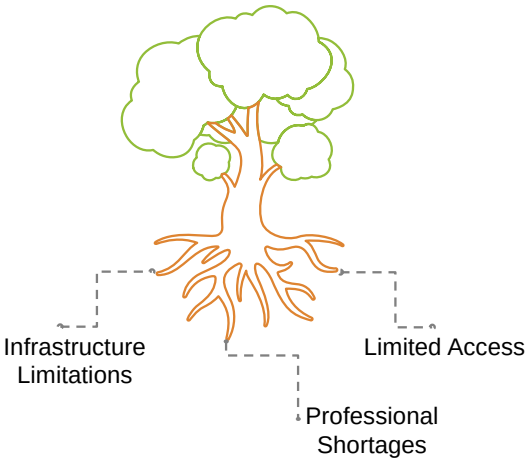
A Real-Time Point-of-Care Assistant on Raspberry Pi for Medical Diagnostics

Priyam Chakraborty[1], Wajoud Noorani[2], Suman Chakraborty[3]

[1]Department of Artificial Intelligence & AI4ICPS, IIT Kharagpur

[2]ChangeJar, [3]Department of Mechanical Engineering, IIT Kharagpur

1. Root Causes in Patient Care



2. Challenges in AI for Point-of-Care Diagnostics

Existing Solutions

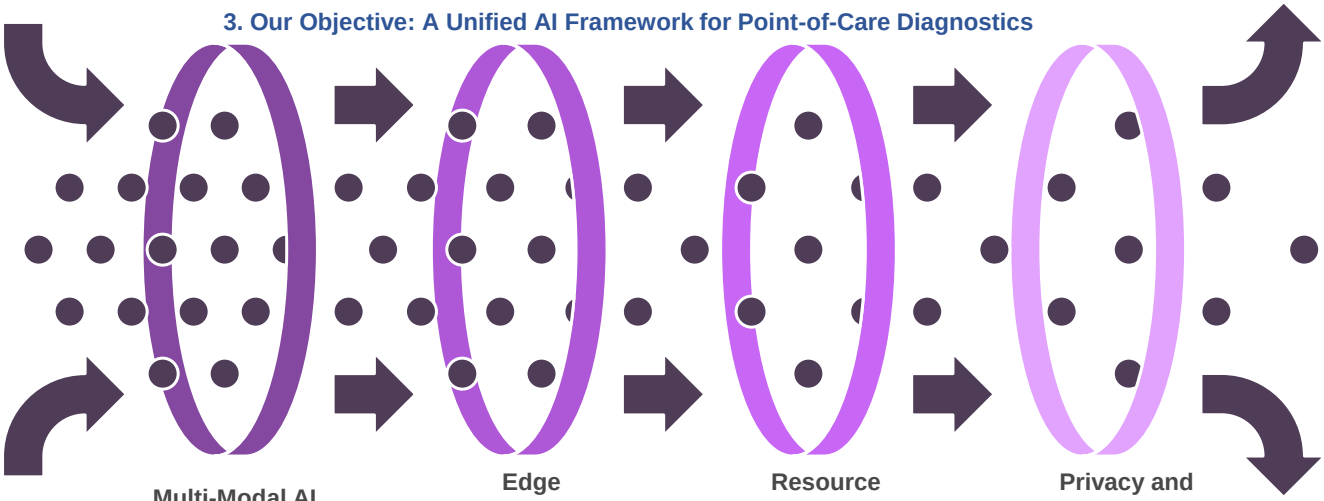
High cost, cloud dependency, single-modality

VS

Ideal Solutions

Low cost, local processing, multi-modality

3. Our Objective: A Unified AI Framework for Point-of-Care Diagnostics



Multi-Modal AI Framework

Integrating textual and visual data analysis

Edge Computing Solutions

Deploying AI models on Raspberry Pi

Resource Constraint Management

Developing solutions for limited resources

Privacy and Security Measures

Implementing federated learning for data privacy

4. Our Methodology: System Characteristics

Characteristic	Multi-Modal AI	Edge Computing	Federated Learning	Open-Source Framework
Data Support	Structured and unstructured medical data	N/A	N/A	N/A
Key Technologies	OpenBioLLM-70B, MobileNetV2, Vision Transformers	TensorFlow Lite quantization, Knowledge distillation	Differential privacy, Asynchronous updates	HL7 FHIR, DICOM, Modular APIs
Optimization	Attention-based fusion, Supervised contrastive learning	Circular buffering, Asynchronous streaming	Multi-site learning, On-device fine-tuning	Community-driven design, Extensive documentation
Performance	100% mAP in cross-modal retrieval	Real-time processing on Raspberry Pi	Privacy-preserving collaboration	Interoperability with clinical systems