



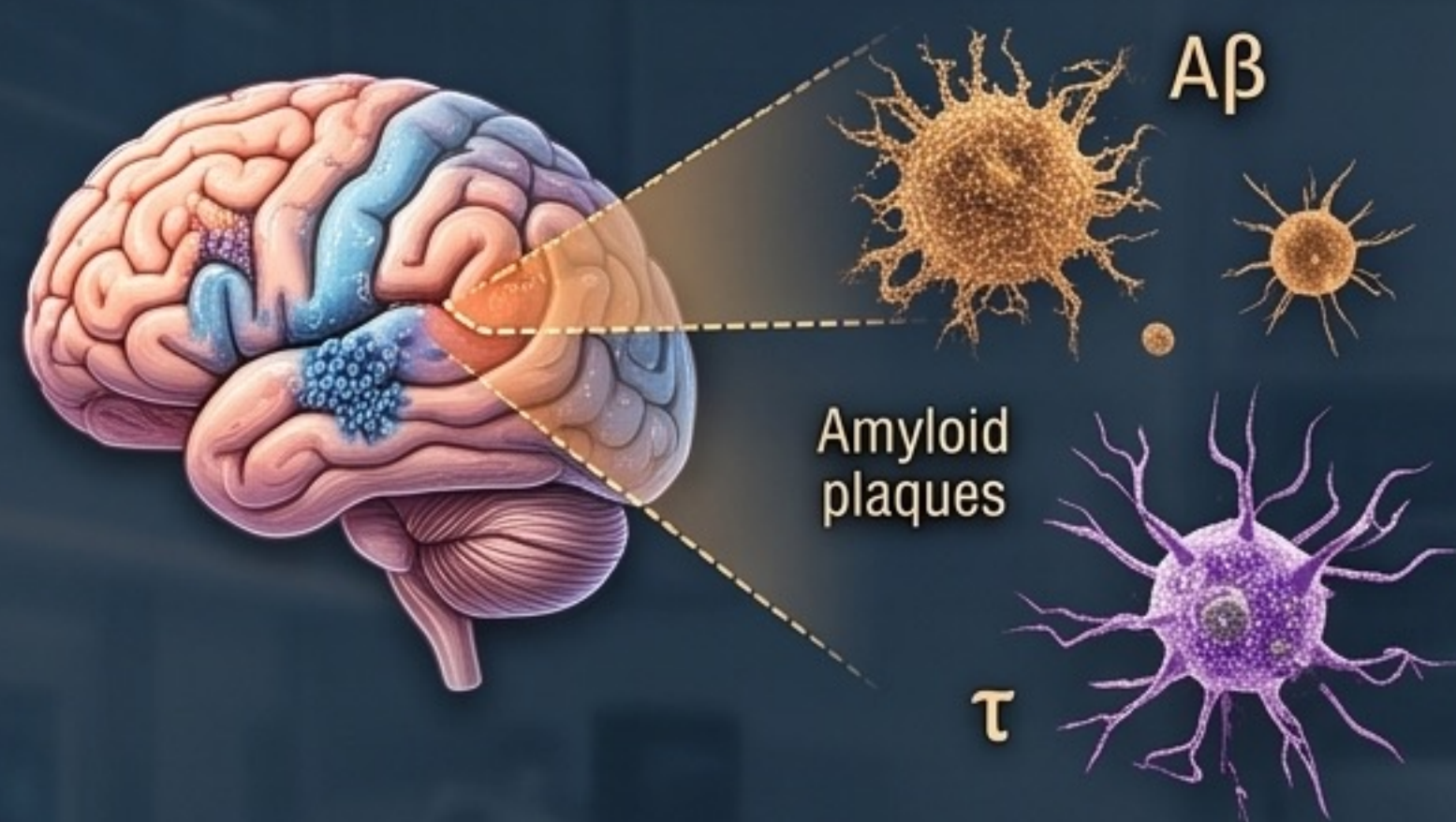
NEURO-SYMBOLIC RECURSIVE SELF-VERIFICATION FOR ALZHEIMER'S DISEASE MODELING: ANCHORING AI IN BIOLOGICAL PHYSICS

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ALZHEIMER'S ASSOCIATION
AAIC>26

KEY TAKEAWAY: External symbolic verification via biological physics makes recursive AI self-improvement reliable and prevents predictive drift in longitudinal disease modeling.

