HACKATHON PROJECT

Neuro AI Cancer Detection

Intelligent Automated Diagnosis via CNN

Presented by **Hafiz Muhammad Asnan Amar**

Presentation Agenda

01. The Hackathon Concept

Defining the scope and goal of the challenge.

02. Vision & Problem

The gap in modern healthcare diagnosis.

03. System Mechanism

The 4-stage technical architecture.

04. Technical Deep Dive

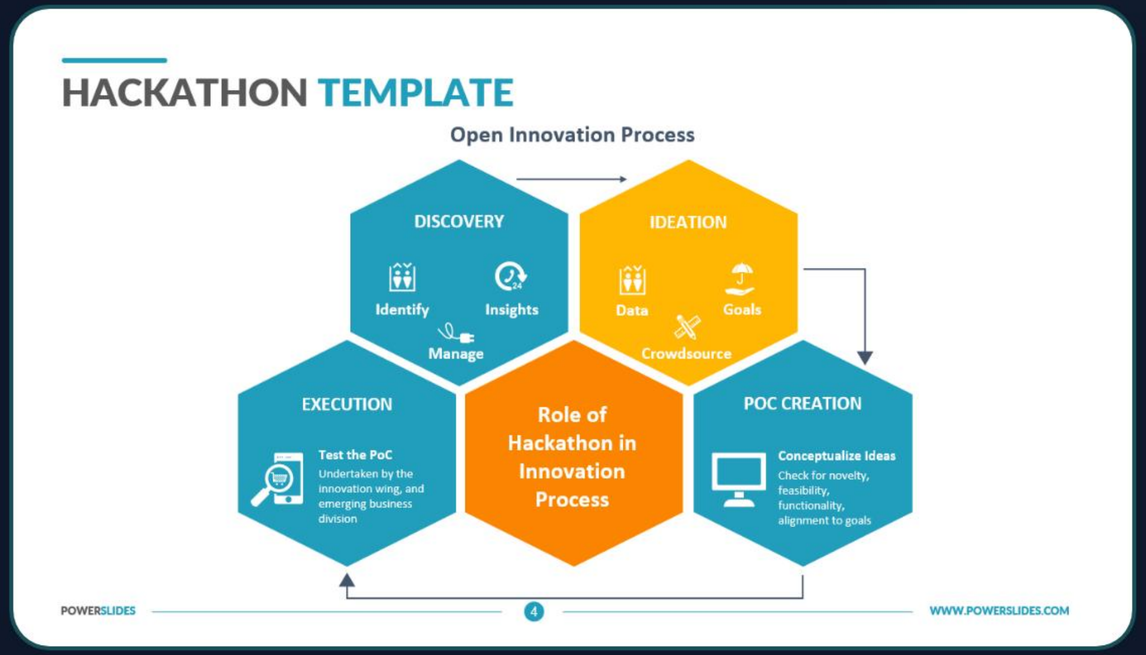
Inside the CNN layers and brain logic.

The Hackathon Foundation

Defining the prototype approach for rapid innovation.

Defining the Hackathon

- **Time-Bound:** Intense 24–72 hour competition.
- **Objective:** Build a functional prototype (Demo System).
- **Core Mission:** Solve a specific real-world problem.
- **Constraint:** Focus on proof-of-concept, not a production-ready hospital product.



Demo vs. Final Product

Goal: Prove the Idea Works

Hackathon Prototype

Working demo that demonstrates feasibility, core logic, and user flow in a limited timeframe.

Medical Grade Product

Requires clinical trials, years of testing, regulatory approval (FDA), and extreme reliability.

How Judges Evaluate Success

Problem

Is the healthcare challenge real and significant?

Innovation

Does the AI solution offer a unique approach?

