NeuroMapping: Early Cognitive Safety in Rural Communities

An affordable, open-source, AI-driven system designed to detect Early cognitive risks and empower communities in low-resource settings.

> Mapping cognitive risk, empowering communities, building open science.

The User Problem: Cognitive Decline Goes Undetected

High Prevalence

Elderly individuals in rural settings frequently begin to exhibit early cognitive issues, often dismissed as normal aging.

Access Barrier

Thereis severelylimited access to specialist neurologists or advanced diagnostic equipment in remote, rural areas.

Detection delayed

Cognitive risks often progress significantly before a diagnosis can be made, reducing the efficacy of potential interventions.

The Solution: NeuroMapping Low-Cost and Effective

NeuroMapping provides a highly scalable and cost-effective approach to early detection using readily available, low-cost hardware.

Wearable EEG Capture

Utilising a low-cost, off-the-shelf EEG headband to accurately capture relevant brain activity patterns.

AI-Powered Analysis

A sophisticated, fully software-based AI system calculates risk scores, identifying subtle patterns indicative of decline.

Actionable Dashboard

Caregivers receive an intuitive dashboard with clear risk heatmaps and explicit, actionable recommendations.

Art of Risk Detection: AI-Powered Analysis

Our machine learning architecture is designed for robust performance on noisy, low-resource data, ensuring trustworthy results.

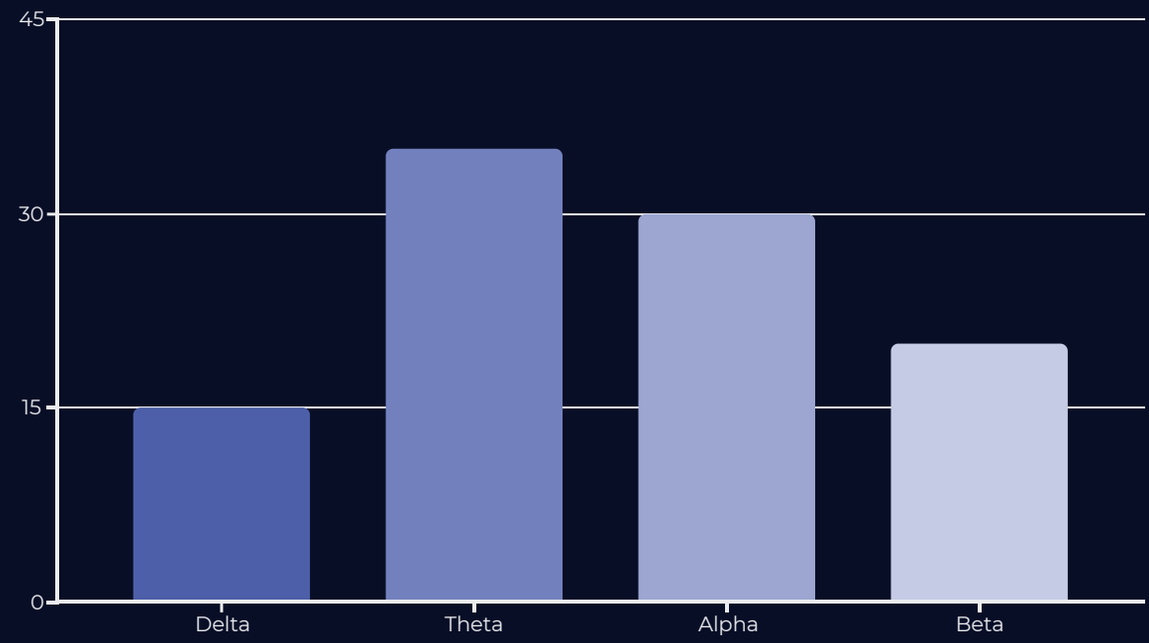
> The model processes both spatial location and temporal changes in brain activity, providing a deep, comprehensive risk profile.

Enable Model

A CNN (Convolutional Neural Network) and Transformer ensemble extracts complex spatial and temporal EEG patterns.

Interpretable

The system generates confidence intervals alongside risk scores, offering transparent and scientifically sound data for review.



Report

Translating complex biometric data into simple, visual, and actionable steps for immediate implementation by community caregivers.

Risk Score

Clear, numerical risk assessment, e.g., 'Risk Score 73% (Medium),' with a 95% confidence interval for reliability.

Specialist Referral

Automated recommendations for necessary steps, such as an immediate neurologist or GP referral based on severity.

Cognitive Exercise

Suggestions for targeted cognitive exercises and lifestyle adjustments that can be integrated into daily care routines.

Track Progress Over Time: Logistical Monitoring

Regular assessments allow caregivers and community health workers to monitor cognitive risk trends, facilitating proactive care.

By tracking data over weeks and months, NeuroMapping enables:

- Timely, data-driven interventions.
- Informed decisions about care pathways.
- Visualisation of positive (or negative) progression over time.
- Measurement of the efficacy of introduced cognitive support programmes.

Pillar of the Project: Open Science and Ethics

Our deployment is guided by a commitment to ethical practice, full transparency, and global accessibility.

Transparency

The prototype stage is clearly marked as 'not clinically validated.' All reports and data processing are open-source and documented.

Documentation-First

All project outputs from letters to code and reports are designed as reusable, educational, and open-source artifacts.

Open Source and Ethical

The entire solution is designed to be low-cost, accessible, and easily adaptable to different resource-constrained environments.

Co Quality Impact Global Scalability

Maximizing awareness and engagement locally ensures the system is effectively adopted and highly replicable worldwide.

Awareness Workshop

Conducting sessions for 30 participants, using gamified engagement techniques to enhance education and understanding.

Global Potential

The low-cost, open-source nature means NeuroMapping can be rapidly and ethically replicated across different international settings.

Key Metric Tracked

We track participation rates, number of assessments conducted, peer education reach, and overall community awareness improvements.

Execution Road: From Concept to Continuity

A phased approach ensures robust development, ethical community integration, and comprehensive documentation for future scaling.

Part 1: Prototype Development

Build a working low-cost prototype (architecture diagram, code, simulation graphs, GitHub repo).

Part 2: Community Engagement

Pilot design in clinics/villages, conduct awareness workshops, and collect early social impact proof (quotes, photos).

Page 3: Documentation Ethics

Finalise 1-page summary, draft ethical statement, and package all technical and community commitments.

Part 4: Endorsement

Acquire signed endorsement letters from academic reviewers, community leaders, and international NGO partners.

Page 5: Submission

Package all artefacts for final submission, including demo video, pitch deck, and verified GitHub links.

Next Steps:

Clear next steps, risk mitigation, and ongoing commitments ensure responsible deployment and lasting community benefit.

Initial Term

Assemble core team, finalise prototype hardware choices, and prepare community pilot sites and materials.

Short term

Run pilots, collect longitudinal data, refine models, and gather community feedback and initial endorsements.

Middle term

Package documentation, recruit reviewers, submit for ethical review where required, and prepare hackathon/demo materials.

Longer term

Scale replication, support local maintainers, and integrate validated clinical pathways if supported by research outcomes.

KeyRisk

Data privacy concerns, potential model bias from limited data, and the gap between prototype performance and clinical validation.

Mitigation

Privacy-by-design, transparent documentation, community consent processes, local capacity building and conservative clinical disclaimers.

Ethical consent

Keep all code and documentation open; clearly label prototype status; engage local leaders and ethics boards before clinical use.

Please note: This project is a research-stage prototype. It is not a clinical diagnostic tool. All deployments must follow local ethical approvals and informed consent practices.