



Temporal Context Layer for Code Repositories using Knowledge Graphs

Honda Research Institute US

DTSC 5810 - Capstone Project Final Presentation

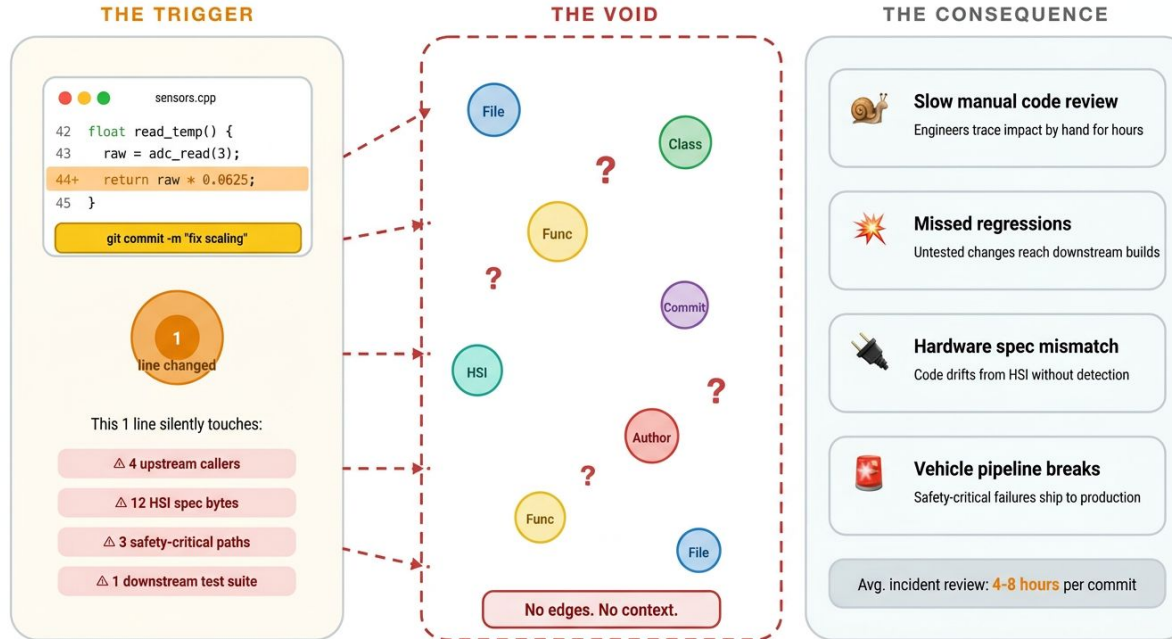
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Problem Statement

If a line of code is changed, which tests will likely fail/flagged as critical or high or low, etc?



Modern repos **lack contextual awareness** - changes are disconnected from their structural & safety impact



Nature of Data

Honda/

- firmware/** C++17
 - main.cpp entry point
 - sensors.cpp / .h ADC, packing
 - canbus.cpp / .h CAN frames
 - gps.cpp / .h NMEA parse
 - interrupts.cpp / .h IRQ dispatch
 - Makefile build config
- cloud/** Python
 - ingest.py telemetry validate
 - utils.py CRC, encryption
- docs/** Markdown
 - hsi.md HW-SW interface
- scripts/** Bash
 - run_demo.sh, run_tests.sh

