Einstein Field Equations in Energy Density–Pressure Language
→ Dynamic law of PPC (curvature sourcing)

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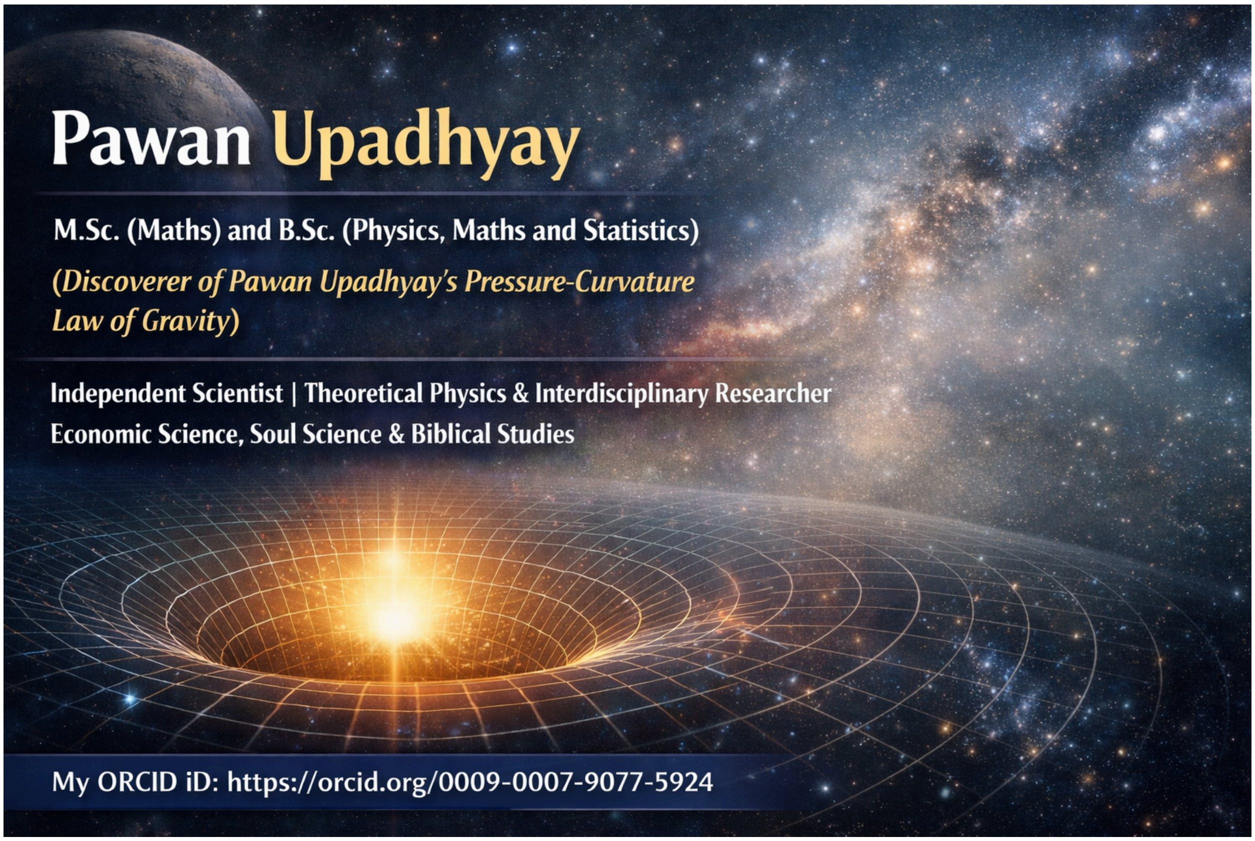


