

# How do you prevent AI from Hallucinating?

*An Engineering approach to Personal Health Analytics  
Inspired by Prof. Oren Freifeld's 'Intro to Deep Learning' (BGU)*

Python • PostgreSQL • CrewAI • Streamlit • Scipy • Heroku

# DETERMINISM BEFORE SEMANTICS

- Problem: LLMs fed raw data will invent correlations.
- Solution: Constrain the AI to look through a 'Pipe'.
- The Pipe = Validated Statistical Results Only.
- The AI can't see raw data, only what the math proves.

[ Raw Garmin Data ]



[ DETERMINISTIC MATH LAYER ] (The Guardrail)

- Pearson Correlations (Linear)
- Markov Chains (State Transitions)
- AR(1) Models (Persistence)



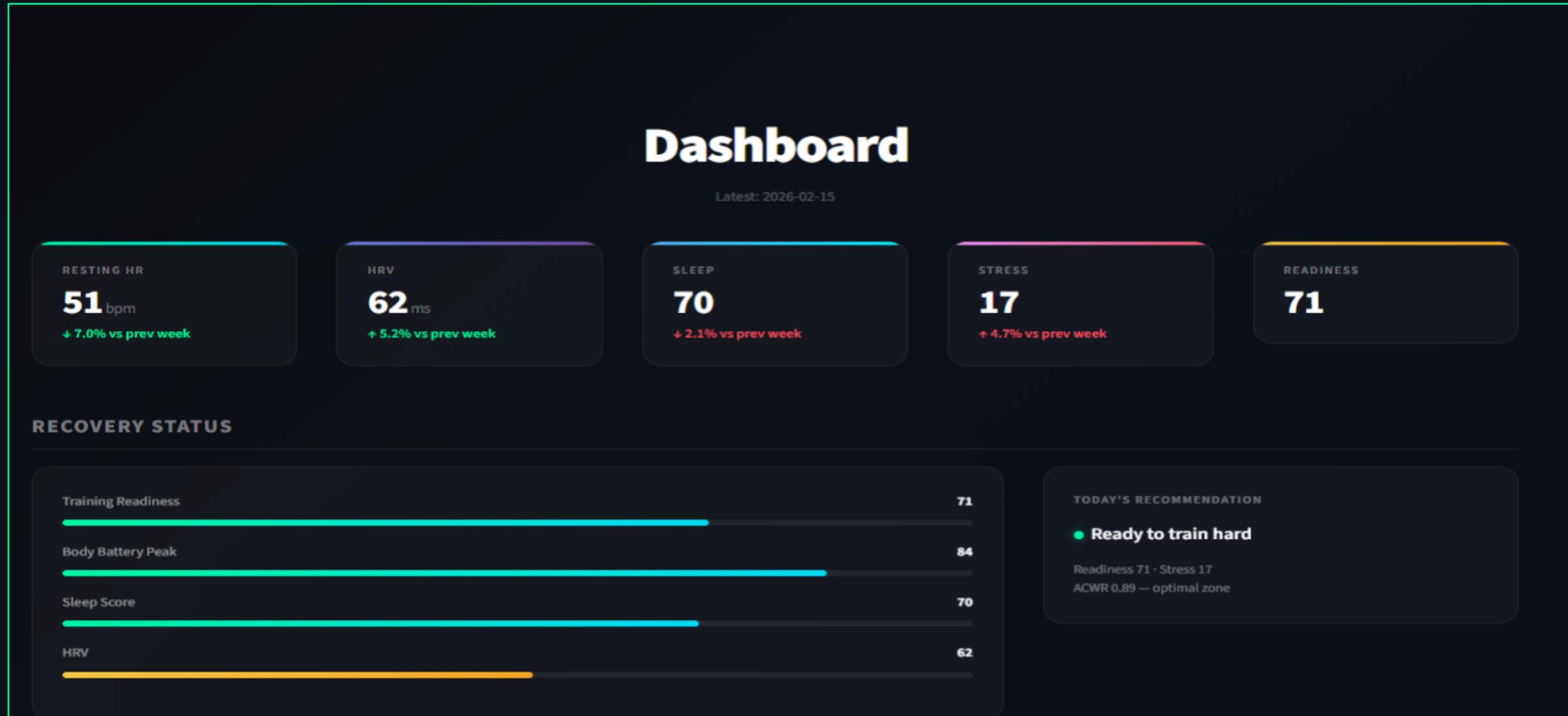
[ SEMANTIC LAYER ] (The AI)

- 5 Specialized Agents (Read-Only)
- "Here is the math. Explain it."



[ True Insight ]

# THE RESULT: N-OF-1 INSIGHTS



Live Dashboard running on Heroku

Garmin Health Intelligence // Engineering Deep Dive

# YOU CAN'T FAKE MATH

We validate relationships mathematically before the AI sees them.

$$\text{Pearson Correlation : } r = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sqrt{\sum(x - \bar{x})^2 \sum(y - \bar{y})^2}}$$