27 source files · 3 languages · 16 git commits

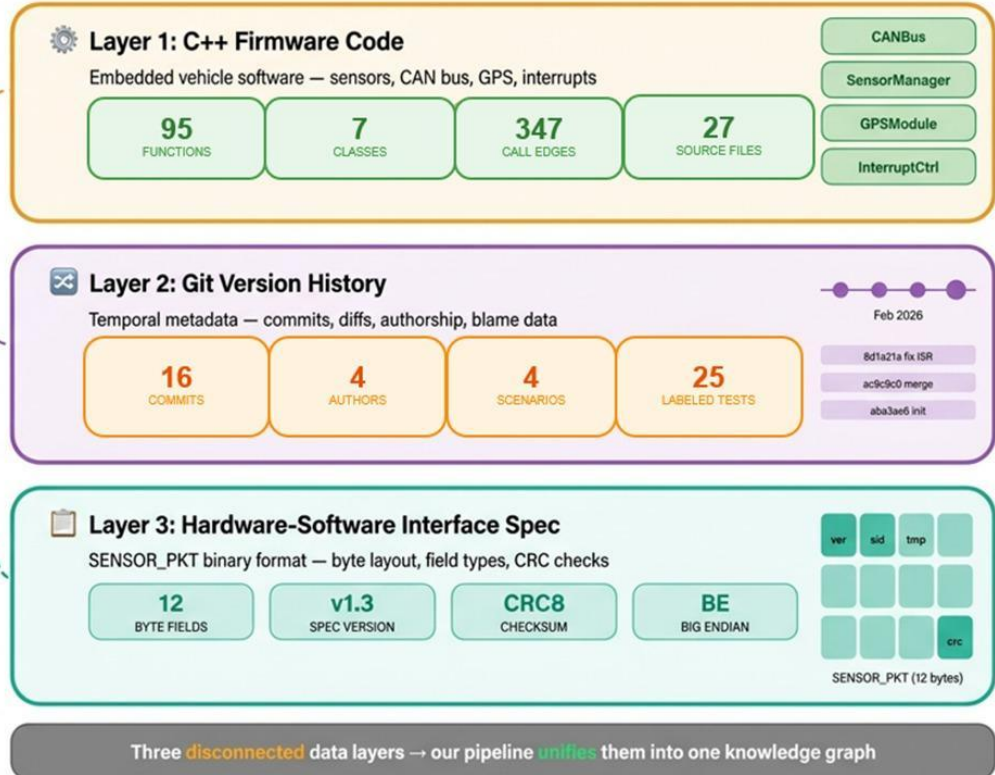
LANGUAGE MIX

C++ 68% Py 22% MD

COMMIT ACTIVITY

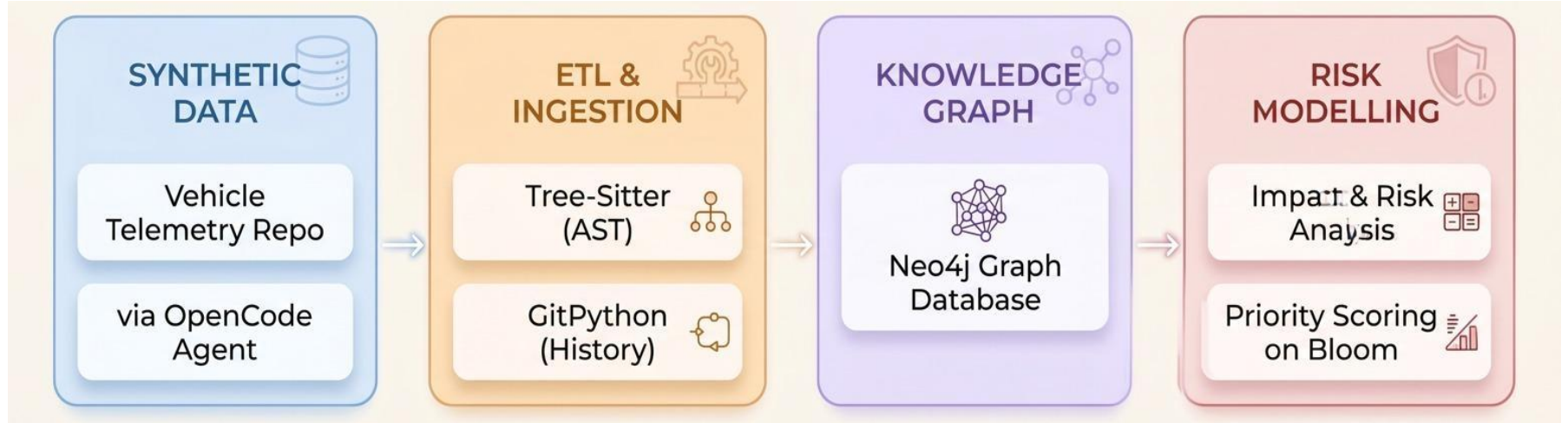
18 commits, 4 authors

THREE DATA LAYERS





Our Solution

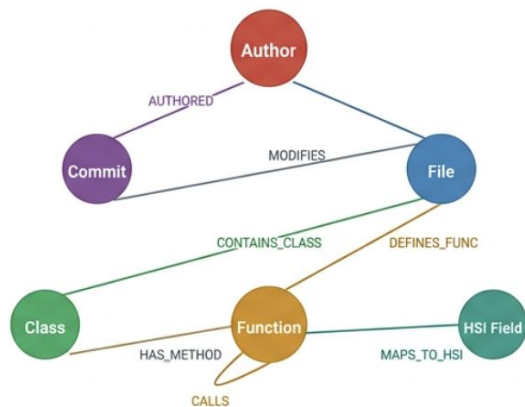




Construction of Knowledge Graph

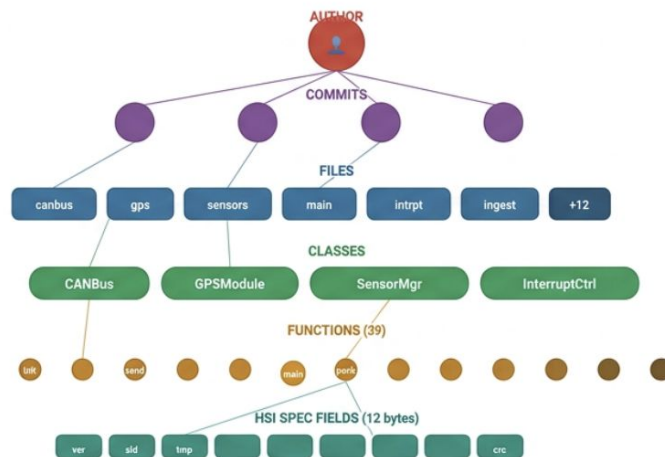
4 Authors 16 Commits 22 Files 2 Classes 70 Functions