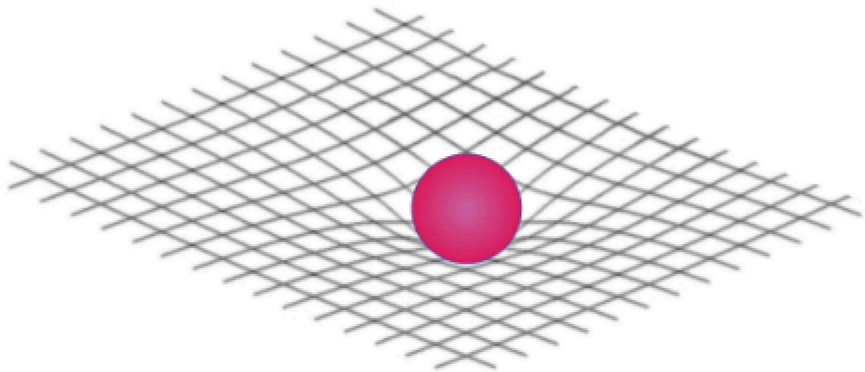
Abstract

Einstein's Field Equations relate spacetime curvature to the distribution of matter and energy through the stress–energy tensor. Conventionally, this tensor is expressed in terms of mass density and pressure. In this work, the Einstein Field Equations are reformulated explicitly in terms of **energy density** E_d and **gravitational pressure** P_g. A general equation of state $P_g = wE_d$ is introduced, allowing a unified description of known physical regimes. A special pressure-dominated regime $w = 1$, corresponding to $P_g = E_d$, is shown to yield a direct proportionality between scalar curvature and energy density. This reformulation does not alter General Relativity but provides a pressure-centric interpretation of gravitational dynamics.

1. Introduction

General Relativity, formulated by Albert Einstein, describes gravitation as the curvature of spacetime produced by matter and energy. The Einstein Field Equations encode this relationship through the stress–energy tensor $T_{\mu\nu}$.

In relativistic gravitation, pressure contributes to curvature on the same footing as energy density. This paper rewrites the Einstein Field Equations entirely in terms of **energy density** E_d and **gravitational pressure** P_g, making the role of pressure explicit and transparent.



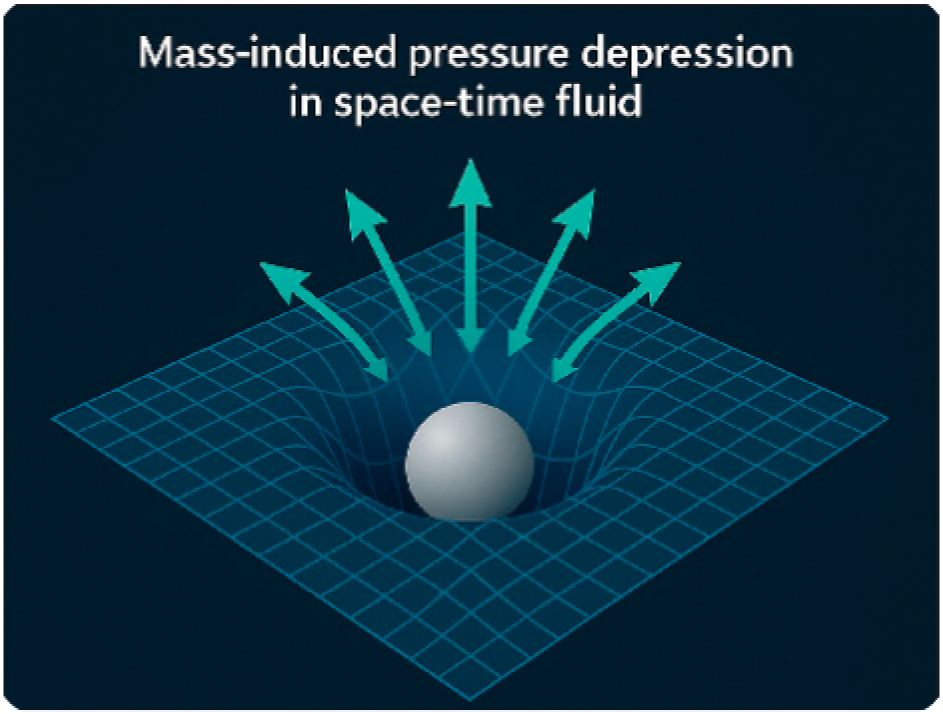
$$G_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

