VIGILANCE.AI

A Live, Agentic Pharmacovigilance Ecosystem (Track: Agentic AI with Live Data)

TEAM TECH ANALYSTS | SYNAPTIX FRONTIER AI HACKATHON 2025

PROBLEM STATEMENT

Pharmacovigilance (PV) is slow by design. Validated safety signals (adverse drug reactions, recalls, contraindications) often appear *after* real-world harm begins. In parallel, modern AI assistants suffer from **AI Amnesia**: they operate over stale indexes and only refresh after re-indexing, creating a dangerous latency gap for safety-critical workflows.

- **Delay:** Official, high-confidence PV updates do not reach clinicians/patients fast enough.
- **Real-world signals appear earlier:** Patients discuss side effects on forums/social media and in early literature feeds.
- **Stale knowledge:** Traditional pipelines require re-embed/re-index/redeploy.

- **Live ingestion & indexing:** new/edited sources become searchable within seconds.
- **Temporary safety alarms:** when early signals rise, we raise *provisional* alerts with confidence and evidence links.
- **Human-in-the-loop safety:** the system informs and escalates; it never prescribes.

SOLUTION: VIGILANCE.AI MOBILE APP

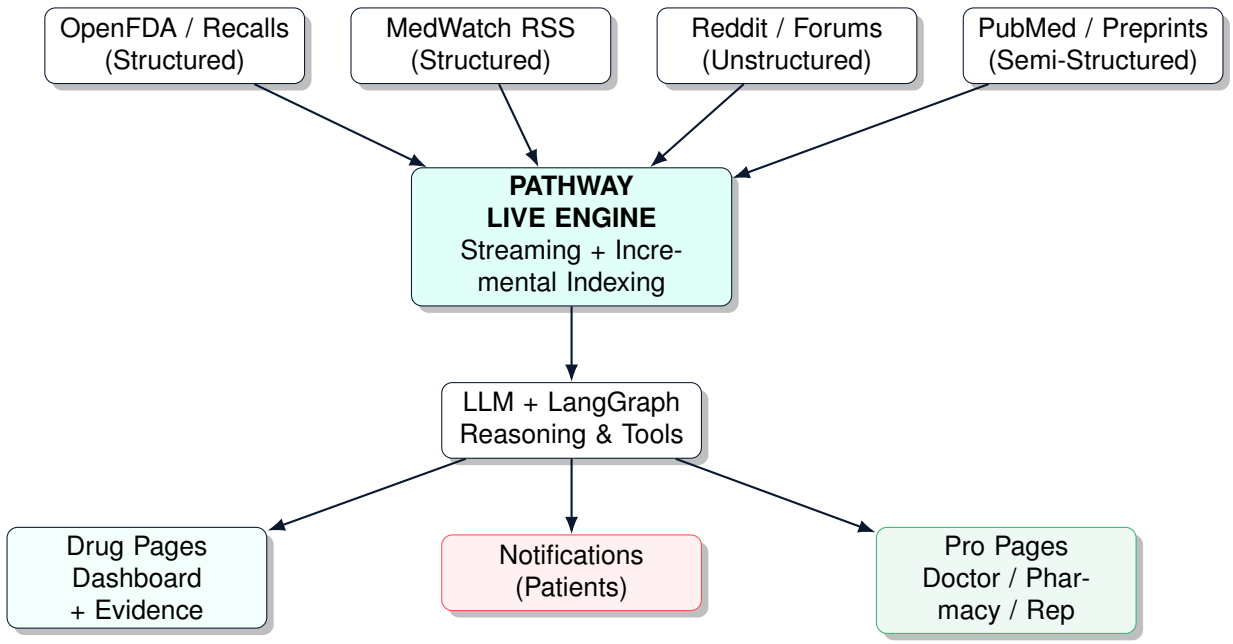
We build a **live, agentic PV ecosystem** on **Pathway** (streaming + incremental indexing) with an LLM reasoning layer. The app is **drug-centric**: every drug has a live dashboard and a patient notification view.

- **Drug Dashboard (Patients):** risk index, harm signals, trend charts, evidence, and verified community signals.
- **Doctor Page (Monitored):** one-tap prescription counts per drug (structured, non-promotional).
- **Pharmacy Page (Monitored):** sales/purchase counts per drug (with consent / optional system integration).
- **Interaction Page:** new drug launches by authorized pharma reps; only doctors/patients can comment.
- **Drug Copilot:** evidence-grounded Q&A for patients/doctors; **no prescribing/dosage advice**.
- **Alerts:** patients follow drugs they take; doctors follow drugs they prescribe; alerts are provisional + evidence-linked.

