Training Governance for Defense AI

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Defense AI systems operate under constraints that commercial AI development does not face: classification boundaries that must be enforced during training, adversarial environments where training data may be poisoned, and acquisition processes that require complete provenance traceability for every training influence. Training governance provides the structural mechanisms to enforce these constraints within the training loop itself rather than depending on operational procedures that may be circumvented.

The classification problem in defense AI training

Defense AI models often require training on data spanning multiple classification levels. A model for intelligence analysis may need to learn from both unclassified open-source intelligence and classified signals intelligence. Current training pipelines do not enforce classification boundaries within the

training process. The model learns from all data uniformly, and classification enforcement occurs at the deployment layer through access controls.

This creates a structural risk: a model trained on classified data carries that classified influence in its parameters, regardless of the deployment context. If the model is deployed in an unclassified environment, the classification boundary has been violated at the training level, even if no classified output is explicitly generated. The classified training influence is embedded in the model's behavior.

Why training data isolation is insufficient

Defense organizations address classification during training by maintaining separate training pipelines for each classification level. This prevents cross-classification contamination but also prevents the model from learning connections across classification levels. An intelligence analyst benefits from a model that understands both open-source and classified information domains. Fully isolated training pipelines produce models that are knowledgeable within each domain but blind to cross-domain connections.

The challenge is enabling cross-classification learning while maintaining provable classification boundaries, a structural requirement that data isolation addresses too coarsely.

How training governance addresses defense AI

Training governance routes gradients based on classification metadata. Unclassified training data routes to deep, broadly accessible layers. Classified data routes to layers that are structurally isolated and accessible only in appropriately classified deployment contexts. The model learns from both classification levels, but the knowledge is depth-separated by classification.

Adversarial training data detection uses entropy-based profiling to identify training examples that deviate from expected patterns. In defense contexts, adversarial actors may attempt to poison training data to create predictable model behaviors. Entropy-based profiling detects examples whose information content is inconsistent with their claimed source, flagging potential data poisoning before the adversarial influence is learned.

Provenance tracing provides the complete training audit trail that defense acquisition requires. Every model behavior can be traced to specific training examples, the classification level of those examples, and the gradient depth at which they were learned. This trace supports the acquisition documentation requirements that defense programs impose on AI systems.

Zero-weight prevention ensures that no training influence is silently discarded. Every training example either contributes to the model through governed gradient routing or is explicitly excluded with documented justification. This prevents the training pipeline from silently dropping data that could affect model behavior in deployment.

What implementation looks like

A defense AI program deploying training governance annotates training data with classification level, source provenance, and confidence assessment. The training pipeline routes gradients based on this metadata, producing models with classification-stratified knowledge and complete provenance documentation.

For intelligence analysis systems, training governance enables models that leverage both open-source and classified knowledge while maintaining provable classification boundaries in the model architecture itself.

For defense acquisition, training governance provides the documentation package that program offices require: complete provenance tracing, classification boundary enforcement evidence, and adversarial robustness assessment at the training level rather than only at the deployment level.

Training Governance All 21 steps →

Govern what the model learns, at what depth, with what provenance.

Primary Technical Disclosure
○ Depth-Selective Training Governance for Machine Learning Systems
Secondary Technical
○ Training Examples as Proposed Semantic Mutations○ Entropy-Band-Indexed Training Depth Profiles○ Depth-Selective Gradient Routing for Governed Training○ Training-Level Memorization Detection○ Differential Privacy Through Depth-Selective Routing○ Governed Fine-Tuning With Verifiable Provenance○ The Training Loop as a Governed Execution Environment○ Policy-Governed Knowledge Retention and Suppression○ Provenance-Traceable Training Dynamics○ Curriculum-Integrated Depth Scheduling○ Affect-Modulated Training Depth○ Training-Inference Governance Integration○ Training Governance for Human-Relatable Agents
Applications (General)
○ Rights-Compliant Model Training Through Depth-Selective Routing○ Regulated Industry Model Governance With Provenance○ Training Governance for Medical AI○ Training Governance for Legal AI○ Training Governance for Financial Model Training● Training Governance for Defense AI○ Training Governance for Educational AI Models○ Training Governance for Creative AI
Applications (Specific)
○ OpenAI's Training Pipeline Has No Depth-Selective Governance○ Constitutional AI Training Lacks Depth-Selective Control○ Stable Diffusion's Training Has No Provenance Layer○ Midjourney Trains Aesthetics Without Governed Depth○ Scale AI Labels Data Without Governing What Models Learn○ Labelbox Manages Annotation Workflows, Not Learning Dynamics○ Snorkel AI Programs Labels but Does Not Govern Gradient Depth○ Weights & Biases Tracks Experiments, Not Learning Governance○ Determined AI Orchestrates Compute, Not Learning Depth○ MosaicML Optimizes Training Efficiency, Not Learning Governance
Training Governance overview →
AQ
deterministic
autonomy

