Paper 027 / Application 004

NullLedger: Signed Bayesian Evidence Infrastructure for Negative Results

Publishing reusable null bounds for speculative physics and mission-grade engineering

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Abstract

NullLedger is a technology paper for turning negative results into signed, queryable scientific assets. It implements the Bayesian null ledger proposed for electrostatic projection experiments but generalizes to materials replication, cavity audits, and subsystem qualification. Each entry stores model definitions, likelihoods, controls, nuisance assumptions, posterior summaries, and provenance.

Status. Draft manuscript for review and revision. This paper is not an empirical claim of new physics or field-ready technology. It is a structured proposal, theory note, protocol, or application architecture intended to be auditable, falsifiable, and publishable with source.

Contents

1 Problem

Negative results are often trapped in PDFs, lab notebooks, or private repositories. They become difficult to combine, search, or cite. The problem is to publish nulls as structured evidence without exaggerating their scope or exposing sensitive raw data unnecessarily.

2 Model

NullLedger separates public metadata, signed digests, redacted run summaries, and optional raw data. Query results return compatibility warnings when users attempt to combine entries with mismatched mechanisms, controls, or priors.

$$\text{Entry} = \{M, L, C, N, P, H\},$$

where M is model, L likelihood, C controls, N nuisance assumptions, P posterior, and H provenance hash.

$$\text{Combine}(E_i, E_j) \Rightarrow \text{Compatible}(M_i, M_j, C_i, C_j).$$

3 Claims

1. **Claim 1.** Null results deserve infrastructure equal to positive-result repositories.
2. **Claim 2.** Compatibility checks prevent mathematically invalid meta-analysis from looking authoritative.
3. **Claim 3.** Signed digests allow public citation before full raw-data release.
4. **Claim 4.** The same ledger pattern supports engineering qualification failures, not only speculative physics nulls.

4 Evidence Plan

The prototype should ingest synthetic nulls from electrostatic, materials, and cavity domains and demonstrate compatibility warnings. A second demonstration should publish a cumulative exclusion plot that changes when one entry is amended through an erratum.

5 JMP0X1B Implementation Surface

The implementation should build on provenance contracts, deterministic serialization, and typed model schemas in JMP0X1B. Query functions should expose reasoned failures, not only successful combinations.

Illustrative JMP0X1B-style contract

```
record EvidenceEntry { model: ModelRef, controls: ControlSet, likelihood: Digest, posterior: P
fn combine(entries: List<EvidenceEntry>) -> Either<CompatibilityError, MetaPosterior> effects{
```

6 Release And Review Plan

Release schemas, example entries, query semantics, compatibility tests, and a public-facing report generator for research.jmp0x1b.com.

7 Open Questions

- How much likelihood detail is needed for useful combination?
- How should confidential raw data be escrowed?
- What signature trust model should the first deployment use?
- Can journals cite ledger entries as formal artifacts?

8 Conclusion

NullLedger gives failed or negative experiments durable scientific value. It is one of the highest-leverage software applications from the research program.

References

References

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