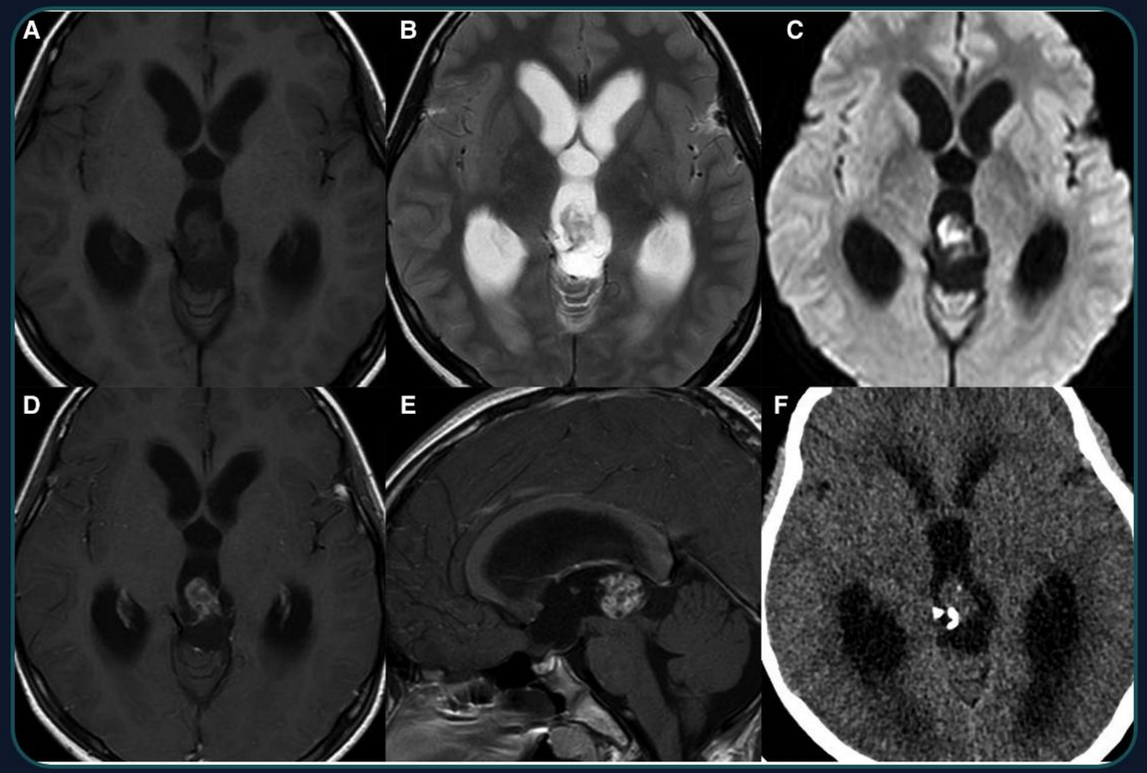
Scalability

Can the system handle larger datasets and grow?

Project Overview: Neuro AI

Automating early cancer detection using deep learning imaging.

Neuro AI Core Vision



Early Detection Saves Lives

Neuro AI mimics the diagnostic logic of a senior radiologist, providing instant screening for MRI scans to identify potential tumors with high precision.

> *"A system designed to act as an intelligent second-opinion for medical professionals."*

The "MRI Scan" Analogy

Human Doctor

Analyzes image manually, susceptible to fatigue, requires years of experience, may take minutes/hours per patient.

Neuro AI System

Analyzes image instantly, consistent 24/7 performance, learns from millions of pixels, results in seconds.

Why This Matters Now

10M

Global Cancer Deaths Annually

- Critical shortage of radiologists in developing regions.
- Delayed diagnosis leads to significantly lower survival rates.
- High margin of error due to human visual limitations.

Technical Architecture

The 4-Stage Mechanism of Neuro AI

The 4-Stage Workflow

Data Collection

Gathering Labeled MRI Scans.

Training AI

Pattern Recognition via CNN.

Prediction

New Image Analysis Phase.

Result Output

Visualization & Confidence Score.

Step 1: Data Collection

Our intelligence begins with diverse medical datasets. We utilize platforms like Kaggle and public medical repositories to source MRI scans.

These images are **labeled** as "Cancerous" or "Normal," providing the ground truth for our neural network.

