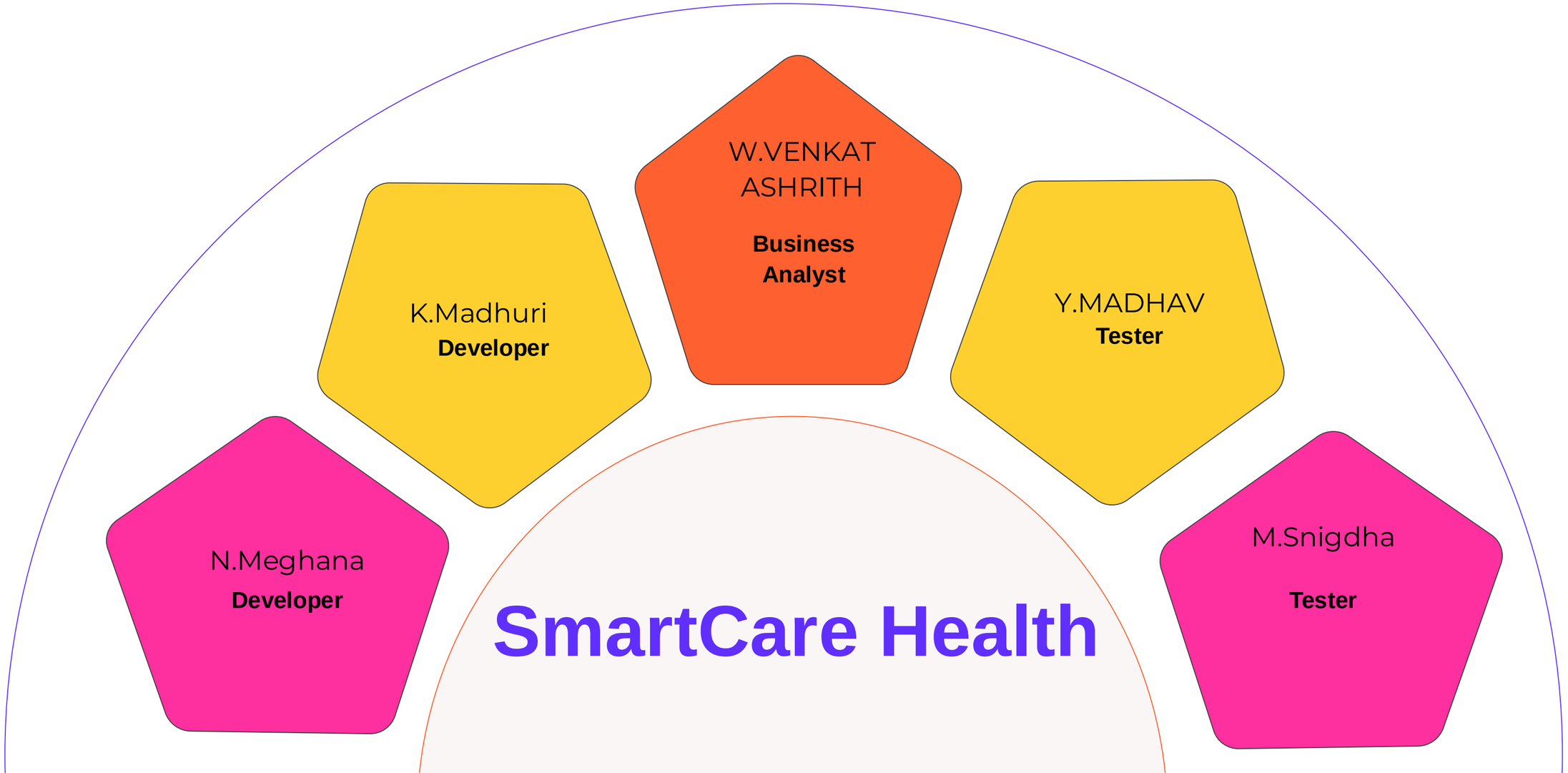

Project Overview

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- **Problem Statement:**

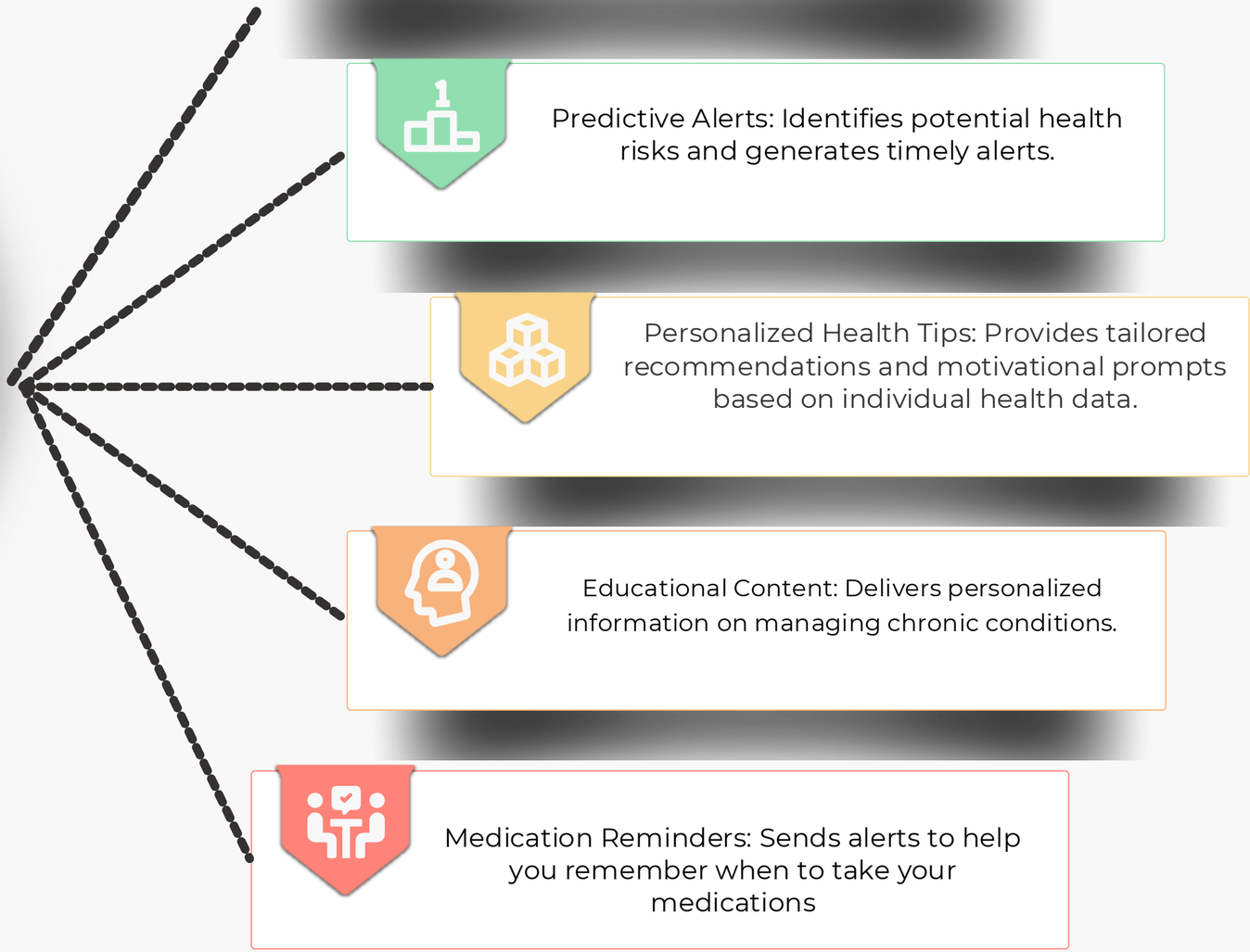
Develop an AI-driven system that continuously monitors chronic disease patients and give real-time alerts to reduce emergency visits and improve patient outcomes.

- **Solution:**

An AI model that continuously monitors chronic disease patients (e.g., diabetes, hypertension) using data from wearables, EHRs, and self-reported symptoms. The system can deliver personalized health tips, alerts for potential issues, and education on managing conditions, while helping hospitals reduce emergency visits and improve patient outcomes.

KEY FEATURES

Progress Tracking: Monitors health trends and tracks patient progress toward health goals.



Real-Time Monitoring: Integrates data from wearables, EHRs, and self-reported symptoms.

Predictive Alerts: Identifies potential health risks and generates timely alerts.

Personalized Health Tips: Provides tailored recommendations and motivational prompts based on individual health data.

Educational Content: Delivers personalized information on managing chronic conditions.

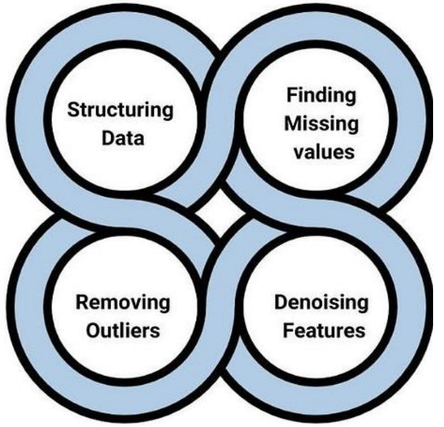
Medication Reminders: Sends alerts to help you remember when to take your medications