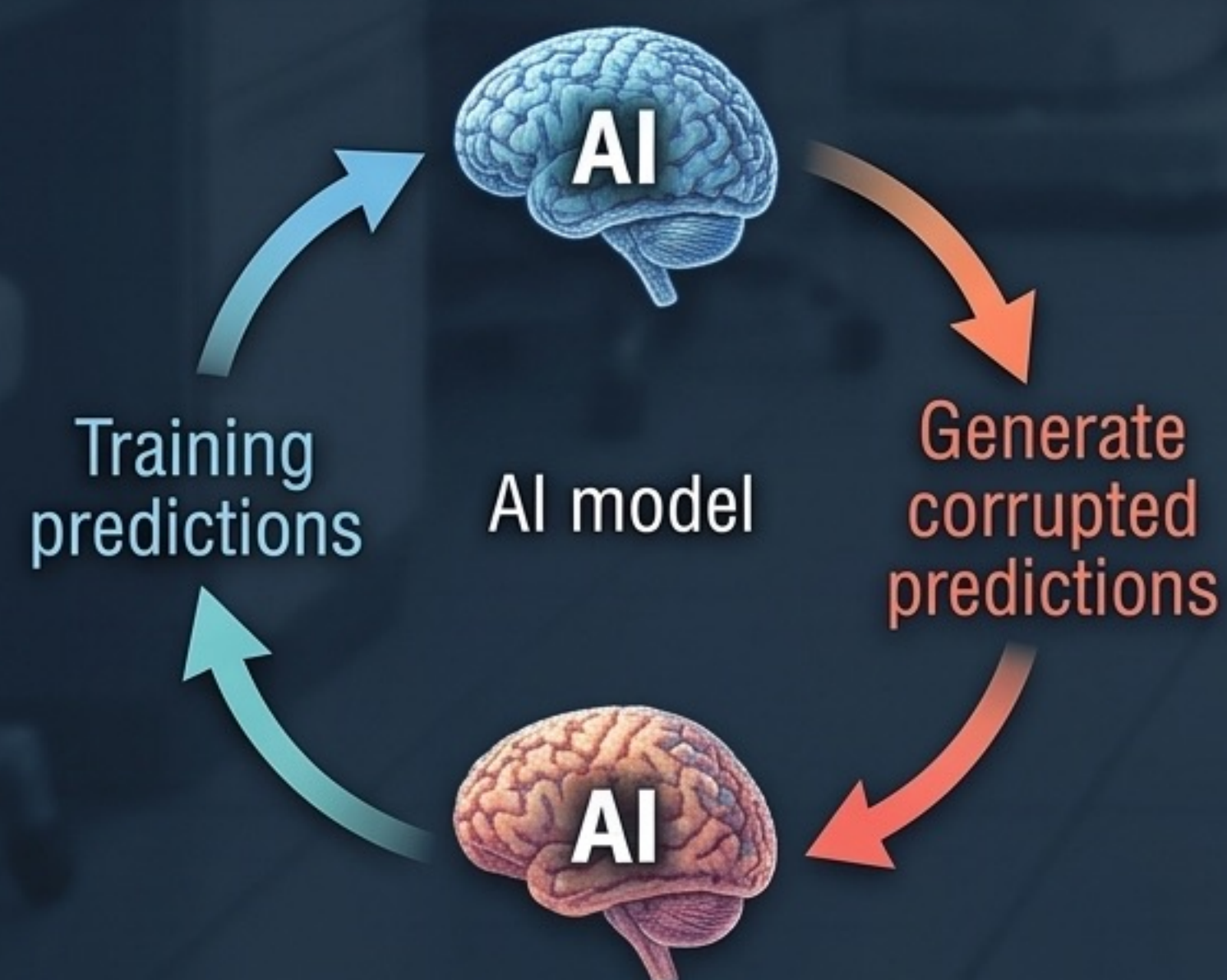
INTRODUCTION (Background)