The AI "Child" Analogy

Learning by Example

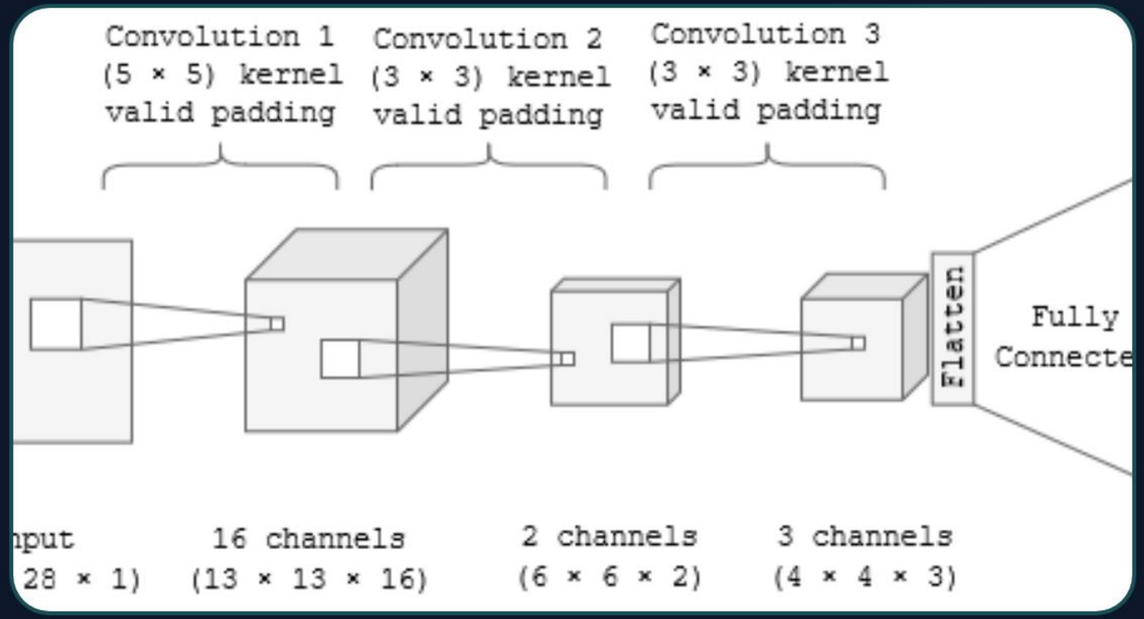
Just as you teach a child to distinguish a cat from a dog by showing them thousands of pictures, we show our AI thousands of MRI scans.

Labeled Data

Without labels, the AI is blind. With labels, it associates specific pixel patterns with medical outcomes.

Step 2: Training the Brain

- **Architecture:** Convolutional Neural Network (CNN).
- **Mechanism:** Specialized machine brain for computer vision.
- **Process:** Scans millions of images to detect invisible patterns.
- **Output:** A trained weights file representing "Medical Knowledge."



Weight Adjustment Logic

During training, the AI adjusts internal numerical values (Weights) to minimize errors.

$$\text{Loss} = \frac{1}{N} \sum_{i=1}^{N} (y_i - \hat{y}_i)^2$$

The AI minimizes the "Loss" function to increase diagnostic accuracy.

"Neuro AI finds patterns in MRI scans that are often invisible to the naked human eye."

The Prediction Phase

How the system operates in a real clinical scenario.

Step 3: Prediction Phase

Real-Time Inference

When a doctor uploads a **new** scan, the system runs it through the pre-trained weights to find matches with known cancer signatures.

- Zero training involved in this stage.
- Instantaneous processing.
- Direct comparison with learned data.

Image Sanitization

1. Resizing

Normalizing images to standard resolution (e.g. 224×224).

2. Cleaning

Removing noise and artifacts from raw MRI scans.

3. Grayscale

Simplifying color channels for structural analysis.

