



Using Computer Vision for Early Detection of Cognitive Decline via Sleep-Wake Data

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Introduction to Alzheimer's Disease and Related Dementias (ADRD)



Overview



Statistics & Impact



Solution?

Alzheimer's
Disease and
Related
Dementias
(ADRD)

Statistics and
growing impact
on the aging
population

Importance of
early
detection and
intervention



The Role of Sleep-Wake Disorders in Alzheimer's Disease and Related Dementia (ADRD)

Role of Sleep-Wake Disorders

```
graph TD; A[Role of Sleep-Wake Disorders] --- B[Sleep Apnea?]; A --- C[Insomnia?]; A --- D[Hypersomnia?]
```

Sleep Apnea?

Insomnia?

Hypersomnia?

What do studies say on sleep disturbances and their early indication of ADRD?





Current diagnostic methods and their limitations.

- ★ **1. Clinical/Cognitive Assessments**
 - **Tools:** MMSE, MoCA, CDR. (miss early stages.)
- ★ **2. Biomarkers**
 - **CSF:** A β 42, p-tau (invasive, costly).
 - **Blood tests:** Promising but not standardized.
- ★ **3. Neuroimaging**
 - **MRI:** Atrophy (late-stage only).
 - **PET:** Amyloid/tau (expensive, limited access).



Why early detection matters?



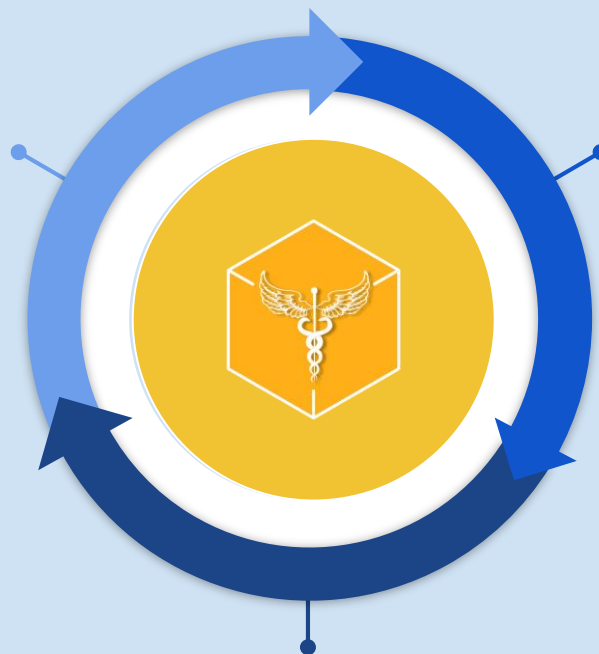
Why early detection matters and the need for non-invasive, scalable solutions

- **Maximizes Treatment Efficacy:**
 - Disease-modifying therapies (e.g., anti-amyloid drugs) work.
- **Stops/Delays Progression:**
 - Early intervention (lifestyle, drugs) slow cognitive decline.
- **Improves Quality of Life:**
 - Allows patients/families to plan care, join clinical trials, and access support sooner.
- **Reduces Healthcare Burden:**
 - Late-stage care costs are 3–5× higher than early management.