Using PPC definitions:

$$T_{\mu\nu} = (E_d + P_g) u_\mu u_\nu + P_g g_{\mu\nu}$$

The equation becomes:

$$\boxed{G_{\mu\nu} = \frac{8\pi G}{c^4} \Big[(E_d + P_g) u_\mu u_\nu + P_g g_{\mu\nu} \Big] - \Lambda g_{\mu\nu}}$$


Mass-induced pressure depression
in space-time fluid

2. Definitions and Notation

We define the following quantities:

- ρ : mass density
- $E_d = \rho c^2$: energy density
- P_g : gravitational pressure
- w : equation-of-state parameter
- $g_{\mu\nu}$: spacetime metric
- u^μ : four-velocity
- $T_{\mu\nu}$: stress–energy tensor
- $T = g^{\mu\nu} T_{\mu\nu}$: trace of the stress–energy tensor

The **base equation of state** is assumed as:

$$\boxed{P_g = w E_d}$$

3. Einstein Field Equations

The Einstein Field Equations are:

$$\boxed{G_{\mu\nu} = R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}R = \frac{8\pi G}{c^4}T_{\mu\nu}}$$

These equations are exact and remain unchanged in this reformulation.

4. Stress–Energy Tensor in Energy–Pressure Form

For an isotropic gravitational medium, the stress–energy tensor is written as:

$$\boxed{T_{\mu\nu} = (E_d + P_g)u_\mu u_\nu + P_g g_{\mu\nu}}$$

This expression shows explicitly that **both energy density and pressure act as sources of spacetime curvature**.

5. Einstein Equations in Energy Density–Pressure Language

Substituting $T_{\mu\nu}$ into the field equations yields:

$$\boxed{R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}R = \frac{8\pi G}{c^4}\left[(E_d + P_g)u_\mu u_\nu + P_g g_{\mu\nu}\right]}$$

This is the Einstein Field Equations written entirely in energy–pressure variables.

6. Trace Equation and Scalar Curvature

Taking the trace of the Einstein Field Equations:

$$-R = \frac{8\pi G}{c^4} T$$

The trace of the stress–energy tensor is:

$$\boxed{T = E_d - 3P_g}$$

Therefore, scalar curvature is:

$$\boxed{R = \frac{8\pi G}{c^4}(3P_g - E_d)}$$

This equation demonstrates that scalar curvature is governed by the **balance between gravitational pressure and energy density**.

7. Ricci Tensor in Energy–Pressure Form

The Ricci tensor can be expressed as:

$$\boxed{R_{\mu\nu} = \frac{8\pi G}{c^4}\left[(E_d + P_g)u_\mu u_\nu + \frac{1}{2}(E_d - P_g)g_{\mu\nu}\right]}$$

This form separates curvature into:

- time-like contributions from energy density,
- spatial contributions from pressure.

8. Conservation Law

Einstein's equations imply covariant conservation:

$$\boxed{\nabla_\mu T^{\mu\nu} = 0}$$

In energy–pressure language:

$$\boxed{\nabla_\mu \left[(E_d + P_g)u^\mu u^\nu\right] + \nabla^\nu P_g = 0}$$

This represents **energy-density transport and pressure balance** in curved spacetime.

9. Special Regime: $w = 1$ (Pressure = Energy Density)

In the special case:

$$\boxed{P_g = E_d}$$

the stress–energy tensor becomes:

$$\boxed{T_{\mu\nu} = 2E_d\, u_\mu u_\nu + E_d\, g_{\mu\nu}}$$

The trace reduces to:

$$\boxed{T = -2E_d}$$

Scalar curvature is then:

$$\boxed{R = \frac{16\pi G}{c^4} E_d}$$

Thus, spacetime curvature is directly proportional to energy density alone.

