INSTITUTION'S INNOVATION COUNCIL
(Ministry of HRD Initiative)

Future Institute of Technology

WEARABLE AI FOR EARLY DETECTION OF PARKINSON'S & ALZHEIMER'S DISEASE

PRESENTED BY : PENTAGON

DEPARTMENT - CSE(AIML)
YEAR - 3RD YEAR

MEMBERS NAME:
ESHIKA GIRI
KIRTIKA DHAR
SHRUTI DAS
SWEEKRITI BISWAS
TUNEER MUKHERJEE

INTRODUCTION

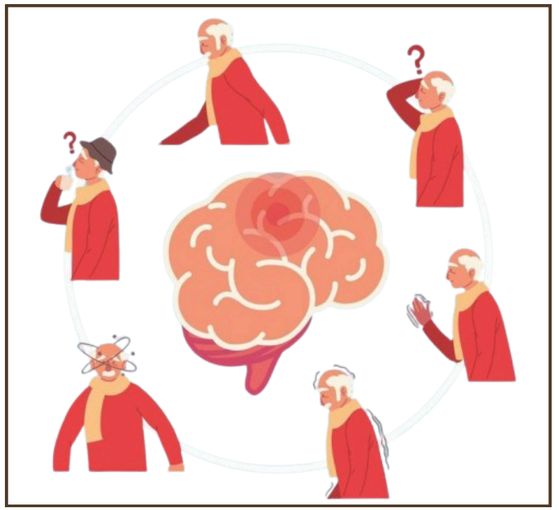
“Alzheimer’s and Parkinson’s disease are progressive neurodegenerative disorders that affect millions of people worldwide.”

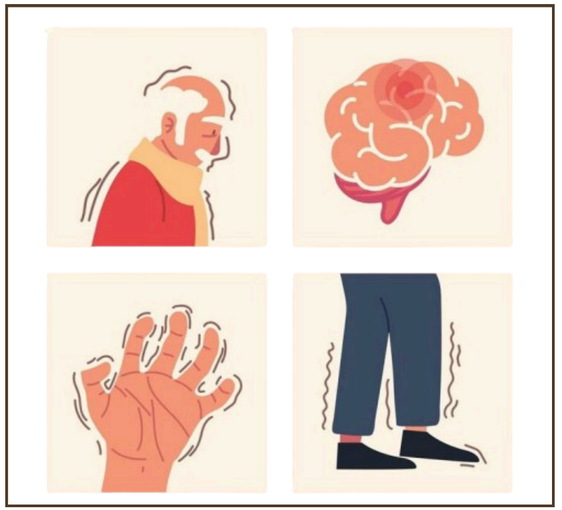
- **Alzheimer’s** causes memory loss and cognitive decline, while **Parkinson’s** affects movement, leading to tremors, stiffness, and balance issues. Both diseases worsen over time and often go undiagnosed until significant neurological damage has occurred.

- **Early detection** is crucial as it allows for **timely medical intervention**, **slows disease progression**, and **improves quality of life**. It helps families **plan for long-term care**. However, traditional diagnostic methods rely on clinical observations and tests that may not detect symptoms early enough.

- Our AI-powered watch detects early signs of Alzheimer’s and Parkinson’s through **motion tracking**, **speech analysis**, and a **task scheduler**.

- It enhances **safety with GPS**, **emergency alerts**, and aids symptom relief via **neurostimulation therapy**, providing real-time health insights for patients, caregivers, and doctors.





HOW OUR WEARABLE AI WORKS

Data Collection & Monitoring

- **Motion Sensors**: Detect tremors and gait abnormalities.
- **Speech Analysis**: Tracks voice modulation, hesitation, and slurring.
- **Heart Rate & Stress Sensors**: Monitor nervous system irregularities and emotional distress.

Connectivity & Data Sharing

- **Cloud Storage & AI Reports**: Securely stores data and tracks disease progression over time.
- **Caregiver & Doctor Access:** Enables real-time health monitoring and remote intervention.
- **Custom Alerts:** Notifies users and caregivers of critical health trends.

Continuous Learning & Adaptation

- **AI Model Updates**: Enhances detection accuracy.
- **Adaptive Monitoring**: Customizes tracking by disease stage.
- **User Feedback Integration**: Refines usability & alerts.

AI-Driven Analysis

- **Machine Learning**: Analyzes movement and speech for early disease markers.
- **Anomaly Detection**: Identifies behavioral deviations and alerts caregivers.
- **Predictive Insights**: Warns of potential neurological decline based on trends.