AITCare's Vision-Based Approach

Key features: non-wearable,
real-time, and NVIDIA edge
computing

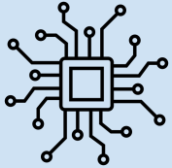


Introduction to
AITCare-Vision

How we use sleep-wake data collected
through computer vision, AI, and ML



Technological Foundations: Computer Vision and Sleep-Wake Disorders



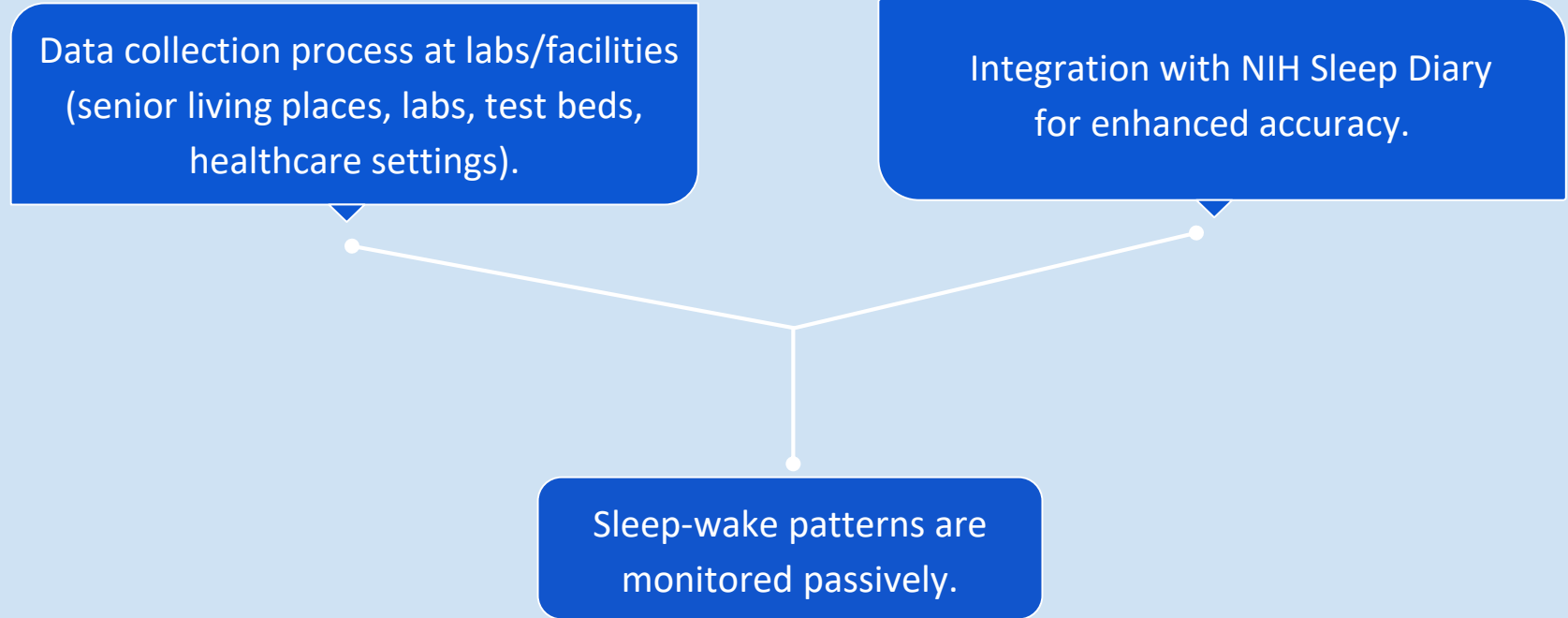
Embedded vision and its role in monitoring sleep-wake behaviors



Sensors used - RGB/Infrared cameras, thermal temperature sensors



Data Collection Process



AI & Machine Learning for Predicting Alzheimer Disease and Related Dementia (ADRD)



The Science Behind It

Sleep-ADRD Link:

1. Disrupted REM/slow-wave sleep correlates with amyloid/tau accumulation
2. Circadian fragmentation → 30% higher ADRD risk