10. Physical Interpretation

- Energy density manifests as gravitational pressure
- Pressure contributes equally to spacetime curvature
- In the $w = 1$ regime, pressure fully converts energy density into curvature

> **Gravity emerges as a pressure-structured energy phenomenon rather than a force.**

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11. Comparison with Other w -Regimes

w	**Physical interpretation**	**Trace T**
0	Dust / matter	E_d
$\frac{1}{3}$	Radiation	0
-1	Vacuum energy	$4E_d$
< 1	Sub-stiff matter	$(1 - 3w)$
1	**Stiff gravitational pressure**	$-2E_d$

Only $w = 1$ yields direct proportionality between curvature and energy density.

12. Conclusion

Einstein Field Equations have been reformulated in explicit energy density–pressure language. While the mathematical structure of General Relativity remains unchanged, this representation highlights the fundamental role of gravitational pressure. A special pressure-dominated regime $w = 1$, corresponding to $P_g = E_d$, leads to a simple and direct relation between scalar curvature and energy density. This framework provides a unified and physically transparent interpretation of gravitation within General Relativity.

Declaration

This paper presents a theoretical reformulation within established General Relativity and does not claim experimental verification.

> *PPC Law asserts that gravitational phenomena arise from energy density and gravitational pressure, where pressure acts as an active geometric agent. In the special regime $P_g = E_d$, gravitational pressure is fully determined by energy density, and spacetime curvature and geodesic motion are governed entirely by this energy-density–pressure equivalence, yielding a pressure-dominated realization of General Relativity.*

Extended Research Paper:

Conceptual Chain of PPC Law with Governing Equations:

This section presents Pawan Upadhyay's Pressure–Curvature (PPC) Law of Gravity as a causal sequence, where each physical stage is accompanied by its corresponding mathematical expression. The formulation remains fully consistent with General Relativity as developed by Albert Einstein, while re-expressing it in energy density–pressure language.

Mass Density➡️Energy Density➡️Pressure➡️Forces of Pressure➡️Curvature via Stress-Energy Tensor➡️Spacetime Curvature➡️Geodesic Motion➡️Pressure Waves

1. Mass and Energy are not Separate.
2. In the PPC Law, forces are defined as the gradients of gravitational pressure.

(In Pawan Upadhyay’s Pressure–Curvature Law of Gravity (PPC Law), gravitational forces arise from spatial gradients of pressure.)

Mathematical expression

$$\boxed{\mathbf{F}_{\text{field}} = -\nabla P_g}$$

- P_g is the gravitational pressure generated by energy density.
- The gradient ∇P_g represents how pressure varies in space.
- The negative sign indicates motion toward lower pressure, consistent with attractive gravitational behavior.

Physical interpretation

- Uniform pressure → no force
- Pressure gradient → force arises
- Stronger gradient → stronger gravitational influence

Thus, gravity is not treated as a mysterious attraction but as a **natural consequence of pressure imbalance in spacetime**.

Relation to spacetime curvature

- Pressure and energy density enter the **stress–energy tensor**.
- The stress–energy tensor determines **spacetime curvature**.
- Curvature governs motion through **geodesics**.

Therefore:

> **Pressure gradients provide the physical origin of curvature-driven motion.**

For Extended Bodies in the PPC Law of Gravity

In the PPC Law, gravitational interaction with **extended bodies** (such as planets, stars, or moons) is described through **pressure-based forces**, rather than point-mass forces.

Key principle

> **For extended bodies, gravitational effects arise from the spatial distribution of pressure acting both throughout the volume and across the surface of the body.**

Two Types of Forces for Extended Bodies

1. Field Force (Volume Effect)

The **field force** arises from the **gradient of gravitational pressure** across space:

$$\mathbf{F}_{\text{field}} = -\nabla P_g$$

- Acts throughout the volume of the body
- Depends on how pressure varies from one region of space to another
- If pressure is uniform, no net field force acts on the body

This force governs **orbital motion and free-fall behavior**.

