Logic Evaluation Engine (LEE) – Grant Handover

Abstract

The Logic Evaluation Engine (LEE) is a novel inference framework built on phase-geometry logic, enabling counterfactual reasoning and high-fidelity diagnostic evaluation. It integrates discrete logical primitives — Alive, Jam, Mem, Vac — derived from material implication, mapped into rotational phase space. LEE produces reproducible, measurable metrics that quantify reasoning stability and contradiction dynamics.

Key Innovations

- **Original Contributions** (Alexander Patterson):

- Phase-geometry mapping from material implication truth tables.

- Identity of conjugate quantities in logical systems.

- StressIndex, Winding, and Resistance metrics for system stability.

- **Externally Inspired Refinements**:

- Logical Bianchi Identity v2: conservation law analogue adapted from external research, with explicit attribution.

Demonstrated Capabilities

- **StressIndex**: Quantifies strain in logical flow.

- **Resistance**: Measures persistence of strain.

- **Bianchi Residual**: Validates conservation of contradiction current.

- All metrics are automatically computed from run logs.

Applications & Impact

- **Medical**: Early-warning systems in diagnostics by modeling logical manifold distortions.

- **Legal**: Evaluating consistency and integrity of case reasoning.

- **AI Safety**: Stress-testing reasoning engines for stability under contradiction.

Current Status

- Codebase and documentation are complete enough for demonstration.

- Provenance logging and metrics computation are automated.

- Example run and outputs included in repository.

Next Steps if Funded (6–12 months)

1. Full integration of time-weighted StressIndex.

2. Expansion of manifold distortion analysis.

3. Applied pilots in medical diagnostics and legal review.

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This work includes original research by the author and an attributed external contribution (Logical Bianchi Identity v2).