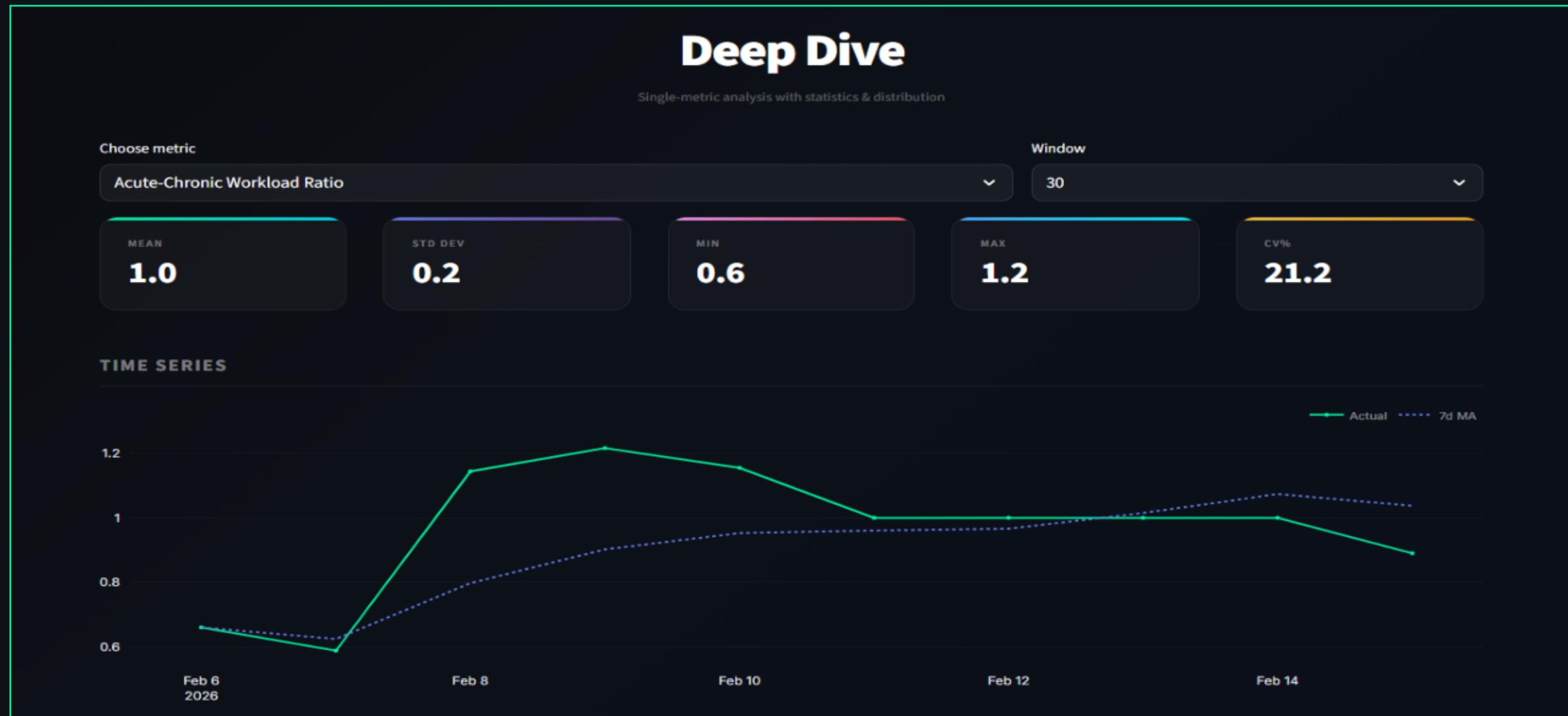
$$\text{Markov Transition : } P_{ij} = P(S_{t+1} = j | S_t = i)$$

$$\text{AR(1) Model : } X_t = c + \phi X_{t-1} + \epsilon_t$$



Computed Correlation Matrix

# DEEP DIVE ANALYSIS



Distribution & Time-Series Analysis

Garmin Health Intelligence // Engineering Deep Dive

# THE AGENT TEAM

- 5 Specialists (not 1 generic prompt).
- Read-Only Access via SQL tools.
- Long-term memory tracks previous advice.
- Built with CrewAI + Gemini 2.5 Flash.

## Agent Chat

Talk to 9 specialized AI agents — they have full database access + correlation data

Single Agent (fast)  Multi-Agent (comprehensive)

Single: one analyst answers quickly. Multi: dispatches to relevant specialists who work in parallel, then synthesizes their responses. Slower but deeper.

> Example questions

how does my sleep affect my training ?

**+ HEALTH ANALYST**

Your sleep significantly impacts your training. Specifically, your sleep metrics from the previous day are strong positive predictors of your training acute load for the current day.

\* \*\*Training Sleep Score\*\* from yesterday predicts today's \*\*Training Acute Load\*\* with a very strong positive correlation of  $r=+0.996$  ( $p=0.0003$ ).  
\* Your overall \*\*Sleep Score\*\* from yesterday predicts today's \*\*Training Acute Load\*\* with a strong positive correlation of  $r=+0.989$  ( $p=0.0013$ ).  
\* \*\*Training Sleep Percentage\*\* from yesterday predicts today's \*\*Training Acute Load\*\* with a strong positive correlation of  $r=+0.976$  ( $p=0.0043$ ).  
\* \*\*REM Sleep Seconds\*\* from yesterday predicts today's \*\*Training Acute Load\*\* with a strong positive correlation of  $r=+0.974$  ( $p=0.0052$ ).

This indicates that better sleep quality and quantity (higher sleep scores, more REM sleep, higher sleep percentage) on one day are highly associated with a greater capacity for training acute load on the following day.

[Clear chat](#)

Ask anything about your health data...