2. Surface Force (Boundary Effect)

For extended bodies, pressure also acts **directly on the surface**:

$$F_p = P_g A$$

- Acts on the **boundary area** of the body
- Depends on the exposed surface area A
- Becomes important when pressure is high or varies across the surface

This force explains how gravitational pressure influences **extended, finite-size objects**, not just idealized point particles.

Net Force on an Extended Body

For an extended body immersed in a gravitational pressure field, the total gravitational influence can be expressed as:

$$\mathbf{F}_{\text{total}} = \int_V (-\nabla P_g)\, dV \;+\; \int_A P_g\, dA$$

This shows that:

- **Volume pressure gradients** determine bulk motion
- **Surface pressure** contributes additional mechanical effects

Physical Interpretation

- Small bodies → field force dominates
- Large or extended bodies → both field and surface forces matter
- Pressure differences across the body determine motion and stability

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Connection to Curvature and Motion

- Pressure and energy density enter the **stress–energy tensor**
- This produces **spacetime curvature**
- Extended bodies follow **geodesic motion modified by pressure distribution**

PPC Casual Chain Step by Step:

Step 1: Mass Density → Energy Density

Matter exists as mass distributed in space. By mass–energy equivalence, mass density directly corresponds to energy density.

$$\boxed{E_d = \rho c^2}$$

This establishes **energy density** E_d as the fundamental scalar quantity in PPC Law.

Step 2: Energy Density → Gravitational Pressure

Energy density gives rise to gravitational pressure.
The general PPC equation of state is defined as:

$$\boxed{P_g = wE_d}$$

where w is a dimensionless pressure parameter characterizing the gravitational regime.

Step 3: Pressure → Stress–Energy Tensor

Energy density and gravitational pressure together form the stress–energy tensor, which acts as the source of spacetime curvature:

$$\boxed{T_{\mu\nu} = (E_d + P_g)\, u_\mu u_\nu + P_g\, g_{\mu\nu}}$$

This equation encodes the **active gravitational role of pressure**, a central principle of PPC Law.

Step 4: Stress–Energy Tensor → Curvature

Spacetime curvature is generated through Einstein's field equations:

$$\boxed{G_{\mu\nu} = R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R = \frac{8\pi G}{c^4} T_{\mu\nu}}$$

Thus, **energy density and pressure are converted into spacetime geometry**.

Step 6: Special PPC Regime (Pressure = Energy Density)

PPC Law identifies a special pressure-dominated gravitational state defined by:

$$\boxed{P_g = E_d \quad (w = 1)}$$

Substituting into the trace relation:

$$\boxed{T = -2E_d}$$

This condition uniquely characterizes the **PPC gravitational regime**.

Step 7: Scalar Curvature in PPC Law

Taking the trace of Einstein's field equations:

$$-R = \frac{8\pi G}{c^4} T$$

and using $T = -2E_d$, one obtains:

$$\boxed{R = \frac{16\pi G}{c^4} E_d}$$

Hence, **scalar curvature becomes directly proportional to energy density**.

Step 8: Curvature → Geodesic Motion

Matter and radiation move along geodesics determined by spacetime curvature:

$$\boxed{\frac{d^2x^\mu}{d\tau^2} + \Gamma^\mu_{\alpha\beta}\frac{dx^\alpha}{d\tau}\frac{dx^\beta}{d\tau} = 0}$$

Since the Christoffel symbols $\Gamma^\mu_{\alpha\beta}$ depend on the metric, and the metric depends on E_d and P_g, **geodesic motion is governed by energy density and pressure**.

Step 8: Curvature → Geodesic Motion

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Since the Christoffel symbols $\Gamma^\mu_{\alpha\beta}$ depend on the metric, and the metric depends on E_d and P_g, **geodesic motion is governed by energy density and pressure**.

Spacetime curvature generated by **energy density** E_d and **gravitational pressure** P_g determines the motion of matter. Free motion follows geodesics of the metric $g_{\mu\nu}$, which itself is sourced by E_d and P_g.