Safety Rule: Inform & monitor only. **No prescriptions. No dosage guidance.** Always recommend consultation with licensed professionals.

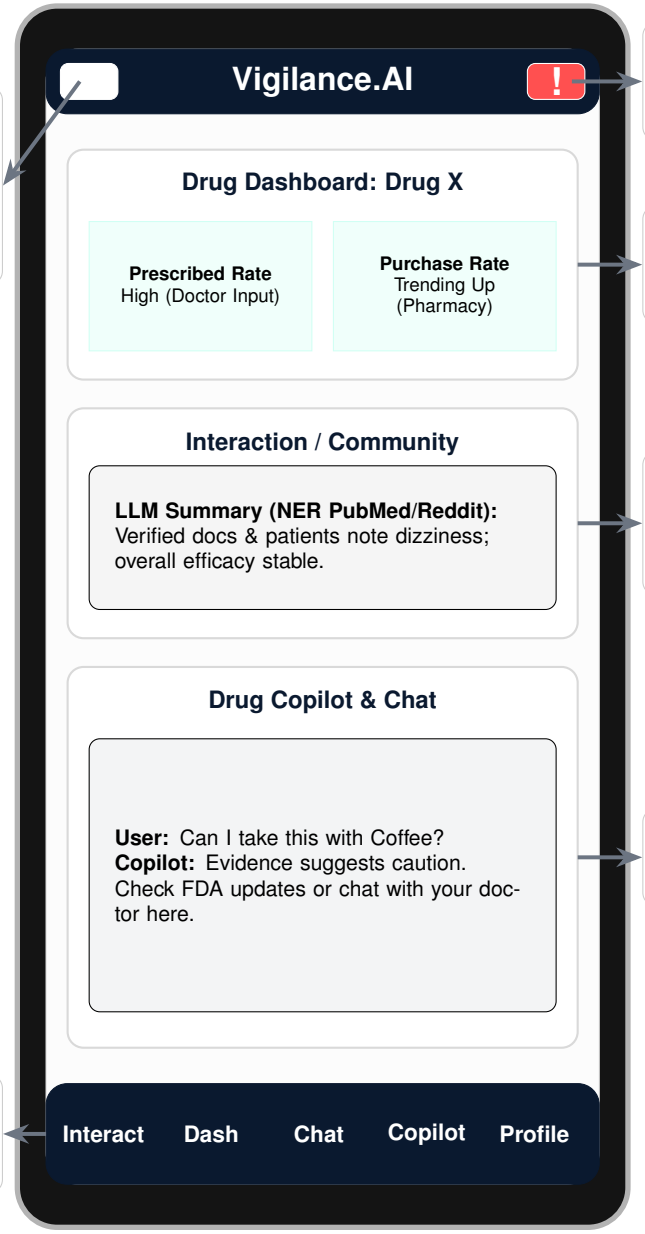
Note on metrics/stats: In the idea round, we demonstrate impact using measurable app KPIs (update latency, detection lead-time vs. baseline feeds, evidence coverage, false-positive review rate) rather than claiming clinical outcomes.

SYSTEM ARCHITECTURE (LIVE DATA + AGENTIC WORKFLOW)



Key "Live" Demo: add/edit a source file or stream event → Pathway updates chunks/embeddings → agent answers with the new evidence immediately (no full re-index).

VIGILANCE.AI MOBILE: UI MAP & COMPONENT GUIDE



1. Hamburger Menu:
- **Doctor Page:** Click-to-add prescription tracking.
- **Patient Page:** Intake tracking & feedback.
- **Pharmacy Stats:** Backend inventory sync for sales data.