Amyloid plaques (Aβ)
& Tau tangles (τ)
AT(N) biomarker cascade

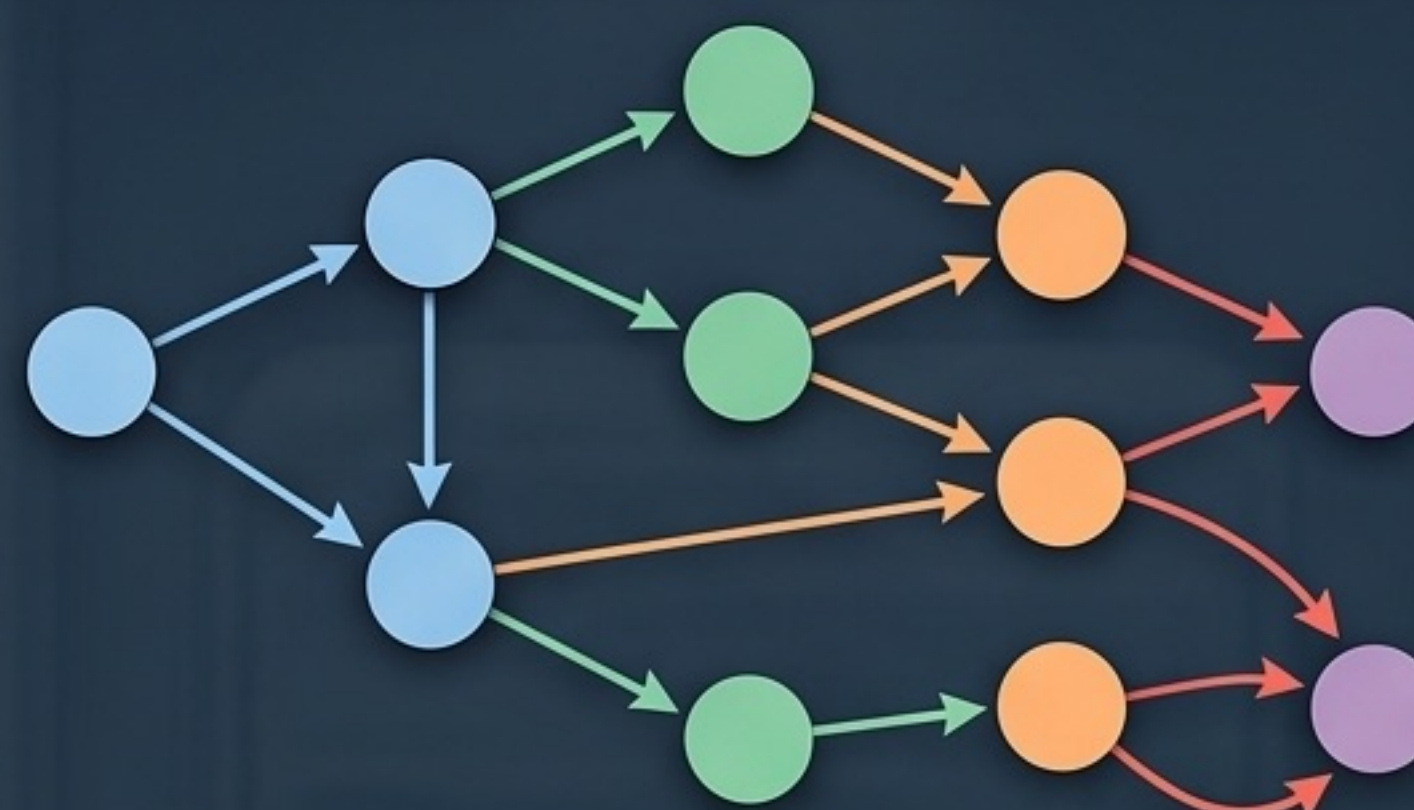
Modeling longitudinal AT(N) biomarker dynamics is complex.

Recursive self-improvement in AI promises capability growth, but iteratively training on self-generated data leads to recursive drift and mode collapse. This computationally demanding task requires stabilization.



