

AI for Bharat Hackathon

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Team Name : NeuroVision

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Problem Statement : AI for Healthcare & Life Sciences

(NeuroScan AI - Predicting Strokes & Dementia Years Before)

Brief about the Idea:

NeuroScan AI - Predicting Strokes & Dementia Years Before Symptoms Appear

THE PROBLEM:

- India: 1.8 million strokes annually (75% preventable)
- Rural areas: 1 neurologist per 250,000 people
- Current diagnosis: Reactive (after symptoms appear)
- Hidden information: Brain MRI contains predictive biomarkers invisible to radiologists

THE OPPORTUNITY:

- Research proves: Brain changes appear 5-10 years before stroke/dementia
- Technology gap: Breakthrough AI stuck in research labs, not reaching rural India
- Cost barrier: Traditional neurological screening costs ₹15,000+

OUR SOLUTION:

- NeuroScan AI analyzes brain MRI scans using deep learning to predict stroke and dementia risk years in advance, making advanced neurology accessible to 25,000 Primary Health Centers across India at ₹200 per screening.

How It's Different:

Existing Solutions

Focus on single conditions
Black-box AI with no explanations
Cost ₹2,000+ per consultation
Require stable internet connectivity
English-only interfaces
Desktop-dependent systems

NeuroScan AI

7 comprehensive assessments in one scan
Visual explanations showing brain regions at risk
₹200 per screening - 90% cost reduction
Offline report viewing for poor connectivity
Multi-language support - Hindi & regional languages
WhatsApp sharing for rural accessibility

Our USP:

The only AI solution combining comprehensive multi-condition brain analysis, visual explainability, and rural-first design at the cost of a basic health checkup.

List of features offered by the solution:

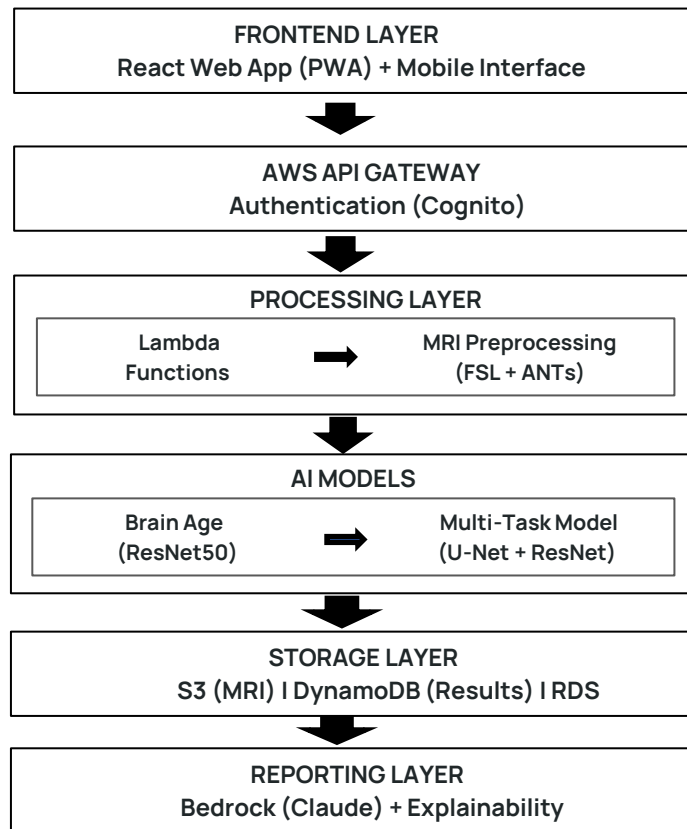
7 AI-Powered Assessments:

- Brain Age Estimation - Detects accelerated brain aging
- White Matter Disease Detection - Identifies vascular damage
- Silent Stroke Identification - Finds unnoticed micro-strokes
- Brain Atrophy Analysis - Measures brain shrinkage
- Microbleed Detection - Spots tiny hemorrhages
- Stroke Risk Prediction - 5-year and 10-year probabilities
- Dementia Risk Assessment - Alzheimer's and vascular dementia

Patient-Centric Features:

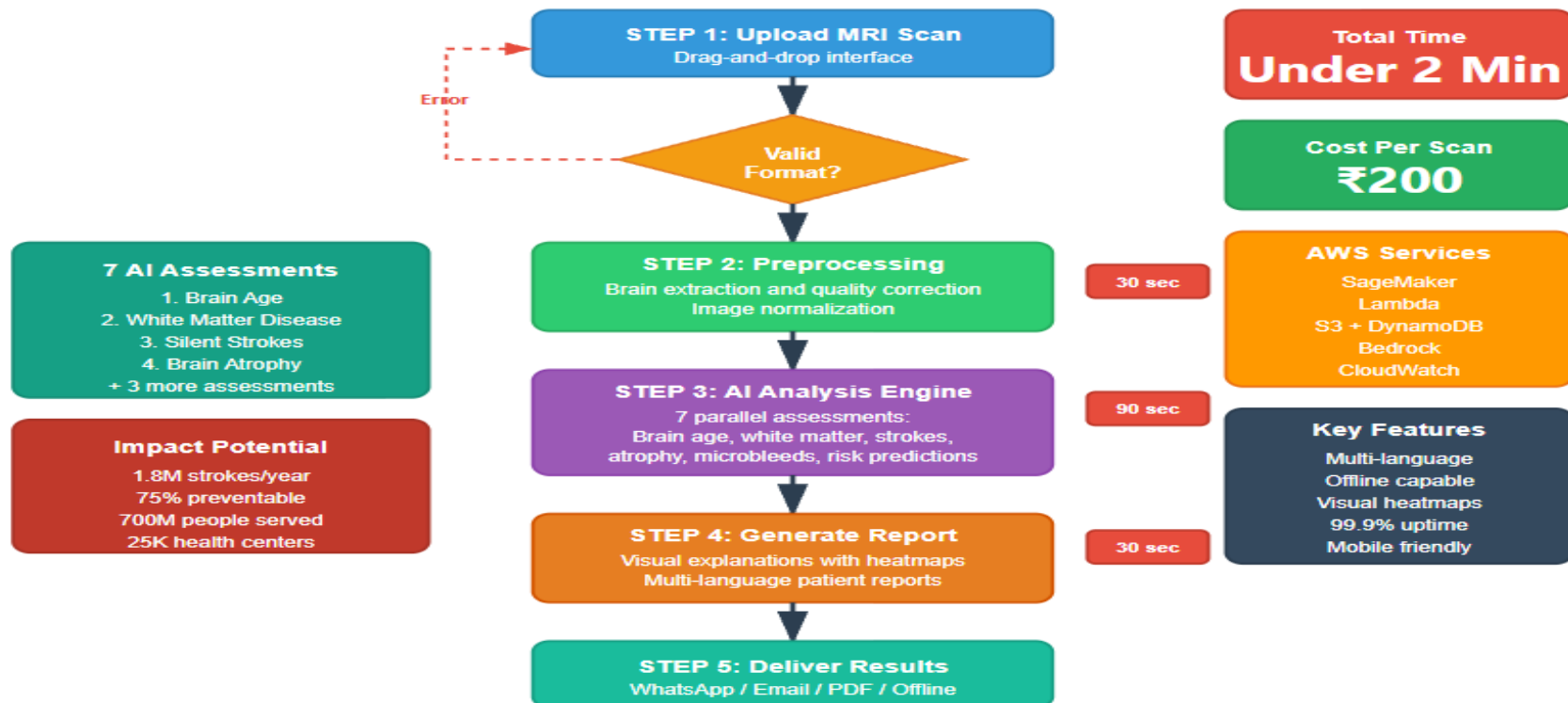
- Under 2 minutes total processing time
- Visual heatmaps showing affected brain regions
- Dual reports - Technical for doctors, simple for patients
- Percentile rankings compared to age-matched population
- Actionable recommendations for risk reduction
- Multi-language support for patient understanding
- WhatsApp/Email/PDF sharing for easy distribution
- Offline viewing for areas with poor connectivity

Process Flow Diagram



Process flow diagram or Use-case diagram:

NeuroScan AI - Process Flow



Architecture diagram of the proposed solution:

Cloud-Native Healthcare Platform

Frontend Layer:

- React Progressive Web App with offline capability

Mobile and tablet responsive design

• **API & Security:**

- AWS API Gateway for routing
- AWS Cognito for authentication
- AES-256 encryption

Processing Engine:

- AWS Lambda for orchestration
- AWS SageMaker for AI inference
- FSL and ANTs for MRI preprocessing

AI Models:

- 3D ResNet50 for brain age
- 3D U-Net for lesion detection
- Ensemble models for risk calculation

Storage:

- Amazon S3 for encrypted MRI storage
- DynamoDB for fast metadata access
- RDS for user and audit data

Reporting:

- AWS Bedrock for multi-language reports
- Grad-CAM for visual explanations

Monitoring:

- CloudWatch for system health
- Auto-scaling for 1000+ concurrent scans

Technologies to be used in the solution:

AI & Machine Learning:

- **PyTorch** - Deep learning framework for 3D CNNs
- **3D ResNet50** - Feature extraction backbone
- **3D U-Net** - Lesion segmentation architecture
- **Grad-CAM** - Explainability visualizations
- **Ensemble Models** - Risk calculation combining multiple approaches

Medical Image Processing:

- **FSL (FMRIB Software Library)** - Brain extraction and registration
- **ANTs (Advanced Normalization Tools)** - Image normalization
- **DICOM & NIfTI** - Medical imaging format support
- **SimpleITK** - Image processing operations

AWS Cloud Services:

- **Amazon SageMaker** - AI model hosting and inference
- **AWS Lambda** - Serverless processing orchestration
- **Amazon S3** - Encrypted medical data storage
- **Amazon DynamoDB** - Fast metadata database
- **Amazon RDS** - Relational data for users and audits
- **AWS API Gateway** - RESTful API management
- **AWS Cognito** - User authentication
- **Amazon Bedrock** - Natural language report generation
- **CloudWatch** - Monitoring and logging
- **AWS KMS** - Encryption key management

Frontend & Integration:

- **React 18 with TypeScript** - Modern web framework
- **Progressive Web App (PWA)** - Offline capabilities
- **Tailwind CSS** - Responsive design
- **Chart.js** - Data visualizations
- **HL7 FHIR** - Healthcare data standards
- **DICOM Protocol** - Medical imaging integration

Estimated implementation cost

PHASE 1 - HACKATHON PROTOTYPE (20 days):

- **AWS Credits (Student):** \$100 (FREE via AWS Educate)
- **Google Drive Storage:** ₹650
- **Development:** ₹0 (self-developed)

TOTAL: ₹650 (~\$8)

PHASE 2 - CLINICAL VALIDATION (6 months):

- **AWS Infrastructure:** ₹50,000/month × 6 = ₹3,00,000
- **Clinical Partnership (NIMHANS/AIIMS):** ₹0 (collaboration)
- **Regulatory Compliance:** ₹2,00,000

TOTAL: ₹5,00,000 (~\$6,000)

PHASE 3 - PILOT DEPLOYMENT (Year 1):

- 100 PHCs × ₹10,000 setup = ₹10,00,000
- **AWS (1,000 scans/day):** ₹5,00,000/year
- **Training & Support:** ₹5,00,000

TOTAL: ₹20,00,000 (~\$24,000)

OPERATIONAL COST PER SCAN:

- **AWS Processing:** ₹150
- **Support & Maintenance:** ₹50

TOTAL: ₹200 per scan
vs Traditional Screening: ₹15,000

ROI: 75x cost reduction

VISION

NeuroScan AI: Preventing Strokes Across India

Our Mission: Making expert neurological screening accessible to every Indian through AI and cloud computing.

The Impact:

Prevent 1.8 million strokes annually

Save ₹3,750+ crores in healthcare costs

Empower 25,000 Primary Health Centers

Serve 700 million underserved rural Indians

Why This Matters: Every 40 seconds, someone in India has a stroke. With NeuroScan AI, we identify risk years early and save lives.

Add as per the requirements for the hackathon:

We use 3D convolutional neural networks for pattern recognition in brain MRI scans. This cannot be done with rule-based systems because the patterns are too complex and exist across billions of voxels in 3D space.

Why AI is Essential:

Radiologists miss 60 to 70 percent of subtle early warning signs that predict stroke 5 to 10 years in advance. AI can analyze the entire 3D brain volume comprehensively in ways humans cannot.

AWS Services Integration:

- SageMaker - AI model training and real-time deployment
- Lambda - Serverless preprocessing automation
- S3 - Encrypted medical image storage
- Bedrock with Claude - Natural language report generation
- DynamoDB - Fast results storage and retrieval
- Cognito - Secure user authentication

Responsible AI Design:

- Explainable predictions with visual heatmaps showing reasoning
- Human-in-the-loop - AI assists, doctors make final decisions
- Privacy-compliant with encryption and de-identification
- Tested across diverse populations to reduce bias
- Clear communication when system is uncertain

Training Data:

Public research datasets from OASIS, ADNI, and IXI containing over 13,000 brain scans. No private patient data used in development

Innovation partner **I12S**
HACKZESTLE

Media partner **YOURSTORY**

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Thank You