2. Taskbar Hierarchy:
Priority: Community interaction first, then Dash, Chat, Copilot, Profile.

3. Safety Alarm System:
Real-time push notifications for drug recalls/dangers. Suggests alternatives to doctors.

4. Drug Dashboard:
Combines Pharmacy purchase rates & Doctor prescription counts into a risk index.

5. Interaction Page:
New drug launches. LLM uses NER on Reddit/PubMed. Comments restricted to Patients/Doctors.

6. Evidence Copilot:
Role-aware prompting. Blocks prescribing requests.

System Demo: Functional Data Flow

- **1. Drug Dashboard (The "Hub"):** Visualizes the *Risk Index*. Data is aggregated live from two sources:
  - **Prescribing Rate:** Real-time counts from the **Doctor Page** inputs.
  - **Purchase Rate:** Automated sales sync from the **Pharmacy Page** backend.
- **2. Intelligence Layer (Interaction & Copilot):**
  - **Interaction Feed:** NER algorithms extract signals from Reddit/PubMed. **New Logic:** If negative sentiment spikes here, the **Alarm** is auto-triggered.
  - **Drug Copilot:** Role-aware AI (Doctor vs Patient). Hard-coded guardrails prevent it from prescribing medication; strictly provides evidence-based answers.
- **3. Role-Based Data Injection (Hamburger Menu):**
  - **Doctor View:** One-tap prescription logging (monitoring dosage quantity per doctor).
  - **Pharmacy View:** Inventory link for sales verification (incentivized via commission).
  - **Patient View:** Personal intake tracking & direct feedback on side effects.
- **4. Safety Alarm System:** A dynamic notification engine. Alerts patients on intake dangers and suggests safer alternatives to doctors based on the latest community signals.

END-TO-END: HOW VIGILANCE.AI MITIGATES PV DELAYS (SAFELY)

SOLVING THE PV LATENCY GAP

Goal: Minimize "time-to-awareness" via live ingestion, hybrid signals, and human-in-the-loop verification.

1. **Ingest:** DB, literature, forums, & app data.
2. **Spikes:** Flag symptom–drug co-occurrence.
3. **Normalize:** NER mapping of std. med-terms.
4. **Verify:** Cross-check labels
5. **Act:** Trigger prov. alert; draft ICSR for review.

- **Latency:** Evidence $\rightarrow$ index speed.
- **Lead-time:** Detection vs. official baselines.
- **Coverage:** Validation via ≥ 2 sources.
- **Precision:** Rate of human confirmation.

WHY DRUG DASHBOARD + PATIENT–DOCTOR CONNECT

Drug Dashboard is the product centerpiece: it turns fragmented signals into a unified, explainable view.

- **Risk Index (Provisional):** composite score from signal velocity, severity, and cross-source evidence.
- **Prescribed Rate (Doctors):** aggregated counts indicate real prescribing behavior shifts.
- **Sold/Purchased Rate (Pharmacies):** demand/availability trends can reveal recalls, shortages, or sudden usage spikes.
- **Verified Discussion:** doctors/patients comment; LLM summarizes and links evidence.
- **Patient–Doctor Connect:** optional doctor chat channel (patients cannot chat with pharma reps).

We explicitly separate **information** (allowed) from **medical advice** (blocked).

ROLE-BASED CONTROLS & INTEGRITY

Patient	Reports side effects and tracks personal intake. **Restriction:** Cannot prescribe drugs.
Doctor	Logs prescription counts so the system can measure risk. **Restriction:** Cannot post advertisements.
Pharmacy	Verifies sales figures to confirm usage trends. **Restriction:** Patient data remains anonymous
Pharma Rep	Updates official drug details. **Restriction:** Blocked from chatting with patients or doctors.

- **Trust Weighting:** Verified clinical logs outweigh unverified social posts; Rep inputs carry the lowest weight.
- **Cross-Validation:** Alerts escalate only when confirmed by ≥ 2 diff. sources (e.g., Social Signal + Clinical Trend).
- **Anomaly Detection:** Filters spam and statistical outliers; rate-limits rapid updates to prevent data manipulation.
- **Audit Trail:** All professional inputs are timestamped and logged with IDs to ensure full accountability.

DRUG COPILOT SAFETY GUARANTEE (NO PRESCRIBING)

- **Protocol:** Answers strictly derived from indexed sources.
- **Hard Guardrails:** Automatically blocks dosage requests and "take/stop" medical advice.
- **Mandatory Escalation:** Redirects clinical decisions to healthcare providers.
- **Role Adaptation:** Adjusts complexity (Patient vs. Doctor)

Blocked requests:
"Tell me dosage for Drug X."
"Should I stop Drug X today?"
"Suggest an alternative medicine."

Allowed:
"What is the current safety status and evidence for Drug X?"

IMPACT (WHAT USERS GAIN)

Patients	Early awareness via notifications, clear safety status per drug, and evidence-backed explanations.
Doctors	Live signal awareness at point-of-care + quick monitoring of prescribing trends for drugs used.
Pharmacies	Participation in safety monitoring through sales trends, optionally integrated into existing systems.
Regulators	Faster detection and structured evidence aggregation; reduced staleness through streaming ingestion and incremental indexing.