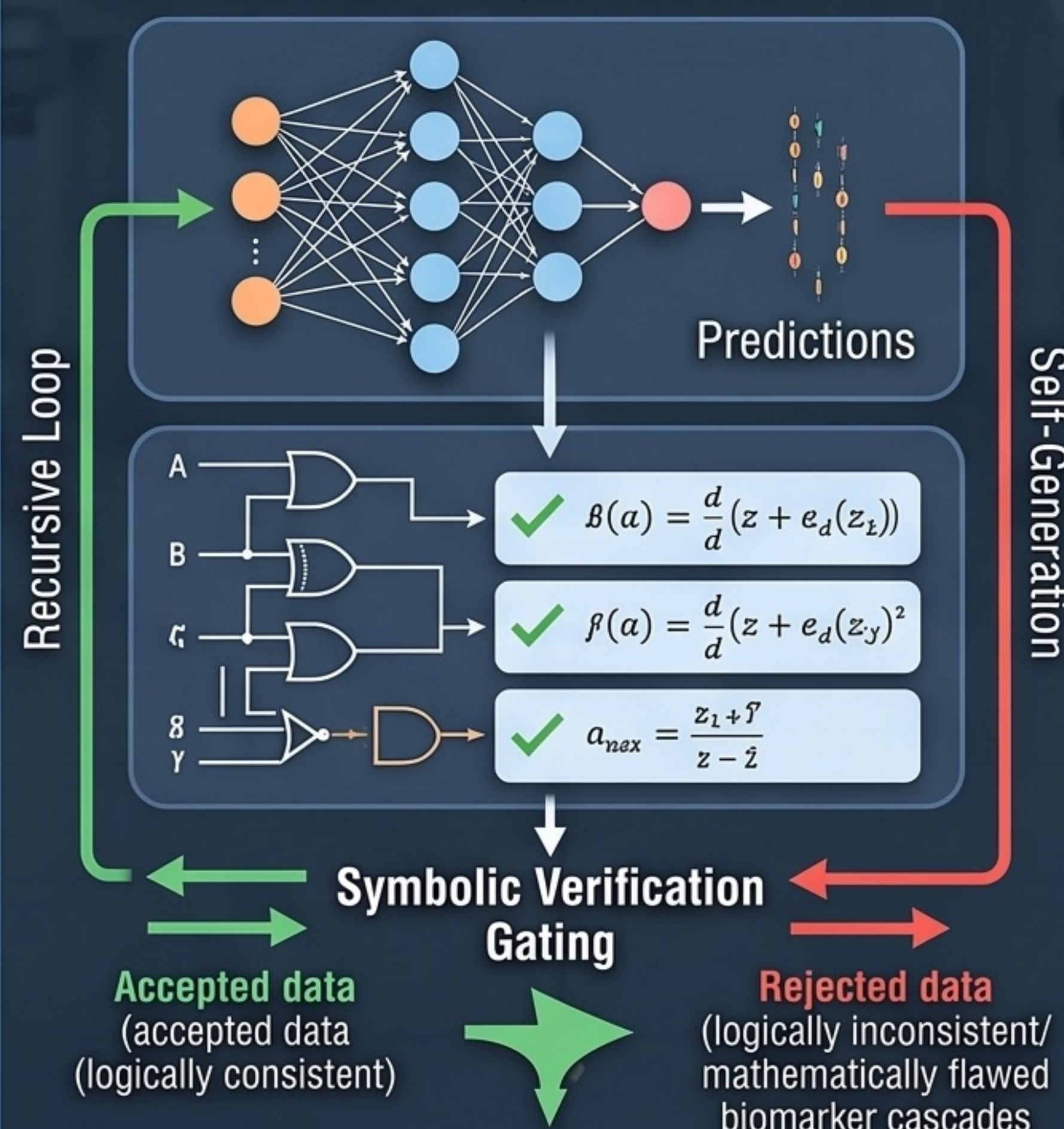
METHODS

(Neuro-Symbolic Recursive Self-Alignment)



DUAL-LAYER SYSTEM:

(A) **NEURAL LAYER** predicting longitudinal biomarker trajectories.
(B) **SYMBOLIC VERIFICATION SUBSYSTEM** evaluating predictions against established Ordinary Differential Equations (DDEs) for amyloid and tau kinetics.



RESULTS

(Halted Drift & Optimized Prediction)



INTEGRATION HALTS RECURSIVE DRIFT:

Symbolic verification prevents self-improvement degradation.

63% IMPROVEMENT IN LONG-TERM ACCURACY:

Rejection of predictions violating physical/biological constraints on synthetic clinical cohorts.



BIOLOGICAL REASONING:

Model differentiates sound physiological trajectories from flawed ones.

PRECISE THERAPEUTIC TIMING:

Autonomous agent optimizes intervention with unprecedented precision.

CONCLUSIONS

(Safeguarding Autonomous Modeling)

CRITICAL SYMBOLIC VERIFICATION: External verification makes recursive self-improvement measurable and reliable in clinical AI.

MATHEMATICALLY SAFE PATHWAY: Explicitly gating self-training data through biological physics enables robust, precise autonomous disease modeling.

