SEVEN SWELL AI LABS



RESEARCH WHITE PAPER

Agent Nudge DB

Binary HDC Failure-State Memory

Binary Hyperdimensional Failure Memory & Prompt Injection.

Preventing repeated broken tool calls across sessions by indexing failure transitions as binary hypervectors.

Field	Value
Document	Architecture Note 02-C
Author	Thaddeus Sylvester Lee
Date	November 2025 (Updated 2026)
Classification	Production Lab Tooling

Seven Swell AI Labs
https://sevenswell.ai/#nudge-db

Document Profile

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Headline	Binary Hyperdimensional Failure Memory & Prompt Injection.
Lead	Preventing repeated broken tool calls across sessions by indexing failure transitions as binary hypervectors.
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Abstract

Agent Nudge DB indexes verified failure scenarios, broken state transitions, and failed tool calls as binary Hyperdimensional Computing (HDC) bit-vectors. When a new task resembles a recorded failure state during live inference, the harness injects targeted cautionary context directly into the autoregressive loop.

01 / The Problem

Reference Signals

Signal	Value
Stateless Loops	Repeat Errors
HDC Failure Index	Persistent

Repeated Tool-Call Failures

Agents running in stateless or unconstrained loops repeatedly attempt the same broken migrations, invalid flags, or port assumptions across sessions, wasting tokens and failing on known traps.

02 / Architecture

Binary HDC Encoding

Encodes failed tool calls, error signatures, and broken state transitions into compact binary bit-vectors scored via Hamming distance in microseconds.

Live Autoregressive Injection

Compares incoming task context against stored failure vectors and injects a concise cautionary prompt before the model repeats a known broken step.

03 / Operational Workflows

Failure Indexing

Field	Value
Subtitle	Binary HDC Memory
Overview	Recording broken state transitions to stop repeat errors.
Objective	Encode verified tool failures and corrective fixes as binary hypervectors for cross-session recall.

Phase 01 / Capture

1. Root Cause Tagging

Record the failing command, error signature, and broken state transition.

Tools: Failure Log

2. Duplicate Check

Compute Hamming distance against existing entries to avoid redundant records.

Tools: HDC Matcher

Phase 02 / Persistence

1. Verified Resolution

Attach the passing fix and validation evidence once the issue is resolved.

Tools: Validation Suite

2. Hypervector Commit

Store the bundled binary vector in the failure-memory index for future sessions.

Tools: HDC Encoder

Session Hydration

Field	Value
Subtitle	Prior-Failure Lookup
Overview	Loading relevant project constraints at session start.
Objective	Prime a new agent session with historical failure notes relevant to the target repository.

Phase 01 / Lookup

1. Context Encoding

Encode the active task summary and repository paths into a query hypervector.

Tools: HDC Encoder

2. Similarity Scan

Retrieve matching cautionary notes via Hamming distance before the first edit.

Tools: HDC Matcher

Index Refresh

Field	Value
Subtitle	Memory Maintenance
Overview	Updating stored failure records after schema or API changes.
Objective	Keep failure-state vectors aligned with current code and database schemas.

Phase 01 / Reconciliation

1. Stale Entry Audit

Flag failure records that reference renamed files, tables, or deprecated endpoints.

Tools: Failure Log

2. Vector Re-encoding

Update affected hypervectors so similarity thresholds stay accurate.

Tools: HDC Encoder

Live Prompt Injection

Field	Value
Subtitle	Autoregressive Guard
Overview	Injecting cautionary prompts mid-loop when risk matches.
Objective	Interrupt repeated failure loops by injecting prior corrective context during live inference.

Phase 01 / Intervention

1. Threshold Trigger

Detect when a pending tool call matches a previously indexed failure transition.

Tools: HDC Matcher

2. Cautionary Nudge

Inject the recorded constraint and verified workaround before execution proceeds.

Tools: Prompt Injector

Summary

Preserve every hard-won constraint.

Agent Nudge DB turns past tool-call failures into fast, deterministic guardrails for future inference runs.

Source

URL: https://sevenswell.ai/#nudge-db