

Legality■First AI: A Unified, Geometry■Based Framework

Abstract

We replace similarity with legality as the source of truth. Inputs are integerized and evaluated in parallel congruence channels (mod 2,4,8,...) on a $k+2$ dimensional toroidal control manifold. A state is admissible iff it satisfies

(i) Type■II lattice legality (Construction■A even/unimodular), (ii) palindromic balance in mod■4/8 histograms, and

(iii) zero syndrome for its code constraints. Otherwise a confluent, terminating rewrite decreases a lexicographic

violation vector until a normal form (REST) or REJECT. Numeric glyphs compile frames; computation is ledgered and committed

once; retrieval keys are invariants. This yields determinism, auditability, and energy efficiency; undecidable claims propose explicit, priced model extensions.

Core Objects & Axioms

A1 Integerized state. Representations are integer vectors.

A2 Frame from glyphs. Numeric glyphs compile thresholds (τ), a scale family ($S \approx 4^k$), modulus set M , and face priorities.

A3 CRT switchboard. Work in residues and stitch by CRT.

A4 Type■II legality. Construction■A lift must land on even, unimodular lattice (e.g., E8/Leech slices).

A5 Palindromic witnesses. Histogram anti■symmetry scores P_4, P_8 must be within bounds.

A6 Confluent reduction. Violation vector $\Phi = (\text{synd}, P_8, P_4, p)$ strictly decreases in ACTION steps.

A7 Facts=Invariants. Truth confined to frame■invariant quantities; cross■frame requires sanctioned functor.

10■D Toroidal Control

Default $k=8$ residue faces + phase + epoch. Parallel transport legal subspaces to prevent re■embedding drift; pose is gauge.

Algorithms

COMPILE_FRAME: derive (τ, S, M, FACES). VERIFY: compute residues, syndrome, pal scores, Type■II flag \rightarrow REST/ACTION/REJECT.

REDUCE: smallest legal move that lowers Φ . NORMAL_FORM: iterate VERIFY/REDUCE; ledger steps; commit once. RETRIEVE: by invariant key (F , shell, coset).

Guarantees & Limits

Determinism (confluent/terminating), explainability (channel■local reasons), robustness (ECC radius), efficiency (commit■once), safety (illegal cross■frame). Limits: frame blindness; small■n degeneracy; adversarial jamming mitigated by multi■mod checks.

Falsifiers & Metrics

F1 Confluence break; F2 Type■II mirage; F3 Pal witness failure; F4 Legality hallucination; F5 Energy regression; F6 Retrieval regression.

Metrics: legality■rate, confluence■hash, ECC radius, energy/commit, time■to■REST, cross■frame rejections.