

A FHIR-Native Microservices Architecture for an Integrated AI-Powered Health Assistant (AI-PHA): Design, Validation, and Regulatory Compliance in the Indian Context

Tanmay Bhatkulkar, Lachi Barse, Janhavi Tambake

MIT ADT University, Loni Kalbhor Pune

Abstract: Modern Electronic Health Record (EHR) systems frequently exhibit fragmentation, hindering interdisciplinary data flow and increasing clinical friction. This paper proposes the design and evaluation framework for an AI-Powered Health Assistant (AI-PHA) system, built on a secure, HL7 FHIR-native microservices architecture. The AI-PHA utilizes distinct, role-specific portals for Physicians, Patients, and Administrators, mitigating usability challenges inherent in generalized systems. A core component is an LLM-based triage engine integrated directly with the EHR via an agentic context protocol, designed to manage minor discomfort inquiries and provide safety-critical referrals. Crucially, the research establishes a multi-dimensional clinical validation framework, prioritizing the minimization of the highly detrimental under-triage rate over simple diagnostic accuracy.

Finally, the system's architecture is analyzed against the mandatory compliance obligations, including the necessity of operating as a Significant Data Fiduciary under the Digital Personal Data Protection (DPDP) Act, 2023, offering a blueprint for responsible AI deployment in regulated clinical environments.

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