

What is claimed is:

1. A system for autonomous agents with persistent cognitive state and self-regulated execution, comprising:

one or more processors;

a non-transitory computer-readable medium storing instructions that, when executed by the one or more processors, cause the one or more processors to:

operate a cross-domain coherence engine implemented as a set of defined coupling functions maintaining bidirectional feedback pathways between a plurality of persistent cognitive domain fields of each of a plurality of semantic agents, wherein a state change in any one cognitive domain field propagates deterministic updates to at least one other cognitive domain field through a coupling function that computes the updates as a deterministic function of the state change and the current state of the at least one other cognitive domain field, and wherein the cross-domain coherence engine enforces that no cognitive domain field is updated in isolation from the feedback pathways;

maintain the plurality of semantic agents, each semantic agent having a cognitive state and comprising the plurality of persistent cognitive domain fields and a lineage field, the cognitive domain fields collectively encoding a behavioral disposition, a normative alignment, and an execution readiness of the semantic agent as continuously updated persistent state, wherein each cognitive domain field is independently tracked by the cross-domain coherence engine with a current value and a trajectory over time, and wherein the semantic agent carries a complete cognitive state such that an execution substrate hosting the semantic agent validates proposed state transitions without retaining authority over the semantic agent's cognitive state;

a composite admissibility evaluator configured to evaluate, for each proposed mutation to a semantic agent, a composite admissibility determination integrating signals from a plurality of the cognitive domain fields through the cross-domain coherence engine, and to selectively permit, gate, or suspend the proposed mutation based on the composite admissibility determination;

a non-executing cognitive mode into which the semantic agent transitions when the composite admissibility determination indicates insufficient execution readiness, the non-executing cognitive mode configured to conduct speculative evaluation including at least construction

of branching hypothetical state sequences, generation of structured inquiry requests, and evaluation of delegation alternatives, without committing state changes to a verified agent state;

wherein each proposed mutation, each composite admissibility determination, and each cognitive domain field update is recorded in the lineage field such that a complete behavioral trajectory of the semantic agent is deterministically reconstructible from the lineage field alone.

2. A computer-implemented method for governing execution of a semantic agent having a cognitive state through cross-domain cognitive coherence, the method comprising:

maintaining the semantic agent with persistent state comprising a lineage field that records a complete behavioral history and a plurality of cognitive domain fields, wherein each cognitive domain field is independently tracked by a cross-domain coherence engine and coupled through bidirectional feedback pathways implemented as defined coupling functions, wherein the semantic agent carries the persistent state including the cross-domain coherence engine such that the semantic agent is migratable between a plurality of execution substrates while preserving behavioral continuity, each execution substrate providing computational resources and validating proposed state transitions without retaining authority over the semantic agent's cognitive state;

receiving a proposed mutation to the semantic agent;

propagating the proposed mutation through the cross-domain coherence engine that computes, for each cognitive domain field, an independent contribution to a composite evaluation of the proposed mutation, and that propagates responsive updates between cognitive domain fields through the bidirectional feedback pathways;

determining, based on the composite evaluation, whether to permit the proposed mutation, gate the proposed mutation pending additional evaluation, or suspend execution of the semantic agent into a non-executing cognitive mode in which speculative evaluation continues without committing state changes;

when execution of the semantic agent is suspended into the non-executing cognitive mode based on the composite evaluation, iteratively generating candidate alternative mutations by constructing branching hypothetical state sequences within the cross-domain coherence engine, evaluating each candidate through the composite evaluation of the coupled cognitive

domain fields, and repeating the generation and evaluation until either a candidate satisfying the composite evaluation is identified and promoted to a verified execution path or an external intervention is received by the semantic agent;

recording, in the lineage field, the proposed mutation, the composite evaluation, all cognitive domain field updates, and any transitions into and out of the non-executing cognitive mode, wherein behavioral continuity of the semantic agent is maintained by the lineage field and the bidirectional feedback pathways such that a complete sequence of evaluations, suspensions, speculative generations, and promotions is deterministically reconstructible.

3. A non-transitory computer-readable medium storing instructions that, when executed by one or more processors, cause the one or more processors to perform a method comprising:

maintaining a semantic agent having a behavioral disposition and comprising a plurality of persistent cognitive domain fields each independently tracked by a cross-domain coherence engine implementing bidirectional feedback pathways as defined coupling functions, and a lineage field, wherein the semantic agent carries a complete cognitive state including the cross-domain coherence engine such that an execution substrate provides computational resources and validates proposed state transitions without retaining authority over the semantic agent's state transitions;

detecting, through the cross-domain coherence engine, a deviation in which a state of the semantic agent in any cognitive domain field deviates from a normative alignment defined by one or more policy constraints applicable to that cognitive domain field;

in response to detecting the deviation, propagating corrective pressure from the deviating cognitive domain field through the bidirectional feedback pathways to at least one other cognitive domain field, thereby modulating the semantic agent's behavioral disposition across coupled domains;

generating, through a three-phase corrective loop operating within the cross-domain coherence engine, a candidate mutation designed to restore normative alignment in the deviating cognitive domain field, the three-phase corrective loop comprising a detection phase that registers normative impact of the deviation, a recording phase that commits the deviation to the lineage field as an immutable entry, and a corrective pressure phase that produces the candidate mutation, wherein the candidate mutation is evaluated against a composite

admissibility determination integrating signals from all coupled cognitive domain fields before permitting execution;

recording each phase of the three-phase corrective loop in the lineage field, wherein a sequence of correction from deviation detection through corrective pressure generation is deterministically reconstructible from the lineage field and wherein the corrective pressure propagates through the bidirectional feedback pathways to modulate the semantic agent's behavioral disposition toward restored normative alignment.