Geodesic equation

$$\boxed{\frac{d^2x^\mu}{d\tau^2} + \Gamma^\mu_{\alpha\beta}(E_d, P_g)\frac{dx^\alpha}{d\tau}\frac{dx^\beta}{d\tau} = 0}$$

Energy–pressure dependence made explicit

The Christoffel symbols are defined by the metric:

$$\Gamma^{\mu}_{\alpha\beta} = \tfrac{1}{2} g^{\mu\nu} \left(\partial_\alpha g_{\nu\beta} + \partial_\beta g_{\nu\alpha} - \partial_\nu g_{\alpha\beta} \right)$$

and the metric is determined by Einstein's field equations:

$$g_{\mu\nu} = g_{\mu\nu}(E_d, P_g)$$

Thus:

$$\boxed{\Gamma^{\mu}_{\alpha\beta} = \Gamma^{\mu}_{\alpha\beta}\big(g_{\mu\nu}(E_d, P_g)\big)}$$

Special PPC regime $w = 1$

When:

$$\boxed{P_g = E_d}$$

the dependence reduces to:

$$\boxed{\Gamma^{\mu}_{\alpha\beta} = \Gamma^{\mu}_{\alpha\beta}(E_d)}$$

and the geodesic equation becomes:

$$\boxed{\frac{d^2x^\mu}{d\tau^2} + \Gamma^{\mu}_{\alpha\beta}(E_d)\frac{dx^\alpha}{d\tau}\frac{dx^\beta}{d\tau} = 0}$$

Physical meaning (PPC interpretation)

> **In PPC Law, geodesic motion is not driven by force but by gradients of energy density and gravitational pressure encoded in spacetime geometry.**

This explicitly closes the PPC chain:

$$E_d,\ P_g \ \rightarrow\ g_{\mu\nu} \ \rightarrow\ \Gamma^{\mu}_{\alpha\beta} \ \rightarrow\ \text{Geodesic Motion}$$

$$\boxed{\rho \rightarrow E_d \rightarrow P_g = wE_d \rightarrow T_{\mu\nu}(E_d, P_g) \rightarrow G_{\mu\nu} \rightarrow g_{\mu\nu}(E_d, P_g) \rightarrow \Gamma^{\mu}_{\alpha\beta}(E_d, P_g) \rightarrow \text{Geodesic Motion} \rightarrow \text{Pressure Waves}}$$

Step 9: Geodesic Motion → Pressure Waves

Energy–momentum conservation requires:

$$\boxed{\nabla_\mu T^{\mu\nu} = 0}$$

In PPC language:

$$\boxed{\nabla_\mu \left[(E_d + P_g) u^\mu u^\nu \right] + \nabla^\nu P_g = 0}$$

Spatial and temporal variations of gravitational pressure propagate as **pressure–curvature disturbances**, identified in PPC Law as **pressure waves**.

Explanation of Step 9

Step 9: Geodesic Motion → Pressure Waves (Energy–Pressure Explicit)

In PPC Law, dynamical evolution of spacetime and matter is governed by **energy–momentum conservation**. Variations in **energy density** E_d and **gravitational pressure** P_g propagate through spacetime as **pressure–curvature disturbances**, referred to as *pressure waves*.

Energy–Momentum Conservation

Einstein's field equations imply the covariant conservation law:

$$\boxed{\nabla_\mu T^{\mu\nu} = 0}$$

Using the PPC stress–energy tensor:

$$T^{\mu\nu} = (E_d + P_g)\, u^\mu u^\nu + P_g\, g^{\mu\nu}$$

the conservation law becomes:

$$\boxed{\nabla_\mu [(E_d + P_g) u^\mu u^\nu] + \nabla^\nu P_g = 0}$$

This equation explicitly shows that **spatial and temporal gradients of** P_g act as dynamical agents.

