

ULOGIC & UMIND

A Foundational Shift in AI Reasoning

Manifesto & Strategic Roadmap

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*We are developing **ULOGIC**, a novel, type-free formal language where logic and algorithms are **fundamentally the same thing**. By treating definitions as creative axioms and utilizing a flat ontology of **HAL-chains**, ULOGIC lays the necessary mathematical foundation for **UMIND**: our vision for a future neuro-symbolic architecture capable of bridging the reasoning gap in LLMs.*

1. Introduction: The Need for a New Formal Language

We propose the utilization of a novel formal language, **ULOGIC**, possessing capabilities significantly more advanced than First-Order Logic (FOL) or Higher-Order Logic (HOL). This language serves as the keystone to achieving a critical milestone in Artificial Intelligence: enabling machines to master the "game of linguistic reasoning." This entails the unified combination of logic, reasoning, algorithmics, metalinguistics, knowledge encapsulation, and explainability.

2. "ULOGIC": A New Formal Logic System (The Innovation)

Fundamental Characteristics: ("Universal Logic Language")

- **Paradox Resolution without Types:** Resolves set-theoretic paradoxes without requiring ZFC axioms or Type Theory hierarchies.
- **Unification of Logic and Computation:** Logic and computation are treated as equivalent expressions within the system.
- **Purely Syntactic-Operational Semantics (Anti-Tarski):** The system is not interpreted in external structures. It represents a new vision of "non-alphabetic languages."
- **Definitions as "Creative Axioms":** Definitions possess a unique ontological status; they are **not** merely eliminable abbreviations.
- **Native Auto-Metalinguistic Capability:** The system allows for native self-reference regarding its expressions without the need for a separate meta-language. (Example: Dealing with **metalinguistic-expressions** like $\forall x_1 \dots x_n P(x_1 \dots x_n)$ which typically cannot be expressed within the standard **object** language).
- **Superior Expressive Power:** Demonstrates expressivity superior to HOL and current frontier systems (Lean, Coq, Isabelle).

3. "UMIND": Neuro-symbolic Architecture (The Next Step)

Keys of Architecture: ("Universal Logic Mind")

- **Strategy:** Combine **LLMs** (generative capacity, suitably trained) with a **ULOGIC Verification Kernel** (rigorous reasoning).
- **Goal:** To create an "AlphaGo-AlphaZero" moment for language. Once the rules of the "complex linguistic reasoning game" are made explicit via ULOGIC, models can learn to play the game with verifiable precision.

4. Objective: Achieving Real Complex Reasoning in AI

The vision is to transcend the current limitations of LLMs (probabilistic prediction engines) and reach a new AI frontier through the following strategy:

- **Learning the Rules:** An LLM, specially trained, learns ULOGIC as a "rule-based game," similar to how models learn Chess, Go, or Code.
- **Rigorous Mathematical Verification:** Every reasoning step is formally verified by a Kernel-Verifier (acting as a "training coach").
- **From Statistical Correlation to Deductive Reasoning:** The ULOGIC kernel validates that the steps "intuited" by the LLM are valid across logic, computation, and metalinguistics.
- **TekDocs:** Creation of a universal network of "Verified ULOGIC Expressions." This ensures knowledge composability, reusability, explainability, and exponential growth of results.

5. The Core Thesis: A Thought Experiment

Consider a hypothetical scenario where we possess a formal logical language ("ULOGIC") with the following properties:

- **Capabilities far exceeding** FOL, HOL, and Typed-HOL.
- **Syntactic resolution of historical set-theoretic contradictions** (paradoxes) via a novel structural approach, rendering the historical ZFC axiom system obsolete - relegating ZFC to a mere structure akin to groups or rings.
- **Internal definition of "Natural Set Theory,"** mirroring the actual practice of working mathematicians, effectively reinventing the philosophy of mathematics.
- **Native expression of algorithms** within the logical language itself.
- **Unification of algorithmics and logic** under a new paradigm.
- **Native Auto-metalinguistics.**
- **Fluid expression of modern advanced mathematics** and general reasoning.

Note: While some claims may appear impossible under current Tarskian semantics and Model Theory, ULOGIC proposes replacing the current logical foundation with a radically different, yet simpler, approach (one that could theoretically be taught in secondary education).

Why is this the "Missing Link"?

If we possess the complete "rules of the game," we can teach a machine to play. Attempting to achieve reasoning in Neuro-symbolic strategies using FOL/HOL is akin to writing a complex novel using only five letters -the expressive power is simply lacking. LLMs fail to learn math from books because books are written in a language that neither formally captures the rules nor fully reflects the reasoning process (books capture ~40%; the mental rules used by mathematicians capture the remaining 60%).

6. Scientific Context: The Expressivity Gap

- **The Limitation:** LLMs do not reason; they predict text that mimics reasoning.
- **The Failure of Current Hybrids:** Current Neuro-symbolic architectures (LLM + Lean/Coq) fail because the underlying formal languages (FOL, Typed-HOL) lack the expressive power to capture the "logic-computation-metalinguistic" complexity of human thought.
- **The "Book Problem":** LLMs have read every math book in existence yet cannot reason. This is because mathematical texts are partial, ambiguous representations. The rigorous rules exist in the mathematician's mind, not on the page. ULOGIC aims to explicitize these hidden rules.

7. ULOGIC: Technical Overview

Beyond the Alphabetic Paradigm:

- ULOGIC expressions are **Headed-Atomic-Lists (HAL-chains)**.
- An "atom" is any indivisible unit (character or word).
- Structure: <HEADER>atom, atom, atom</> or (atom, atom, atom).
- These are not mere strings; they are typed chains with specific behaviors at the atomic/subatomic level. This multi-chain typed structure is the key to deriving the necessary logical rules.