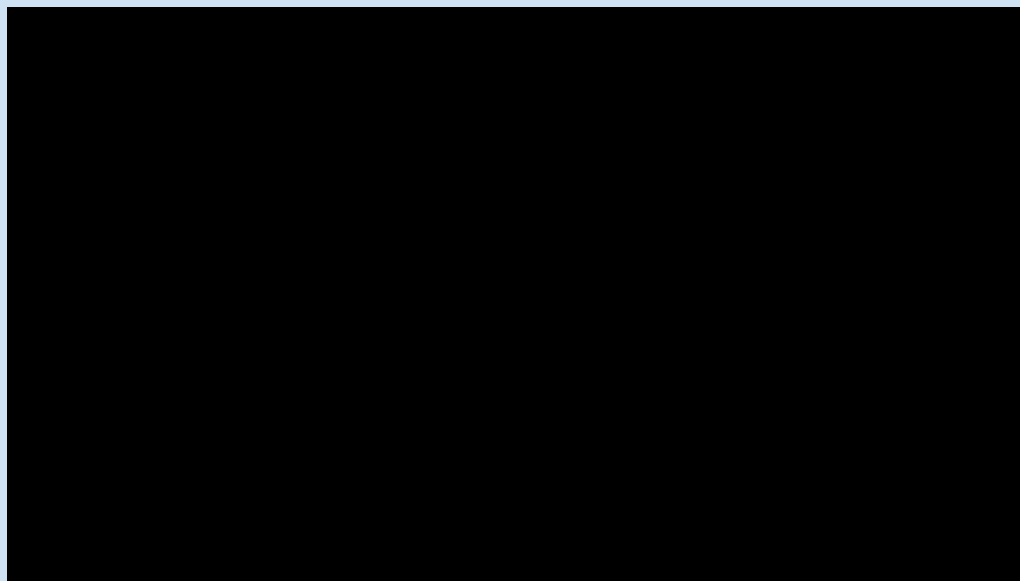


Key Tracked Parameters

Data Sources	Data Param(s)	Outputs
RGB/Infrared Sensors	Minute movements, Bed-bathroom routines, sleep-wake, break times, respirations, sleep posture etc.	Sleep stage prediction, ADRD risk score,
Thermostat	Room temperature	Circadian disruption

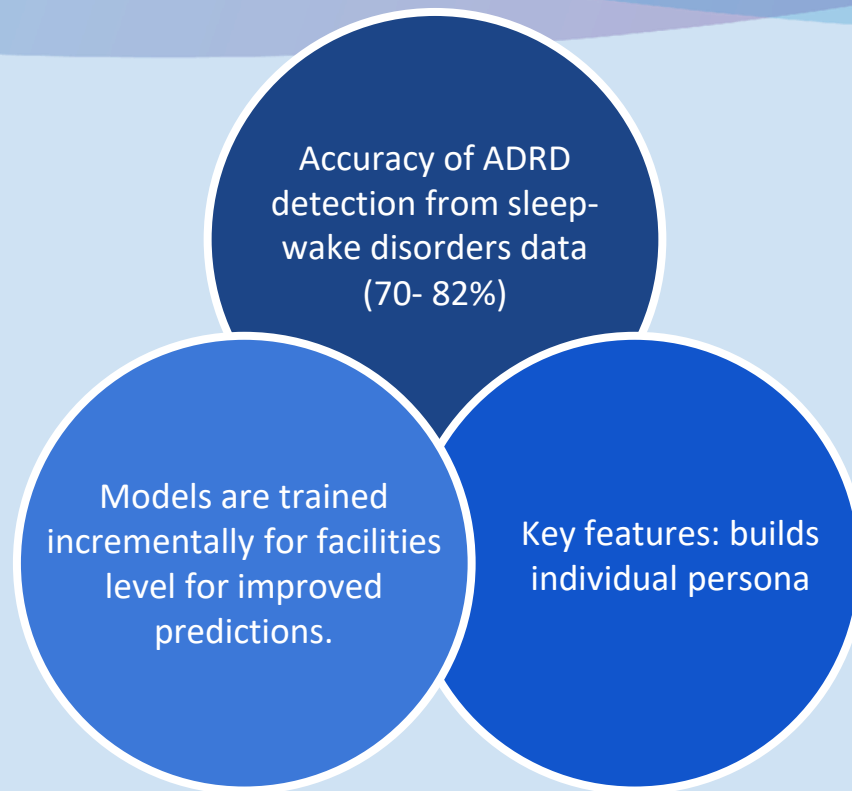


1 min Demo Video



AITCare-SleepVision Demo





Privacy and Data Security

1

HIPAA compliance and Data Security.

2

Edge processing ensures privacy and minimal data transfer to the cloud

3

FDA regulation followed



Future Roadmap: Scaling the Solution



Expanding AITCare-Vision to more facilities



Next steps in making AITCare-Vision as Software As Medical Device (SaMD)



Key Takeaways: Passive AI for Alzheimer Disease Related Dementia Detection

Silent Signals Matter

1 *“ADRD manifests in subtle behavior changes long before clinical symptoms—ambient sensors catch what humans miss.”*

Privacy-Preserving AI Works

2 *“Federated learning enables early detection without compromising personal data (no video/audio storage).”*

The Future is Preventive

3 *“Homes that monitor brain health will become as standard as smoke detectors.”*



My Thought

“Everyday household devices will evolve into multi-functional guardians of health”