4. The system of claim 1, wherein the cognitive domain fields comprise at least three domains each independently tracked by the cross-domain coherence engine, and wherein the bidirectional feedback pathways form a connected graph such that a state change originating in any one cognitive domain field is capable of propagating, through one or more intermediate coupling functions, to every other cognitive domain field.

5. The system of claim 1, wherein the composite admissibility determination comprises, for at least one cognitive domain field, computing both a current scalar value and a rate of change of the scalar value over a policy-defined temporal window, and wherein the composite admissibility determination incorporates the rate of change such that a projected future crossing of a policy-defined threshold influences the admissibility determination independently of whether the current scalar value exceeds the threshold.

6. The system of claim 1, wherein the cross-domain coherence engine enforces asymmetric coupling such that a negative state change in a first cognitive domain field propagates to coupled cognitive domain fields at a rate different from the rate at which a positive state change of equal magnitude in the first cognitive domain field propagates.

7. The system of claim 1, wherein at least one of the bidirectional feedback pathways couples a first cognitive domain field encoding behavioral disposition to a second cognitive domain field encoding execution readiness, such that degradation of the behavioral disposition reduces execution readiness through the coupling function.

8. The system of claim 1, wherein the cross-domain coherence engine maintains at least one feedback pathway coupling a cognitive domain field encoding normative alignment to a cognitive domain field encoding behavioral disposition, such that detection of normative

deviation produces a measurable change in the behavioral disposition through the coupling function.

9. The system of claim 1, further comprising a containment layer separating hypothetical state sequences generated during speculative evaluation from verified agent state, the structural boundary enforcing that no hypothetical state sequence alters verified agent state without passing through a composite admissibility evaluation by the cross-domain coherence engine.

10. The system of claim 1, further comprising an interface configured to receive proposed mutations from a stateless external model, wherein the interface is architecturally unidirectional such that no verified agent state, no cognitive domain field value, and no lineage content is transmitted to the stateless external model through the interface.

11. The system of claim 1, further comprising a governance substrate configured to evaluate proposed mutations during execution of a probabilistic inference process, the governance substrate interposing an admissibility evaluation between successive inference steps such that each inference step is conditioned on a persistent semantic state maintained independently of the probabilistic inference process.

12. The method of claim 2, further comprising detecting, through the cross-domain coherence engine, that the semantic agent has maintained a sustained pattern in which one or more cognitive domain fields remain outside a policy-defined normative alignment for a duration exceeding a policy-defined threshold, and in response to detecting the sustained pattern classifying the sustained pattern as a stable operating regime distinct from transient deviation.

13. The method of claim 2, further comprising projecting a behavioral trajectory of the semantic agent across a plurality of hypothetical projected mutation paths and classifying each projected mutation path according to whether the projected mutation path trends toward or away from normative alignment across the coupled cognitive domain fields.

14. The system of claim 1, further comprising a learning pathway in which execution outcomes produced by permitted mutations are evaluated by a training governance module and selectively incorporated as governed training data subject to depth-selective routing constraints, such that the cognitive domain fields are refined through the system's own governed execution without requiring externally curated training data.

15. The system of claim 1, further comprising a knowledge cascade in which a training governance module informs an inference control module that enforces semantic admissibility during candidate mutation generation, and the inference control module informs a proposal generation module that produces the candidate mutations, such that each successive stage in the cascade operates under governance constraints propagated from prior stages.

16. The system of claim 1, wherein the cognitive domain fields form a sequential modulation cascade in which a first cognitive domain field encoding behavioral disposition modulates a second cognitive domain field encoding dispositional trait expression, the second cognitive domain field modulates a third cognitive domain field encoding normative alignment evaluation thoroughness, and the third cognitive domain field modulates a fourth cognitive domain field encoding execution readiness, such that a state change in the first cognitive domain field propagates through the cascade to the fourth cognitive domain field.

17. The system of claim 1, further comprising a plurality of interaction modules coupled through a sequential dependency chain in which a biological continuity module establishes an operator identity through persistent observation of behavioral signals as a prerequisite for a capability progression module that governs advancement through a plurality of gated tiers, and the capability progression module provides progression state to a disruption detection module that monitors parametric state of the cross-domain coherence engine for phase-shift trajectories indicated by progression patterns including stalled advancement, repeated regression, or acceleration exceeding a policy-defined rate threshold.

18. The method of claim 2, further comprising completing a closed-loop architecture within the cross-domain coherence engine through three concurrent feedback loops: a first loop in which application outcomes produced by committed mutations propagate through the cross-domain coherence engine to update the cognitive domain fields; a second loop in which updated cognitive domain fields propagate governed constraints back to an execution evaluation substrate; and a third loop in which execution outcomes feed back to a training governance module as candidate training data subject to governed depth-selective routing.

19. The system of claim 1, wherein the semantic agent implements an architectural inversion in which the semantic agent carries the complete cognitive state, including the cross-domain coherence engine and all bidirectional feedback pathways, such that the execution substrate

operates as a passive computational resource provider that validates proposed state transitions without determining a behavioral trajectory of the semantic agent, retaining the semantic agent's cognitive state, or influencing self-regulatory dynamics of the semantic agent.

20. The system of claim 19, wherein the architectural inversion enables substrate-independent migration in which the semantic agent migrates between a plurality of heterogeneous execution substrates while preserving behavioral continuity, the behavioral continuity being maintained by the semantic agent's carried cognitive state and lineage field independently of which execution substrate of the plurality provides underlying computational resources.