The Critique of Predicate Logic:

- Current analysis (FOL/HOL) segregates "functors," "predicates," and "relations." This presupposes a set-theoretic view (sets and relations) prematurely.
- **The Tarskian Error:** Tarskian semantics interprets "formulas" into "Mathematical Structures," reducing logic to a "theory of polynomials" (Model Theory).

- **The ULOGIC Alternative:** ULOGIC has **no external interpretation**. It is a world of expressive chains. There is no "external reality" to interpret against. Syntax *is* the reality.

Key Discovery 1: Definitions are Not Elimidable

- **Thesis:** The standard logical view that definitions are "eliminable abbreviations" is fundamentally flawed.
- **Reality:** Definitions are **Creative Axioms**. They introduce new expressions into the system.
- **Proof:** Cantor's Theorem ($|A| < |P(A)|$) is unprovable without the intermediate definition of the diagonal set. If definitions were eliminable, the theorem should be provable without them. It is not. In ULOGIC, definitions are treated as essential structural bridges.

Key Discovery 2: Paradox Resolution

- **Set-theoretic contradictions are solved** by combining "Chain Types" with "Definition Rules."
- **Natural Set Theory:** ULOGIC allows for the definition of "Sets" (including the Universal Set) without Type Theory or ZFC axioms, avoiding contradictions through syntactic "acceptability" constraints on the definition process.
- **ZFC Irrelevance:** ULOGIC shows that ZFC is merely a defined structure, not the foundation of mathematics.

Key Discovery 3: Logic = Algorithms

- **Equivalence:** In ULOGIC, logic and computation are the same.
 - A logical rule is a syntactic algorithm on expressions.
 - A reasoning step is a constructive procedure.
 - A "Semantic Algorithm" (using instruction "do", "if", "while" -that are expressions- combined with uninterpreted other expressions) compiles into a logical context (other expressions)
 - Executing an algorithm is, in reality, performing a deduction in the associated context. Logic and computation are the same thing.

Key Discovery 4: Auto-Metalinguistics

- Contrary to the Tarskian hierarchy of languages and meta-languages, ULOGIC (like natural language) is a single system capable of self-reference.
- By modeling the system within itself (defining ULOGIC structure as a mathematical structure within ULOGIC), future "Mirror Rules" can eventually allow theorems within the model to become rules of the system.

8. Application to AI: The Roadmap

System 1: The LLC (Large Logic Collider)

- Objective: Create the ULOGIC language. Reverse-engineer the linguistic-logical-algorithmic processes to create an exact artificial language.

System 2: The Verification Kernel

- Nature: Traditional, rigorous software.
- Function: Not to search infinite trees, but to **verify** instantly if a proposed ULOGIC expression or derivation is correct.

System 3: The Hybrid LLM (Tandem Architecture)

- **LLM-1 (Translator):** Trains to translate Natural Language + Informal Math into ULOGIC Deep Structure (HAL-chains/AST). Requires specialized tokenization for non-serial, nested structures.
- **LLM-2 (Player):** Learns to "play the game" of manipulating ULOGIC expressions.
 - *Phase 1:* Training on human-generated examples.
 - *Phase 2:* AlphaGo style. Confronts the Kernel. The Kernel defines the valid moves; the LLM learns the intuition to reach the goal.
- **Singularity Point:** When the AI can translate math books into ULOGIC and fill in the logical gaps autonomously.

9. TekDocs: The GitHub of Exact Knowledge

- **Concept:** Verified expressions are stored in **TekDocs** (Transportable Encapsulated Knowledge).
- **Function:**
 - Traceable, reusable, and composable knowledge.
 - A global network of verified truth.
 - AI systems use TekDocs to accelerate training and reasoning, avoiding the "intractable tree" problem by reusing proven paths.

10. Strategic Context: Project CLARYT.ai (Dual Path)

- **MyBrain2.ai (Business Track):** A commercial SaaS platform for "SecondBrain + Microlearning," targeting the €370B corporate training market to secure financial stability and investor confidence.
- **UMIND-ULOGIC (DeepTech Track):** A "Moonshot" research initiative focused on verifiable AI reasoning and the new formal frontier.

11. CONCLUSION:

A “NATIVE OPERATING SYSTEM” FOR REASONING AI

The true magnitude of **ULOGIC** extends beyond merely constituting "another logical system." Its revolutionary potential lies in its architecture as the native **Operating System** for the next generation of Reasoning Artificial Intelligence.

While the prevailing approach in neuro-symbolic AI attempts to force the "square peg" of legacy formalisms -such as Lean, ZFC, and rigid Type Theory- into the "round hole" of probabilistic Neural Networks, ULOGIC proposes a fundamental redesign of the peg itself.

ULOGIC:

- **Marks a departure from FOL and HOL**, which require metalanguages and interpretations, and remain fundamentally incapable of capturing deep meaning or expressing algorithms and natural set theory as practiced by mathematicians.
- **Will empower the successors of LLMs** to perceive complete underlying patterns within a sufficiently expressive and self-contained language, enabling them to truly learn and master the game of complex linguistic reasoning.

We acknowledge this initiative as a definitive **DeepTech "Moonshot."**

The technical challenges ahead are substantial; engineering the Verification Kernel is a task of "Sistine Chapel" complexity. However, the potential reward is singular: if the foundational hypothesis of HAL-chains and creative definitions proves robust, ULOGIC will not merely improve upon current automated reasoning systems -it will render them obsolete, establishing the necessary substrate for true “Exact Artificial Intelligence” capable of scientific discovery.