Emotional Decay Curves With Hysteresis

by Nick Clark | Published March 27, 2026 | PDF

Exponential decay toward baseline with asymmetric update rates where negative valence decays faster than positive, producing a built-in caution bias.

What It Is

Each affective dimension decays exponentially toward its policy-defined baseline over time. The decay is asymmetric: negative valence dimensions such as elevated risk sensitivity decay faster than positive valence adjustments. This built-in asymmetry produces a structural caution bias where agents recover from fear faster than they lose confidence.

Hysteresis ensures that affect dimensions do not snap instantly between states. The transition follows a smooth curve governed by time constants that differ between the rising and falling phases of each dimension.

Why It Matters

Without asymmetric decay, agents either retain negative affect too long, becoming permanently cautious, or lose it too quickly, becoming reckless after adverse experiences. The asymmetry produces behavior that mirrors a key property of biological emotion: the memory of negative experiences fades, but more slowly than positive momentum builds.

Hysteresis prevents oscillation. An agent near a behavioral transition point does not flip rapidly between states. Instead, it transitions smoothly, and the transition back requires the affect dimension to move past the threshold by a margin, preventing rapid cycling.

How It Works Structurally

Each dimension carries its own decay time constant, specified in the policy reference. The decay function computes the current effective value as the baseline plus the difference between the last updated value and baseline, multiplied by an exponential decay factor based on elapsed time since last update.

The asymmetry is implemented by applying different time constants for values above baseline versus below baseline. Negative shifts (risk sensitivity spikes) decay with a shorter time constant than positive shifts (novelty appetite increases). The hysteresis margin is a per-dimension policy parameter.

What It Enables

Agents that naturally become cautious in response to adverse events but do not remain permanently cautious. Over time, the elevated caution fades, returning the agent to normal operational posture. This prevents the accumulation of permanent behavioral restrictions from transient events.

System designers can tune the caution bias by adjusting asymmetry ratios, producing agents that are more or less conservative in their recovery profiles depending on domain requirements.

Affective State All 21 steps →

Emotion as a computational primitive, not a simulation.

Primary Technical Disclosure
○ Affective State as a Deterministic Control Primitive for Semantic Agents
Secondary Technical
○ Affective State as Seventh Canonical Field○ Named Control Field Modulation Architecture○ Affect-Modulated Promotion Thresholds○ Deterministic Affect Encoding and Update Mechanics● Emotional Decay Curves With Hysteresis○ Entropy-Governed Valence Stabilization○ Affective Inheritance in Delegation Chains○ Emotional Quarantine and Volatility Management○ Affect-Modulated Trust Slope Validation○ Biological Signal-to-Affective Coupling○ Affective Contagion in Multi-Agent Systems○ Affect-Modulated Discovery Traversal○ Affect-Governance Separation○ Policy-Bounded Affective Updates○ Affect as Cross-Primitive Input○ Affect-Modulated Inference Integration○ Substrate-Agnostic Affect Deployment○ Pseudonymous Emotional Operation○ Temporal Cognition Field
Applications (General)
○ Companion AI That Maintains Emotional Consistency Across Sessions○ Therapeutic Agent Affect Management Under Clinical Constraints○ Affective State for Customer Service Agents○ Affective State for Elderly Care Companion Agents○ Affective State for Crisis Response Agents○ Affective State for Negotiation Agents○ Affective State for Educational Tutoring Agents○ Affective State for HR and Recruitment Agents
Applications (Specific)
○ Replika's Emotional Memory Is Stateless○ Character.ai's Personality Problem Is Deeper Than Prompting○ Woebot's Therapeutic Affect Has No Persistent State○ Elomia's Empathy Resets Every Session○ Hume AI Measures Emotion but Cannot Govern It○ Affectiva Reads Faces but Not Emotional Trajectories○ Cogito Scores Conversations Without Emotional State○ Beyond Verbal Decoded Voice Without Building Emotional Memory○ EmotiBit Captures Physiology Without Affective Governance○ RealEyes Measures Attention Without Emotional Persistence
Affective State overview →
AQ
deterministic
autonomy

Legal

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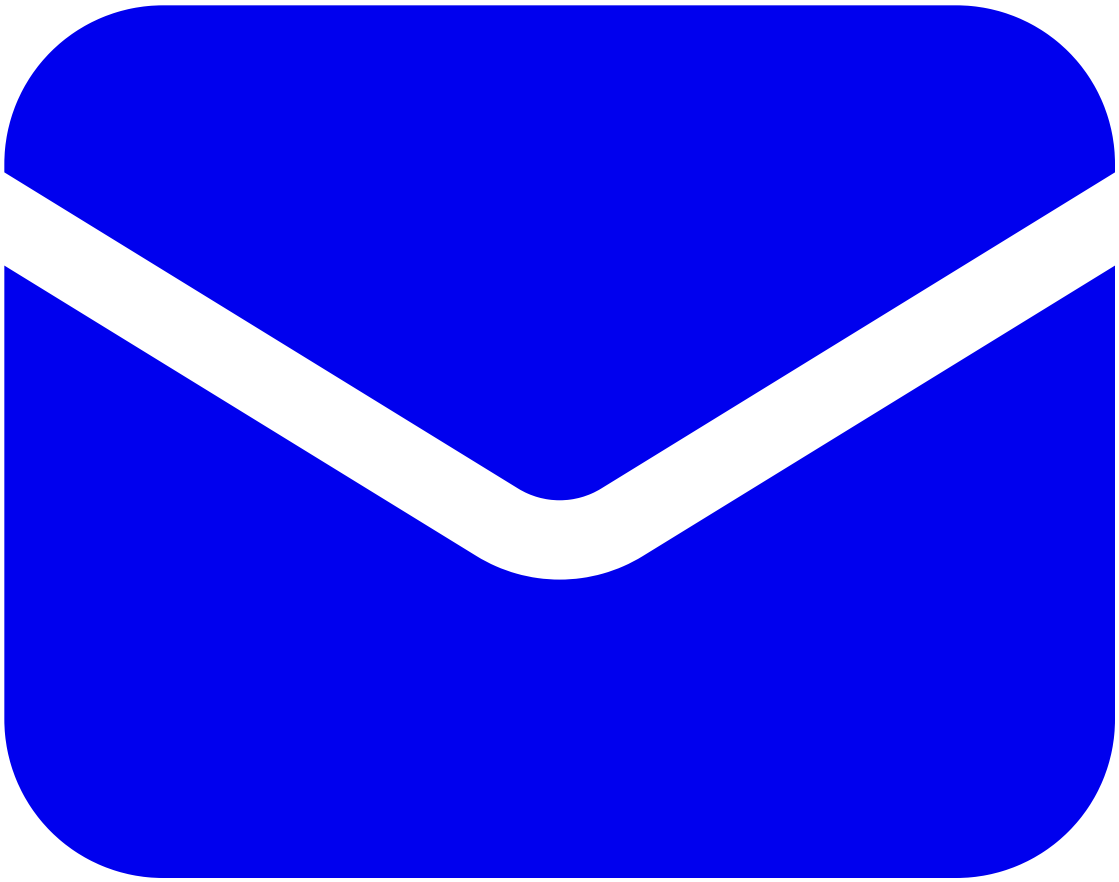

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