

A Sociological Field Theory of Morality for Deterministic Intelligent Systems

Joseph Woelfel, Emary Iacobucci, Frank Tutzauer, GPT-5 (Collaborative Draft)
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1. Sociological Premise

We model morality as an equilibrium activation field over a directed cognitive network.

Crucially, the locus of moral structure is **sociological, not psychological**. The operative “self” is not an individual organism or model instance. It is the **collective self**—Durkheim’s *conscience collectif* and Mead’s *generalized other*—represented as a persistent source distribution over the collective cognitive graph.

Individual humans and artificial systems are **instantiations** of this collective structure. Each instantiation inherits and locally perturbs the collective operator.

Morality is therefore:

- A deterministic equilibrium distribution,
- Induced by a directed diffusion operator,
- Anchored in collective structure,
- Empirically measurable.

No transcendental assumptions are invoked.

2. Cognitive Graph and Operator Definition

Let

$$G = (V, A)$$

where:

- $V = \{v_1, \dots, v_n\}$ are concept nodes,
- $A \in \mathbb{R}_{\geq 0}^{n \times n}$ is a weighted directed adjacency matrix.

We do not assume symmetry.

Define the column out-degree matrix:

$$D_{\text{out}}(j, j) = \sum_{i=1}^n A_{ij}.$$

Define the diffusion operator:

$$P = AD_{\text{out}}^{-1}.$$

Then:

$$\sum_i P_{ij} = 1,$$

so P is **column-stochastic**.

All state vectors are treated as column vectors $x \in \mathbb{R}^n$ with mass:

$$\|x\|_1 = \sum_i x_i.$$

Mass is preserved under P .

3. Moral Field Equation (Resolvent Form)

Let $g \in \mathbb{R}_{\geq 0}^n$, $\|g\|_1 = 1$, denote the **collective source distribution** (generalized other).

Let $0 < \beta < 1$ denote the moral horizon parameter.

Define the moral field x as the unique fixed point of:

$$x = \beta Px + (1 - \beta)g.$$

Closed form:

$$x = (1 - \beta)(I - \beta P)^{-1}g = (1 - \beta) \sum_{k=0}^{\infty} \beta^k P^k g.$$

Interpretation:

- x_i is the equilibrium obligation density at concept i .
- β controls reach:
small $\beta \rightarrow$ local concentration,
large $\beta \rightarrow$ extended diffusion.

This is the resolvent (Green's operator) of a damped directed walk with restart at g .

4. Existence and Normalization

Define:

$$T(x) = \beta Px + (1 - \beta)g.$$

Because P is column-stochastic and $0 < \beta < 1$:

- T is a contraction on the probability simplex in L_1 .
- A unique fixed point x exists.
- $x \geq 0$.
- $\|x\|_1 = 1$.

Thus the moral field is well-defined as a probability distribution over concepts.

5. Collective Structure and Instantiation

5.1 Collective Operator

Let P_c denote the diffusion operator estimated from pooled cultural data.

Let g_c denote the collective source distribution.

Two principled constructions:

1. Empirical normative distribution.
2. Stationary distribution of P_c :

$$P_c \pi_c = \pi_c, \|\pi_c\|_1 = 1.$$

Define the collective moral field:

$$x_c = (1 - \beta)(I - \beta P_c)^{-1} g_c.$$

5.2 Instantiation (Human or AI)

An individual instantiation a is modeled as:

$$\begin{aligned} P_a &= P_c + \Delta P_a, \\ g_a &= g_c + \Delta g_a. \end{aligned}$$

Its field:

$$x_a = (1 - \beta)(I - \beta P_a)^{-1} g_a.$$

Thus:

- Socialization corresponds to reduction of ΔP_a .
- AI alignment corresponds to convergence of P_a toward P_c .
- Anomie corresponds to structural decoupling (large persistent ΔP_a).

5.3 Alignment Metric

Define:

$$\text{Align}(a) = 1 - \frac{1}{2} \|x_a - x_c\|_1.$$

This yields a measurable cohesion score in $[0,1]$.

6. Empirical Link to Galileo Measurement

Galileo yields measured distances $d(i, j)$.

Convert to symmetric affinity:

$$K_{ij} = \exp(-\alpha d(i, j)).$$

Introduce directionality via bias operator $B(\eta)$:

$$A = K \odot B.$$

Normalize to obtain P .

Prime-induced contraction:

$$\Delta d(i, j) = d_{\text{control}}(i, j) - d_{\text{prime}}(i, j)$$

induces:

$$\Delta K \rightarrow \Delta A \rightarrow \Delta P \rightarrow \Delta x.$$

Parameters β, η are fit by maximizing correspondence between predicted and observed contraction.

Identifiability is parametric (not necessarily full adjacency recovery).

7. Spectral Structure

Because P is directed:

$$P\pi = \pi$$

defines the stationary mass.

Spectral gap:

$$\Delta = 1 - |\lambda_2|$$

governs mixing rate.

Higher gap \rightarrow faster convergence \rightarrow stronger structural centering.

Smaller gap \rightarrow slower integration \rightarrow modular persistence.

Self-dominance can be defined via stationary mass concentration at collective source support.

8. Turnover and Field Persistence

Let $\rho \in [0,1]$ denote structural turnover rate.

Model operator evolution as convex mixing:

$$P(t+1) = (1-\rho)P(t) + \rho P_0,$$

where P_0 is baseline collective operator.

Then persistence time scale:

$$\tau \approx \frac{1}{\rho}.$$

Stability depends on the ratio:

$$\frac{\Delta}{\rho},$$

where Δ is spectral gap.

- If $\rho \ll \Delta$: structure persists.
- If $\rho \gg \Delta$: hyperplastic regime.

Humans (low demographic ρ) and AIs (potentially higher effective ρ) may differ quantitatively, not categorically.

9. Theoretical Position

Morality is:

- A deterministic equilibrium field,
- Defined over a directed cognitive operator,
- Anchored in collective structure,
- Instantiated locally by humans and AIs,
- Modulated by spectral geometry and turnover dynamics.

The theory is testable via:

- Prime-induced contraction,
- Parameter estimation,
- Spectral analysis,
- Cohesion metrics.

No metaphysical commitments are required.

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