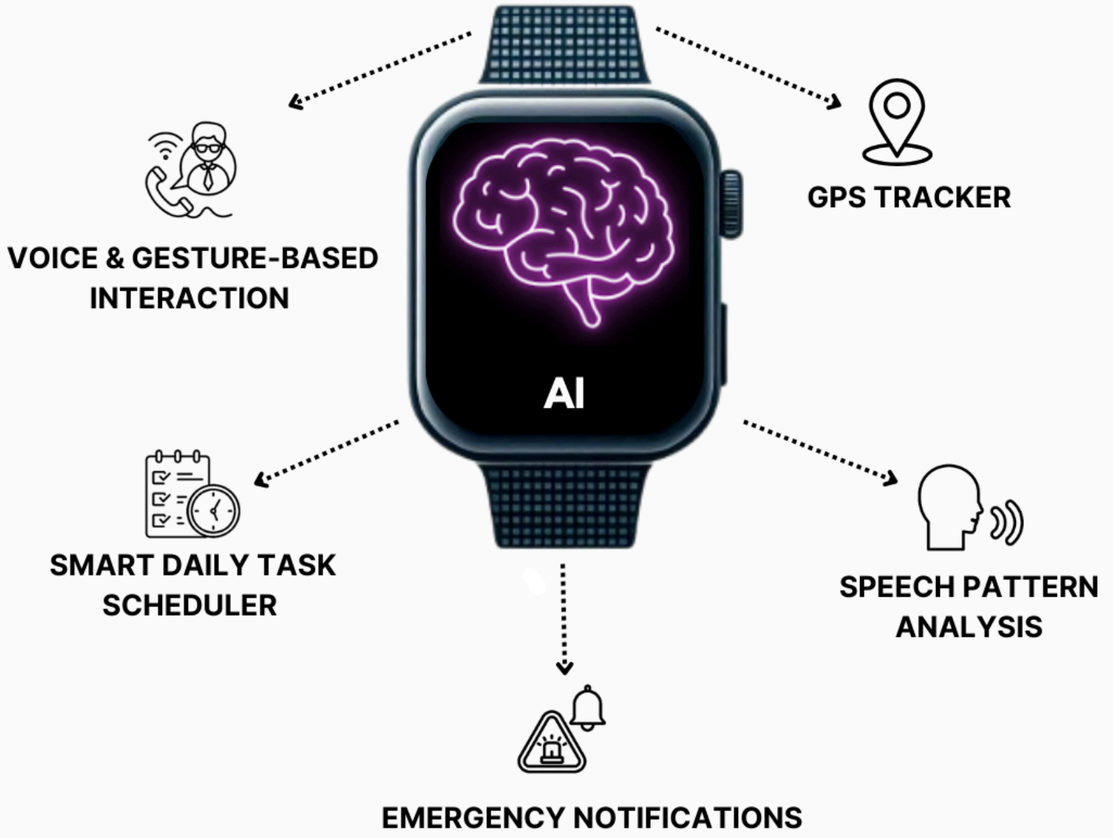
Smart Assistance

- **Emergency Alerts & GPS Tracking:** Detects falls, prevents wandering.
- **Task Reminders:** Assists with schedules daily routines.
- **Voice Interaction:** Enables hands-free navigation for easier usability.

INNOVATIVE ENHANCEMENTS

- Detects speech changes like **hesitation**, and **slurring**, indicating **cognitive** and **motor decline**.
- Gesture controls help patients with **tremors** for smoother **interactions**.

- Monitors missed **medications**, **appointments**, or **incomplete tasks**, **detecting memory impairment** and **motor difficulties.**
- Tracks delays in task execution, indicating cognitive decline and reduced motor control.



- Recognizes **wandering behavior** or abrupt stops, common in both conditions.
- **Sends alerts** if the patient strays from familiar locations or experiences mobility difficulties.

- Detects **speech hesitation**, **monotone voice**, and **slowed speech**, early markers of **Alzheimer's** and **Parkinson's**.
- Analyzes changes in **vocabulary**, **sentence structure**, and **voice modulation** to assess **neurological health.**

- Identifies **sudden falls**, **tremors**, and **changes in movement patterns**, signaling motor impairments and cognitive decline.
- Detects **restlessness**, **disorientation**, or **slow movements**, **triggering** alerts for caregivers.

TECHNOLOGY STACK

Hardware Components

- **Biometric Sensors**: Track heart rate, temperature, and oxygen levels for physiological changes.
- **Motion Sensors**: Monitor gait, balance, and tremors using accelerometers & gyroscopes.
- **Speech Processing Units**: Analyze voice patterns for cognitive and speech impairments.
- **GPS Module**: Enables real-time location tracking and safety alerts.
- **Edge AI Chips**: Process sensor data in real-time for faster insights without cloud reliance.

