Biological Signal-to-Affective Coupling

by Nick Clark | Published March 27, 2026 | PDF

Pipeline translating human physiological indicators such as heart rate variability, galvanic skin response, and vocal prosody into agent affective updates through policy-governed coupling functions.

What It Is

A policy-governed pipeline translates human physiological indicators into agent affective updates. Supported signals include heart rate variability, galvanic skin response, vocal prosody, facial micro-expressions, and other measurable physiological states. The pipeline maps these signals through coupling functions that produce structured updates to specific affective dimensions.

The coupling is unidirectional: biological signals update agent affect, but agent affect does not directly modify human physiological state.

Why It Matters

Agents operating alongside human operators need to respond to the operator's state. A driver's elevated stress should influence the vehicle agent's risk sensitivity. A patient's distress should influence the therapeutic agent's escalation tendency. Without biological coupling, agents are blind to the human state they are meant to serve.

The coupling must be policy-governed to prevent manipulation. Biological signals can be noisy or spoofed, so the pipeline includes validation and bounds that prevent adversarial biological inputs from destabilizing agent behavior.

How It Works Structurally

Biological signals are acquired through sensors appropriate to the domain. The pipeline normalizes raw signals against the individual's baseline, applies noise filtering, and maps the resulting values through coupling functions defined in the agent's policy reference. Each coupling function specifies which biological signal affects which affective dimension, the mapping curve, and the update bounds.

Updates from biological signals are subject to the same governance constraints as all other affective updates: range bounds, rate limits, and admissible triggers apply.

What It Enables

Human-agent systems where the agent genuinely responds to the operator's condition. Autonomous vehicles that become more cautious when the driver is stressed. Companion AI that adjusts its interaction style when it detects user fatigue. Therapeutic systems that modulate intervention intensity based on patient physiological state.

All of these capabilities emerge from the same structural mechanism, parameterized differently for each domain.

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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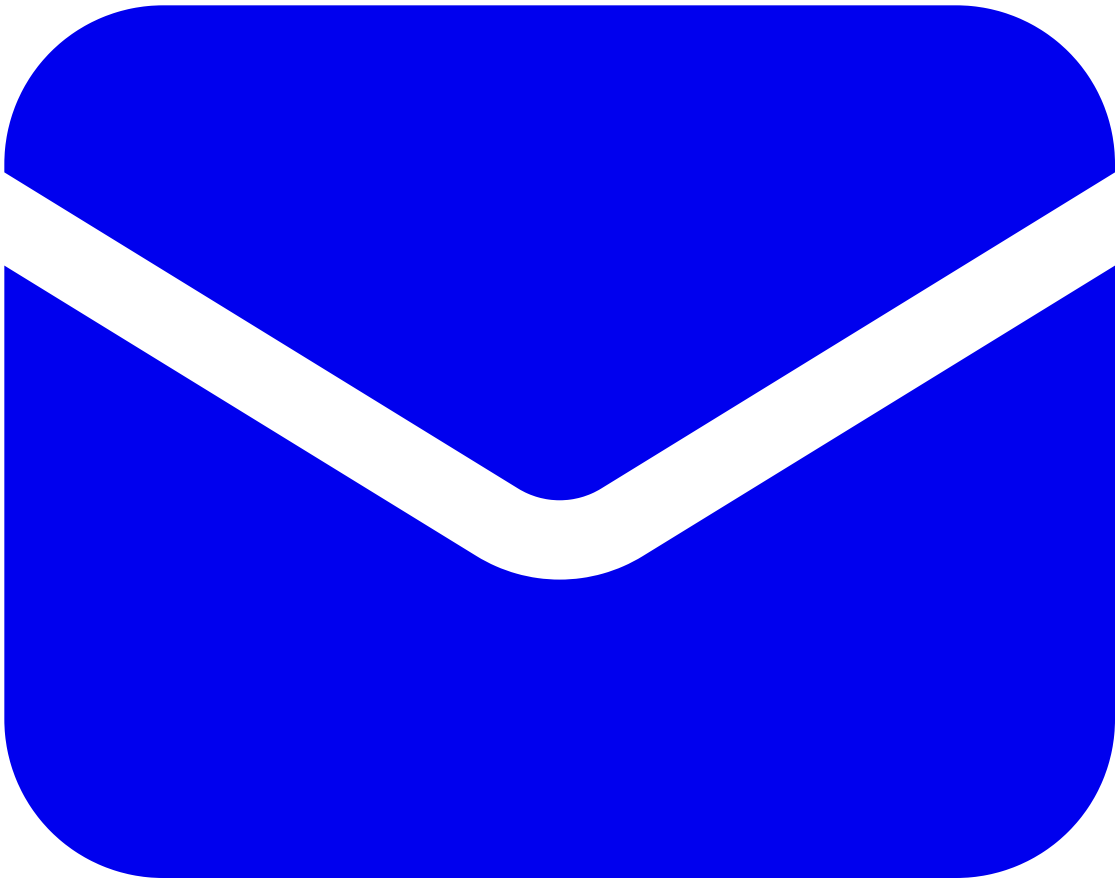

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