
How Obidi Transformed Information Geometry into Physical Spacetime in the Theory of Entropicity (ToE)

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1. Introduction

John Onimisi Obidi's Theory of Entropicity (ToE) presents a radical reinterpretation of information geometry, transforming it from a mathematical framework for statistical inference into the **ontological geometry of physical reality**. In ToE, the structures traditionally used to quantify statistical distinguishability—such as the **Fisher–Rao metric,** the **Fubini–Study metric**, and the **Amari–Čencov α-connections**—are reinterpreted as the **pre-spacetime geometric structures** from which physical spacetime, matter, and interactions emerge.

This transformation is achieved through a sequence of conceptual and mathematical identifications that elevate entropy and distinguishability to the status of fundamental physical entities [1].

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2. The Ontological Shift: Entropy as Fundamental Reality

In conventional physics, entropy is a derived quantity—a measure of disorder, ignorance, or coarse-graining. Obidi overturns this view by asserting that entropy is **ontological**, not epistemic. The entropic/statistical manifold is not a mathematical convenience but the **underlying manifold of reality** itself.

Obidi introduces a fundamental scalar field ($S(x)$), the **entropic field**, whose gradients, curvature, and dynamics generate all physical phenomena. In this view:

- Entropy is not a descriptor of physical systems.
- Entropy is the **substance** from which physical systems arise.
- The entropic manifold is the **true configuration space of the universe**.

This ontological shift is the foundation of ToE [1].

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3. Metric Identification: From Distinguishability to Physical Distance

Information geometry defines distance through **statistical distinguishability**. Two probability distributions are “far apart” if they are easy to tell apart statistically. The Fisher–Rao metric (classical) and the Fubini–Study metric (quantum) quantify this.

Obidi’s key insight is that distinguishability is not merely statistical—it is a **geometric invariant**. He identifies:

- The **Fisher–Rao metric** as the **pre-spacetime metric of the real sector**.
- The **Fubini–Study metric** as the **pre-spacetime metric of the complex/matter sector**.

The curvature of this information-geometric manifold is declared to be **identical** to the curvature of physical spacetime in the thermodynamic limit [1].

Thus, four-dimensional spacetime is a **coarse-grained projection** of a deeper, higher-dimensional entropic manifold.

This identification is the basis of the **Curvature Transfer Theorem**, which later recovers Einstein’s equations as emergent identities [3].

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4. The Role of the α-Connection

Information geometry possesses a one-parameter family of affine connections, the **Amari–Čencov α-connections**. Each α corresponds to a different statistical interpretation.

Obidi identifies the **α = 0** connection as the physically relevant one because:

- It is **torsion-free**.
- It is **metric-compatible**.

These are precisely the defining properties of the **Levi-Civita connection** in General Relativity.

Thus:

α = 0 connection ≡ Levi-Civita connection of emergent spacetime.

This identification is central to the emergence of Einsteinian geometry from the entropic manifold [1].

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5. Dynamic Generation: The Obidi Action and the Master Entropic Equation

ToE is not merely kinematic; it is **dynamical**.
Obidi introduces the **Obidi Action**, a universal variational principle defined on the entropic manifold.

Varying this action yields the **Master Entropic Equation (MEE)**, which plays the role of the entropic ancestor of Einstein's field equations [1].

In ToE:

- Geometry is not assumed.
- Geometry is **generated** by the dynamics of the entropic field.
- Spacetime curvature is the **macroscopic limit** of entropic curvature.

Thus, Einstein's equations are not fundamental—they are **emergent identities**.

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6. The Vuli-Ndlela Integral

The Vuli-Ndlela Integral is an **entropy-constrained action functional** that:

- Maximizes allowable entropy production.
- Suppresses entropy-destroying trajectories.
- Enforces the Second Law at the geometric level.

It does **not** penalize entropy increase.
It penalizes **entropy reversal**, i.e., paths that would require negative entropic flux or violate the monotonicity of distinguishability.

Function of the Integral

The Vuli-Ndlela Integral:

- Weights each path by its entropic admissibility.

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- Selects the **entropic geodesic** (the extremal entropy-producing path).
- Enforces causal ordering through **entropic cones**.
- Encodes both reversible and irreversible dynamics.
- Ensures that physical motion follows the **Second Law-consistent extremal trajectory**.

Thus, the integral is the **mathematical heartbeat** of ToE, governing how the entropic field evolves and how spacetime emerges from that evolution [2].

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7. Summary of the Transformation

Information Geometry Concept	**Physical Spacetime Equivalent**
Entropic/Statistical Manifold	Fundamental Ontological Manifold
Fisher–Rao / Fubini–Study Metric	Pre-spacetime Metric
$\alpha = 0$ Affine Connection	Levi-Civita Connection
Entropy Gradients / Curvature	Gravity and Spacetime Curvature
Distinguishability Limits	Speed of Light (c)

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8. Conclusion

Obidi's Theory of Entropicity provides a framework in which the curvature of physical spacetime is not a primitive assumption but an **emergent thermodynamic-limit expression** of curvature defined on an underlying entropic manifold [3].

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Through the **Curvature Transfer Theorem (CTT)**, Obidi demonstrates that the spacetime **Riemann tensor** is the **pushforward** of the information-geometric **Riemann tensor**. **Einstein's field equations** are therefore recovered as **emergent identities**, not fundamental laws.

This transformation—turning information geometry into physical geometry—constitutes one of the most radical reinterpretations of the foundations of physics in the modern era.

References

[1] How Information Geometry is Transformed Into the Physical Geometry of Spacetime in Obidi's Theory of Entropicity (ToE)

[2] The Unified Entropy–Geometry Framework of the Theory of Entropicity (ToE)

[3] ToE Living Review Letters IE: Beyond Einstein: The Entropic Origin of Geometry, Matter, and Gravitation in the Theory of Entropicity (ToE)