Software & AI models

- **Machine Learning Frameworks:** TensorFlow, PyTorch for detecting speech irregularities and movement patterns.
- **Neural Networks:** LSTM & CNN models for analyzing cognitive function using speech and motor data.
- **Cloud Computing:** AWS, Google Cloud, Firebase for secure data storage and remote monitoring.
- **Mobile & Web Applications:** Flutter for cross-platform mobile apps, React for web dashboard interfaces.
- **Embedded Software for Wearable Device:** Arduino, Raspberry Pi, ESP32 for on-device AI processing in real-time.

ETHICAL CONSIDERATIONS & SOLUTIONS

Data Privacy & Security
- Sensitive Health Data
- End-to-End Encryption
- User Control

Reliability & Accuracy
- Medical-Grade Precision
- Continuous Model Updates

Informed Consent
- Transparency
- Opt-in Mechanism
- Easy Opt-Out

Autonomy & Human Oversight
- AI as an Aid, Not a Replacement
- User Empowerment

Bias & Fairness in AI
- Diverse Training Data
- Bias Mitigation

Ethical AI Deployment & Regulation
- Compliance with Health Regulations
- Independent Audits

Accessibility & Inclusivity
- Affordable Solutions
- User-Friendly Design

SOCIETAL IMPACT

Early Detection & Prevention

- Identifies Alzheimer's & Parkinson's symptoms before they worsen.
- Helps doctors start treatment sooner, improving patient outcomes.
- Reduces long-term healthcare costs by delaying disease progression.

Improved Quality of Life

- Supports independent living with smart assistance.
- Reduces stress by offering continuous health monitoring.
- Enhances daily functioning with reminders and symptom management.

Advancing Medical Research

- Generates real-world health data for studying neurodegenerative diseases.
- Helps researchers improve early diagnosis techniques.
- Supports AI-driven medical advancements in brain health.

Raising Awareness & Reducing Stigma

- Encourages early screening and proactive health management.
- Educates the public on the importance of brain health.
- Reduces fear around Alzheimer's & Parkinson's.

Caregiver & Family Support

- Provides real-time health updates to caregivers and doctors.
- Reduces the burden of constant supervision with automated alerts.
- Increases safety with fall detection and GPS tracking

Affordable & Accessible Healthcare

- Offers a cost-effective solution for disease monitoring.
- Expands access to healthcare, especially in underserved areas.
- Reduces hospital visits through home-based monitoring.

CONCLUSION

- **Wearable AI** revolutionizes early detection and proactive management of Alzheimer’s & Parkinson’, enabling timely intervention.

- Our **AI-powered innovations** ensure **real-time monitoring**, enhanced safety, and personalized assistance, improving patients' quality of life.

- By integrating **ethical safeguards**, including **data privacy** and user consent, we ensure a responsible, transparent, and impactful healthcare solution.

- This **cutting-edge technology** not only empowers individuals and caregivers but also advances medical research for better neurodegenerative disease management.

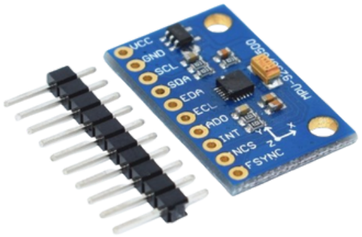
REFERENCE

1. Artificial intelligence in Parkinson's disease: Early detection and diagnostic advancements-Vol.99, Issue August 2024.
2. Revolutionizing the Early Detection of Alzheimer’s Disease through Non-Invasive Biomarkers: The Role of Artificial Intelligence and Deep Learning-Issue 22 April 2023.
3. Smartwatch data and AI aid early Detection of Parkinson's Disease-Issue 7 July 2024
4. Science & Tech Spotlight: At-Home Tools to Diagnose Alzheimer's, Parkinson's, and Related Diseases- Issue 25 March 2024

THANK YOU

INNOVATION SHOWCASE

ACCELEROMETER-GYROSCOPE TREMOR ALERTS

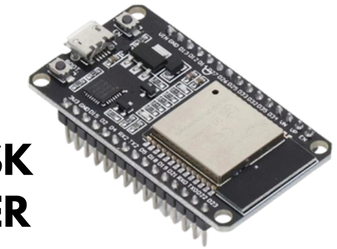


VOICE ASSISTANT & SPEECH RECOGNITION

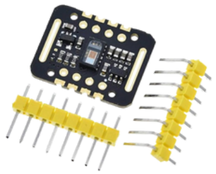
SMART NOTIFICATION SYSTEM

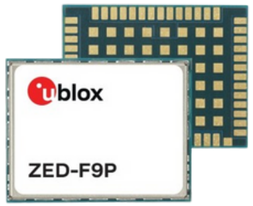
EMERGENCY ALERT SYSTEM

DAILY TASK SCHEDULER



HEART RATE MONITOR





GPS TRACKING MODULE