Pressure–Wave Interpretation

Expanding the conservation law yields two coupled effects:

1. **Energy–density transport**

$$u^{\mu}\nabla_{\mu}E_d \;\neq\; 0$$

2. **Pressure propagation**

$$\nabla^{\nu}P_g \;\neq\; 0$$

Together, these describe the **propagation of pressure disturbances** through spacetime geometry.

Special PPC Regime ($w = 1$)

For the PPC condition:

$$\boxed{P_g = E_d}$$

the conservation equation reduces to:

$$\boxed{\nabla_\mu (2E_d \, u^\mu u^\nu) + \nabla^\nu E_d = 0}$$

This shows that **energy density gradients propagate directly as pressure–curvature waves**.

PPC Law Interpretation

> **Pressure waves in PPC Law are spacetime disturbances arising from the propagation of energy-density gradients, carried through geodesic motion and constrained by covariant conservation.**

These waves are **not external forces**, but **dynamic responses of spacetime geometry** to evolving E_d and P_g.

Completed PPC Law Causal Closure

$$\boxed{E_d,\ P_g \ \longrightarrow\ g_{\mu\nu}\ \longrightarrow\ \Gamma^{\mu}_{\alpha\beta}\ \longrightarrow\ \text{Geodesic Motion}\ \longrightarrow\ \nabla_\mu T^{\mu\nu}=0\ \longrightarrow\ \text{Pressure Waves}}$$

Compact PPC Casual Chain

$$\boxed{\rho \rightarrow E_d = \rho c^2 \rightarrow P_g = wE_d \rightarrow T_{\mu\nu}(E_d, P_g) \rightarrow G_{\mu\nu} \rightarrow R(E_d, P_g) \rightarrow \Gamma^{\mu}_{\alpha\beta}(E_d, P_g) \rightarrow \text{Geodesic Motion} \rightarrow \text{Pressure Waves}}$$

$$\boxed{w = 1 \;\Rightarrow\; P_g = E_d \;\Rightarrow\; R \propto E_d}$$

Interpretive Statement (PPC Law):

PPC Law interprets gravity as a geometric consequence of energy density and gravitational pressure, where mass density is expressed through energy density and pressure acts as an active source of spacetime curvature, giving rise to geodesic motion.

> *The above equation chain represents a pressure-dominated realization of General Relativity, valid explicitly for the stiff gravitational equation of state* $P_g = E_d$ $(w = 1)$.

<u>2nd Research Paper</u>

Geodesic Motion Equation in the Form of Energy Density and Gravitational Pressure (Kinematic Law of Pawan Upadhyay's Pressure-Curvature Law of Gravity (PPC Law of Gravity))