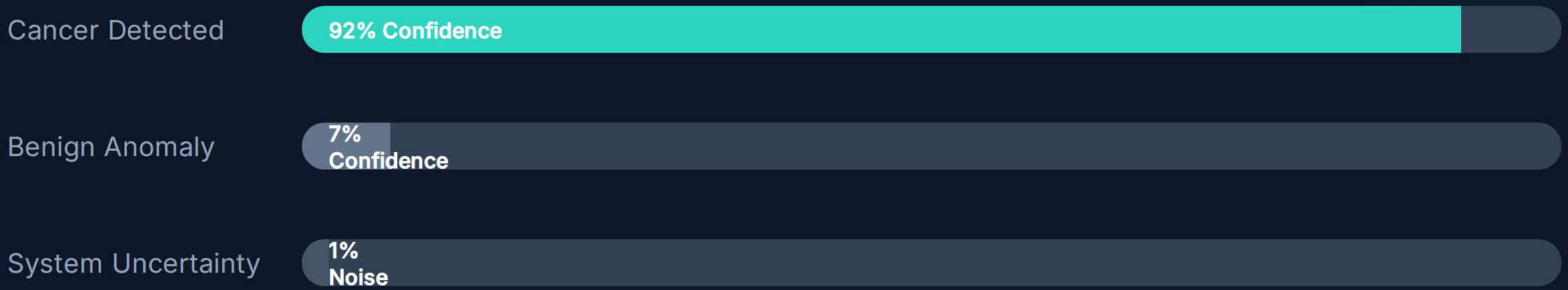
Step 4: Result Visualization

Actionable Insights

The system doesn't just say "Yes" or "No." It provides a data-rich dashboard for doctors.

- Confidence Percentage (e.g. 92% Confident)
- Tumor Region Highlight (Heatmap)
- Historical Comparison

Predictive Confidence



The output allows doctors to confirm findings with statistical backing.

Hackathon Execution Roadmap

From Dataset to Live Presentation in 72 Hours.

Day 1: The Foundation

Data Acquisition & Model Setup

Downloading 5,000+ medical images, configuring the CNN architecture, and initiating the primary training loops on high-performance GPUs.

Day 2: App Development

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Frontend & Model Integration

Building the user interface using Streamlit, connecting the backend AI model, and ensuring seamless MRI uploads and real-time inference.

Day 3: Final Pitch

Testing & Presentation

System stress-testing, bug fixing, and crafting a compelling narrative for the judges. Demonstrating a **LIVE DEMO** of the working system.