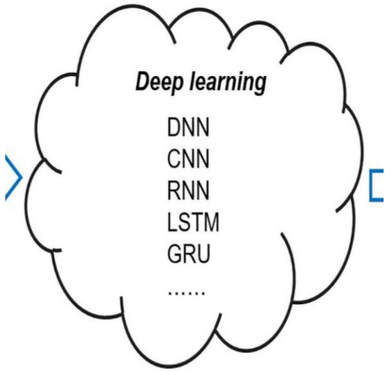
System Architecture

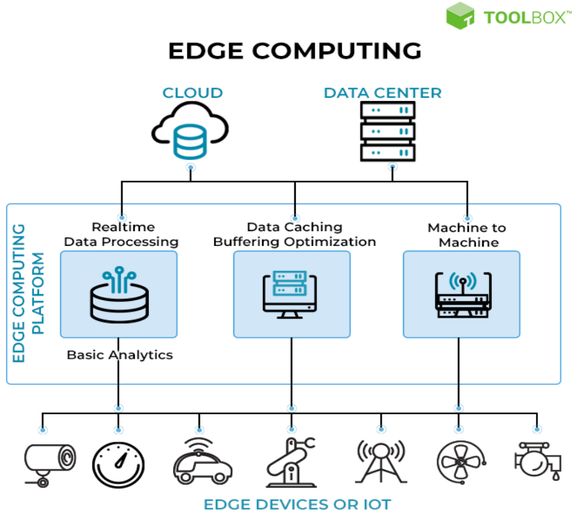
- **Architecture Diagram:**

Preprocessing of **Time-Series** Data In **Machine Learning**

Making data ready when sequence matters!







System Architecture

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- **Data Flow:**

1) Data Sources:
- Wearables (Heart rate, BP, glucose levels)
- EHRs (Medication history, diagnoses, lab results)
- Self-Reported Symptoms (Apps, digital diaries)

2) Data Preprocessing:
- Normalization
- Time-Series Analysis
- Missing Data Handling

3) Model Architecture:
- Multi-Modal Deep Learning
  * CNNs (Image data)
  * RNNs/LSTMs (Time-series data)
  * MLPs (Tabular data)
- Attention Mechanisms
- Personalization Layer

4) Output:
- Personalized Health Tips
- Real-Time Alerts

5) Deployment:
- Edge Computing (On-device)
- Cloud Integration (For large-scale processing)

6) Evaluation:
- Metrics (ROC-AUC, F1-Score)
- Clinical Trials
- Patient Feedback

7) Ethical Considerations:
- Data Privacy
- Bias Mitigation
- Transparency

Technology Stack

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01. Flutter/React

Frontend

User interface for patients and healthcare providers, allowing symptom reporting, receiving alerts, and viewing health tips.

02. Node.js with Express, Django

Backend

Handles data processing, model integration, user authentication, and manages API requests.

03. PostgreSQL, MongoDB

Database

Stores patient data (EHRs, self-reported symptoms) and logs from wearable devices in a structured and scalable format.

04. Google fit API, Twilio

APIs/Third-Party Services

Integrates with wearables for real-time data, sends alerts via SMS/email, and connects with healthcare systems (FHIR API for EHRs).

Future Enhancements

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Planned Features:

Enhanced Predictive Analytics:

- Implement machine learning models capable of predicting future health risks (e.g., heart attacks, diabetic complications) based on historical and real-time data trends.

Medication Management and Adherence Tracking:

- Include features for reminding patients about medications, tracking adherence, and alerting both patients and healthcare providers about missed doses.

Diet and Lifestyle Recommendations:

- Provide personalized dietary advice and lifestyle recommendations based on the patient's real-time health data, medical history, and chronic conditions.

Scalability:

Cloud Infrastructure for Scalability

- Cloud Hosting: Use scalable cloud platforms such as AWS, Google Cloud, or Microsoft Azure, which offer flexibility in scaling resources (compute power, storage, etc.) based on demand.

Data Analytics and Insights at Scale

- Big Data Analytics: Use big data frameworks such as Apache Hadoop or Apache Spark for analyzing large datasets, enabling the generation of insights from the growing number of patients and data points.

Impact & Benefits

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Impact:

Better Disease Management:

- **Personalized Help**: The AI provides specific advice based on each patient's health information. For example, it might suggest certain foods to eat or changes to their medication to help them manage their condition better.
- **Ongoing Monitoring:** The AI keeps track of health data continuously, spotting problems early and suggesting changes before they become serious.

Improved Health Outcomes:

- **Better Control**: With personalized advice and real-time feedback, patients can keep their conditions under control more effectively, leading to better overall health.
- **Fewer Emergency Visits**: By catching potential issues early, the AI can help prevent severe health problems, reducing the need for emergency trips to the hospital.

Benefits:

- **Deployment:** We realized that strategically integrating edge and cloud computing is vital for optimizing real-time processing capabilities and ensuring robust scalability of the system.
- **Data Integration and Model Development:** Combining data from wearables, EHRs, and self-reports gives a full picture of patient health. This dataset allows advanced AI models to generate accurate health insights and actionable recommendations, enhancing overall care.

Cost Benefit Analysis

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- According LASI, about 75 million elderly persons above age 60 in India, suffer from chronic diseases
- On average, patients aged 60+ with chronic conditions visit the hospital an average of 4 times per year, costing an average of ₹27,500(BioMed Central)
- If the number of avoided emergency visits could be approximately 1000/year. This would lead to an estimated savings of ₹2.75 crore.
- Assuming there is 200 visits per year avoided among the 60+ population, the app could lead to savings of ₹ 28.129 lakh/year and ₹10 lakh is spent for development of the app.

ROI and Net Profit

- ROI: 181.29%
- Net Profit = ₹28.129 lakh – ₹10 lakh = ₹18.129 lakh
- ROI Calculation:₹18.129 lakh / ₹10 lakh) × 100 = **181.29%**

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Thank You