RSVP Trilogy: Compressed Abstracts for arXiv

1 Paper 1: From Fractured Representations to Modal Coherence

Abstract

Deep neural networks often produce fractured, entangled representations (FER) despite high performance, limiting interpretability and generalization. We introduce the Relativistic Scalar Vector Plenum (RSVP), a field-theoretic framework modeling cognition via scalar potential (Φ), vector flow ($\vec{v}$), and entropy ($\mathcal{S}$) fields. Coherent representations are modal fixpoints satisfying Löb's Theorem, while fractured ones exhibit thermodynamic instability and torsion ($T_{\text{ent}} = \int \|\nabla \times \vec{v}\|^2 dx$). RSVP reframes generalization as semantic convergence in field space, offering a physically grounded explanation for representational quality. Predictions are outlined for empirical validation.

(116 words)

2 Paper 2: Diagnosing Representation Fracture via Scalar-Vector-Entropy Field Dynamics

Abstract

Fractured representations in deep learning obscure interpretability and modularity. Using the RSVP framework, we develop geometric diagnostics to quantify representational quality via scalar (Φ), vector ($\vec{v}$), and entropy ($\mathcal{S}$) fields extracted from model activations. We propose three metrics: Torsion Entanglement Score ($\|\nabla \times \vec{v}\|$), Modal Closure Depth, and Redundancy Index. Applied to MLPs, transformers, and evolved networks, these reveal structural flaws missed by standard metrics. We release `rsvp_diag`, an open-source toolkit for model inspection, enabling theory-driven debugging and interpretability analysis.

(104 words)

3 Paper 3: Beyond Gradient Descent: A Modal-Thermodynamic Paradigm for AI

Abstract

Gradient descent fails to ensure modular, interpretable representations. We propose the RSVP framework, modeling learning as recursive convergence of scalar, vector, and entropy fields toward modal fixpoints ($\Box A$). A thermodynamic descent rule ($\Phi_{t+1} = \Phi_t - \eta \nabla \mathcal{S}_{\text{eff}}$) replaces backpropagation, emphasizing semantic stability. RSVP supports modularity, continual learning, and intrinsic interpretability, drawing from modal logic and non-equilibrium thermodynamics. We outline RSVP-inspired architectures for cognitive AI, with implications for alignment and generalization.

(108 words)