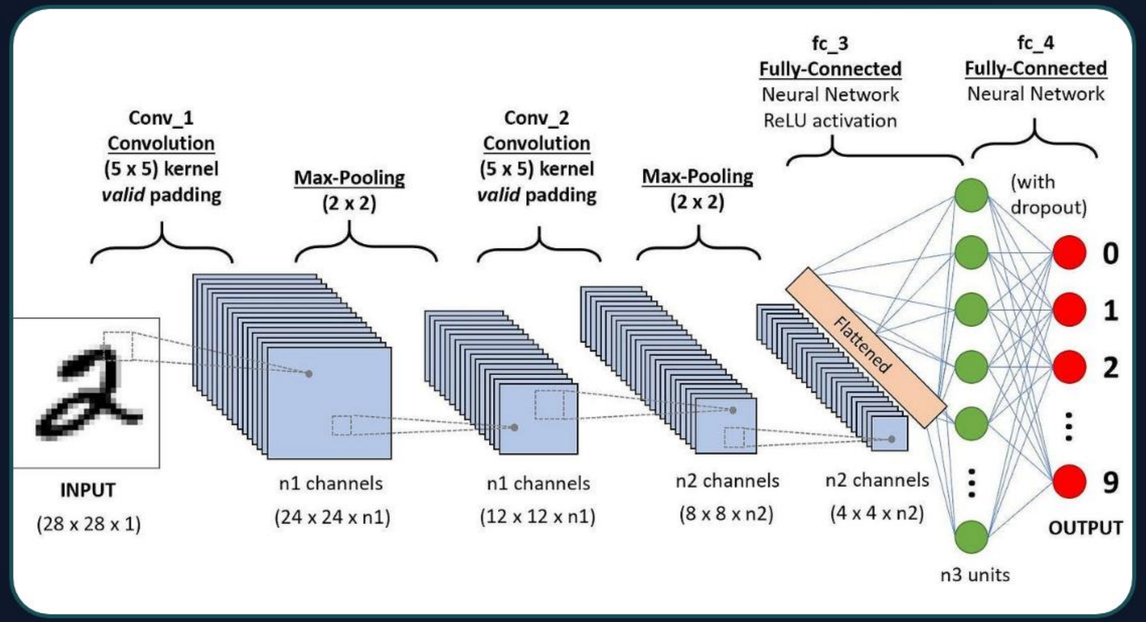
Inside the Model Brain

A layered approach to understanding Convolutional Neural Networks.

CNN Layer 1: Detection of Edges

Structural Borders

The initial layers of the CNN act like microscopic filters, identifying the basic borders and edges of tissues and bone structures within the MRI.



CNN Layer 2: Shape Recognition

Pattern Synthesis

Layer 2 combines edges into recognizable shapes. It looks for circular anomalies or irregular clusters that differ from healthy tissue geometry.

Anomaly Filtering

The AI starts to distinguish between a natural blood vessel and a potential tumor based on geometric density.

CNN Layer 3: Complex Structures

High-Level Concept Recognition

At this stage, the AI understands "Medical Context." It recognizes specific types of tumors based on texture, density gradient, and interaction with surrounding brain tissue.

The Final Layer: Decision Making

CANCER

Probability: 95%

NORMAL

Probability: 5%

The Softmax layer outputs the final classification based on the highest probability.

Healthcare Integration

Hospital Implementation

1. Hospital uploads scan to cloud server.
2. AI processes image in < 2 seconds.
3. Radiologist reviews AI-flagged scan immediately.
4. Critical cases move to top of the queue.

Why Judges Will Love This

Social Impact

Saving lives through earlier detection.

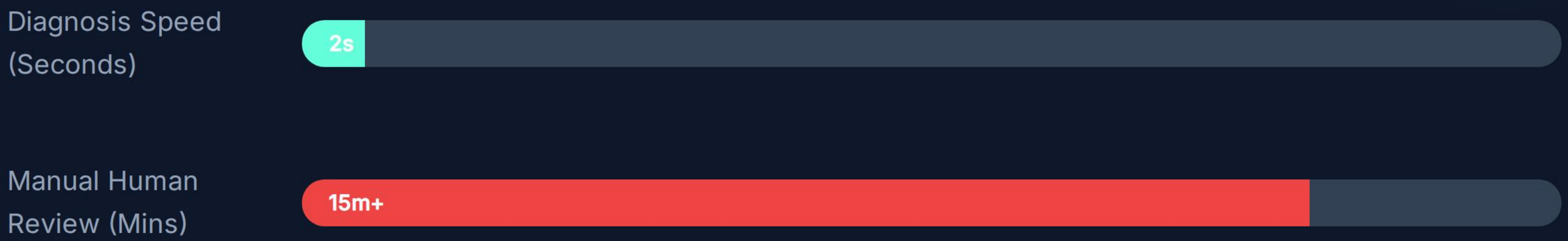
Technical Depth

Proven usage of Deep Learning & CNN.

Practical Demo

Real-time functional web application.

System Performance Comparison



Neuro AI reduces initial screening time by **99%**.

The Pitch Conclusion

"Our system uses Convolutional Neural Networks to analyze medical images and automatically detect cancer patterns. The model is trained on labeled datasets and deployed through a web interface where doctors can receive instant predictions."

Any Questions?

Thank you for your attention.

Presented by:

Hafiz Muhammad Asnan Amar

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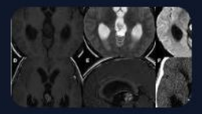

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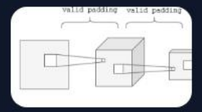

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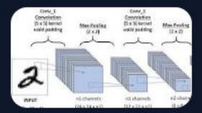

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