Node Types & Relationships



EDGE TYPES
AUTHORED · AUTHORED · MODIFIES · CONTAINS_CLASS /
DEFINES_FUNC · HAS_METHOD · CALLS · MAPS_TO_HSI

Layered Graph Structure



● Author

● Commits

● Files

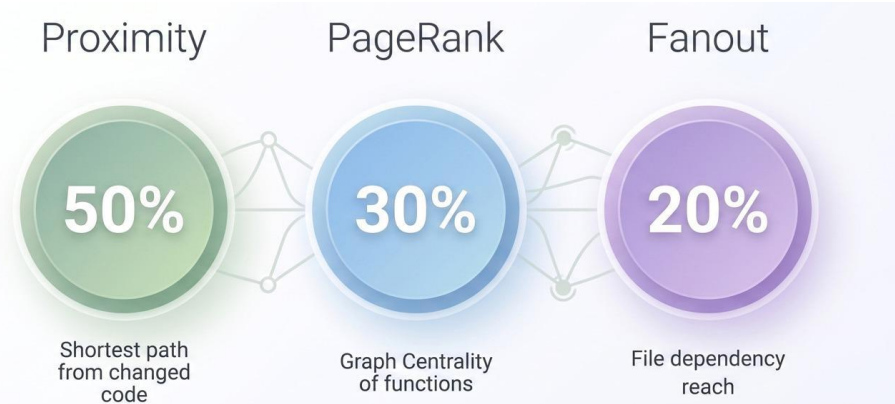
● Classes

● Functions

● HSI Fields



Priority Scoring



$$\text{Priority} = 0.5 \cdot \text{Proximity} + 0.3 \cdot \text{PageRank} + 0.2 \cdot \text{Fanout}$$

Tier	Score range	Bloom color
Critical	> 0.75	Red
High	0.50 – 0.75	Orange
Medium	0.25 – 0.50	Yellow
Low	> 0.0 and ≤ 0.25	Green
Safe	= 0.0	Blue



Neo4j Bloom Live Demo

neo4j Desktop

Feedback

Fully-managed cloud database Neo4j AuraDB

Cloud

Try Neo4j Aura

Data services

Local instances

Remote connections

Tools

Import

Query

Explore

Dashboards **New**

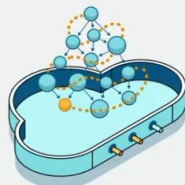
About

Settings

Default Perspective

Export

Search



Explore your graph

Get started by generating a graph snippet or search for a graph yourself.

Show me a graph

Search the graph

Nodes Relationships

Filter categories

All In Scene Off Scene

All (0) Selected (0)

Force-based layout 1



Results and Findings

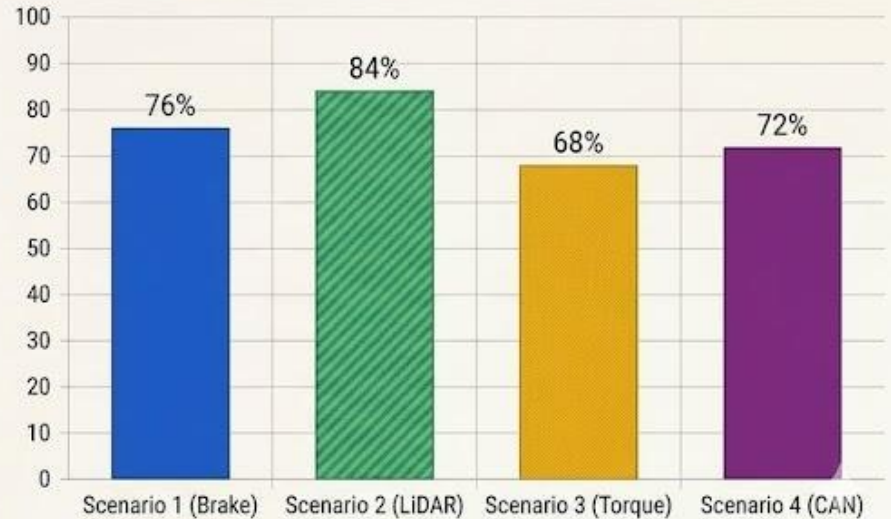
Reduction Metrics



Test Count Summary



Scenario Performance breakdown





Learnings

Strengthening Graph Database Understanding	Turning Abstract Concepts into Practical Outputs
Hands-On Research Experience	Test Risk Understanding
Automotive Industry Exposure	Innovative Problem-Solving Methodologies



Thank You !