JustIn: An Open-Source Framework for Accelerating Just-In-Time Adaptive Intervention (JITAI) Optimization

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Vision

The JITAI Technical Tax: Barriers to Scalable Innovation

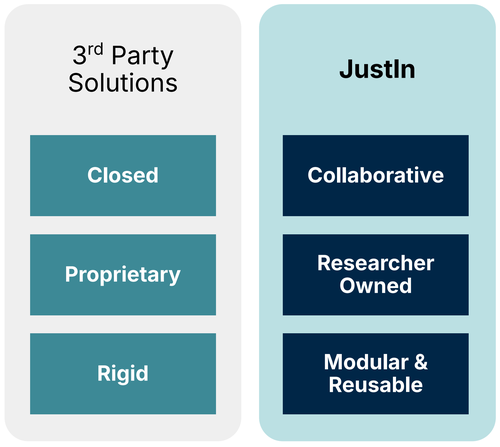
While Just-in-Time Adaptive Interventions (JITAIs) offer a transformative approach to health outcomes, the path from concept to deployment is currently blocked by a "technical tax" that drains research budgets and stalls progress.

- Prohibitive Engineering Overhead: Building JITAI ecosystems from scratch demands massive infrastructure and app development before research even begins, wasting years of potential progress.
- Non-Standardized "Disposable" Architecture: Lack of common frameworks results in hard-coded software that cannot be adapted for future studies without a total rewrite.
- Opaque "Black Box" Ecosystems: Proprietary, closed-source tools prevent modification and inspection, creating vendor lock-in that stifles collaborative innovation.
- Rigid Development Roadmaps: Novel research ideas often conflict with third-party service priorities, forcing experts to abandon innovation or invest in costly custom code.

Our Vision: Open, Autonomous, Reusable

JustIn bridges the gap between JITAI concepts and field deployment through a robust, open-source ecosystem.

- Openness: Accelerate open science through an open-source framework that eliminates financial barriers and fosters global collaboration.
- Autonomy: Empower researchers with full ownership of their software stack and data, free from vendor lock-in.
- Reusability: Provide modular scaffolding and pre-tested components that turn one-off code into scalable tools for future studies.

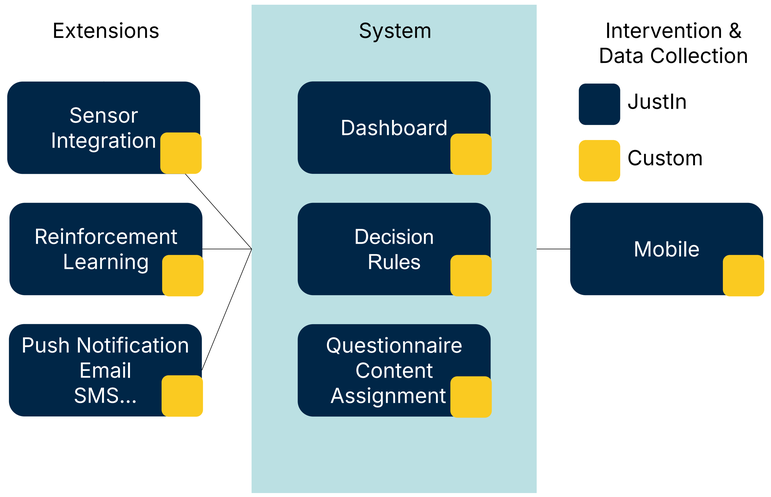


Approach

Architecture

JustIn provides a modular JITAI foundation, handling heavy engineering (blue) while allowing custom logic (yellow). This hybrid approach lets teams prioritize novel research while ensuring software remains reusable for future studies.

- Core System Scaffolding: Standardized modules for the Dashboard, Decision Rules, and Task Assignment. This "central brain" enforces a modular design that makes every study inherently reuse-friendly.
- Intervention Delivery: A reusable library of Mobile Widgets. These pre-tested components allow researchers to quickly assemble and port specialized interfaces across multiple studies with minimum custom coding.
- Plug-and-Play Extensions: A flexible interface for integrating Sensors, Reinforcement Learning, and communication channels like Email, or SMS.



From Fieldwork to Framework

JustIn is more than a software—it's a living research project. By documenting real-world deployment challenges, we continuously distill field insights into the platform's architecture, specifically engineered to streamline JITAI optimization.

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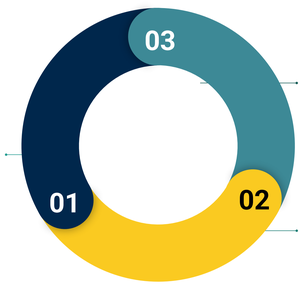
Field Deployment
Identify real-world technical barriers and participant needs.



JITAI Toolbox
An integrated ecosystem of interoperable tools to streamline the entire JITAI optimization lifecycle.

Distillation
A standardized software framework with reusable patterns.

Action & Impact

Progress & Roadmap

Framework v0.0.1: Core modular architecture is established, featuring centralized decision-rule logic hosted on GitHub and distributed via NPM.
Next Release:

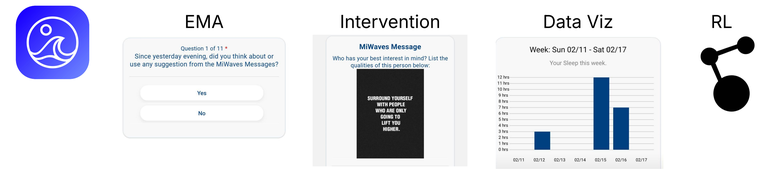
- Cross-Platform Delivery: Unified mobile components for intervention delivery and data collection on iOS and Android.
- Monitoring Hub: Real-time facility for tracking participants and JITAI performance.
- Sensor Integration: Native support for Fitbit data streams.

Future Goal:No-code interfaces for intuitive intervention authoring.

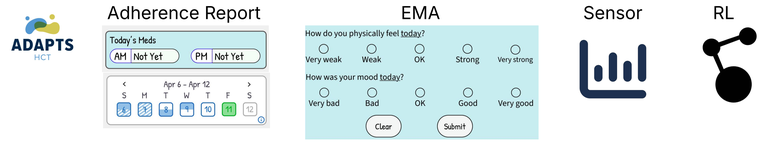
Real-World Impact

JustIn is currently being refined and validated through active NIH-funded pilot projects:

MiWaves: A JITAI designed to reduce cannabis use among emerging adults. It features twice-daily check-ins, reinforcement learning for personalized messaging, and visual feedback for self-monitoring (N=122, 30-days).



ADAPTS-HCT: A novel intervention supporting patient-caregiver dyads in post surgery adherence management. It integrates passive sensor data (e.g., Fitbit) and joint activity to improve self-care dynamics.



Build with us!

The **JustIn Consortium** is a cross-institutional coalition dedicated to bridging behavioral science, machine learning, and software engineering to optimize JITAI. We are seeking partners to test and refine JustIn.

Question? Contact Pei-Yao (peiyaoh@umich.edu)

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