Legal

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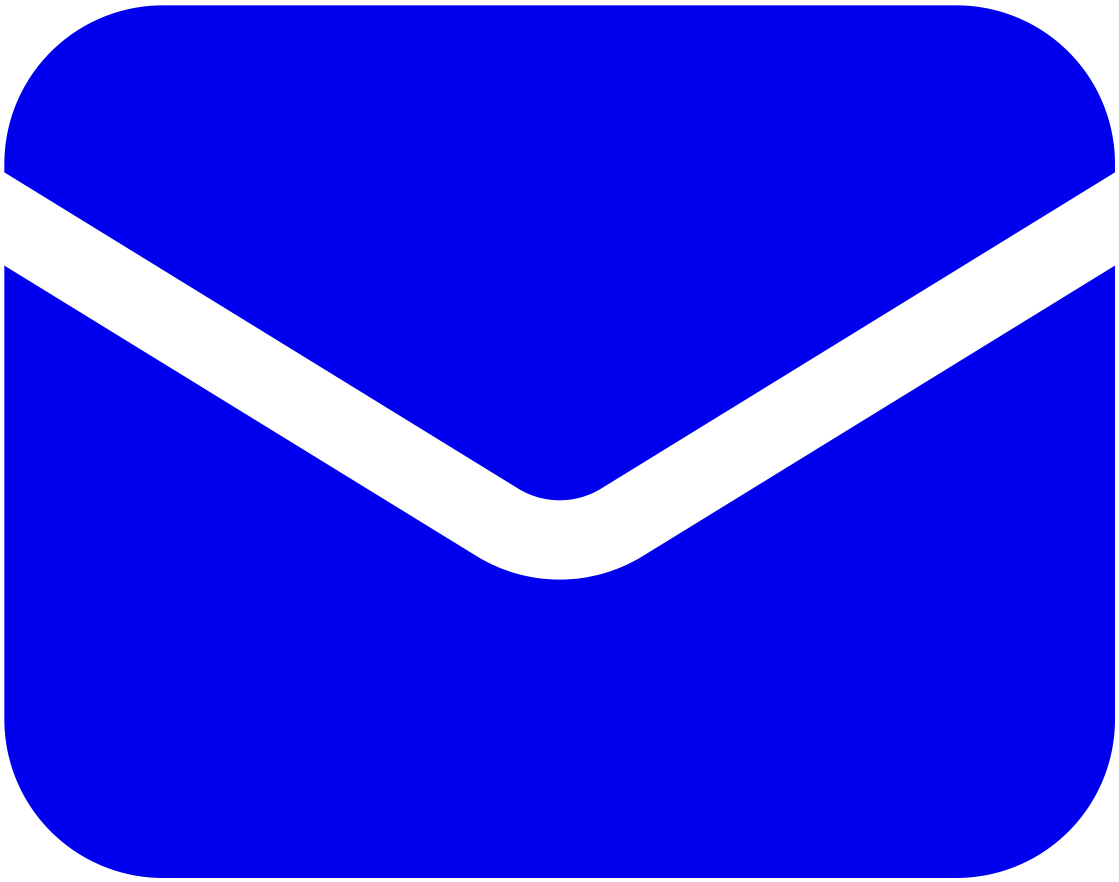

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