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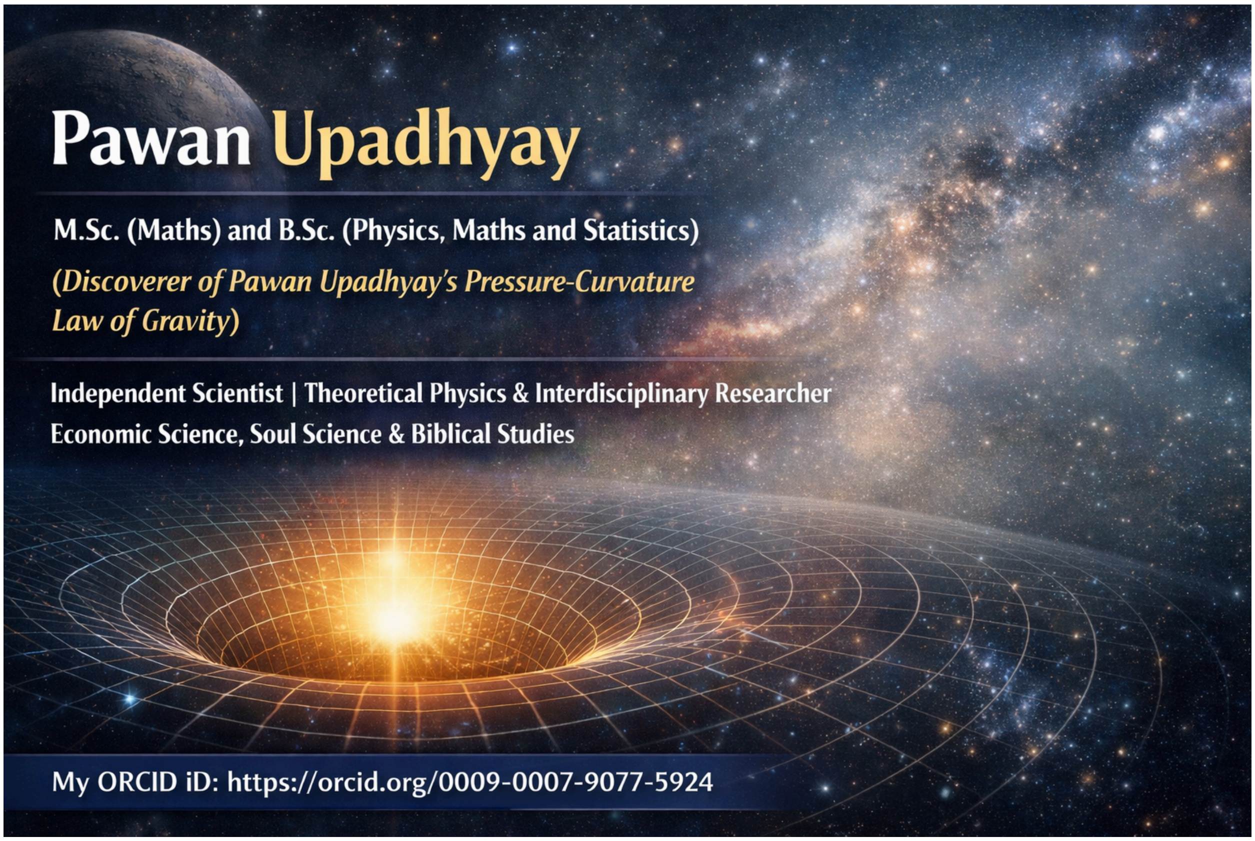

Abstract

In General Relativity, gravitational motion is described through geodesics in curved spacetime. This curvature is sourced by the stress−energy tensor, traditionally expressed in terms of mass density and pressure. In this work, geodesic motion is reformulated explicitly in terms of **energy density** E_d and **gravitational pressure** P_g. A general proportional relation $P_g = wE_d$ is assumed. By imposing the trace condition $T = -2E_d$, the equation-of-state parameter is uniquely fixed as $w = 1$, leading to $P_g = E_d$. Other physically relevant cases $(w < 1,, w = -1,, w = 0,, w = \frac{1}{3})$ are examined for comparison. The analysis shows that the proposed single master equation is valid exclusively in the $w = 1$ regime.

1. Introduction

In the geometric theory of gravitation developed by Albert Einstein, free particles follow geodesics of a curved spacetime rather than trajectories determined by a force. The curvature of spacetime is governed by the stress–energy tensor, which includes both energy density and pressure as gravitational sources.

This paper reformulates the geodesic motion equation using **energy density** E_d and **gravitational pressure** P_g, with particular emphasis on a pressure-dominated gravitational regime.

2. Definitions and Notation

We define the following quantities:

- ρ : mass density
- $E_d = \rho c^2$: energy density
- P_g : gravitational pressure
- w : equation-of-state parameter
- $g_{\mu\nu}$: spacetime metric
- u^μ : four-velocity
- $T_{\mu\nu}$: stress–energy tensor
- $T = g^{\mu\nu} T_{\mu\nu}$: trace of the stress–energy tensor

The **base equation of state** is assumed as:

$$\boxed{P_g = w E_d}$$

3. Trace of the Stress–Energy Tensor

For an isotropic gravitational medium, the trace is:

$$\boxed{T = \rho c^2 - 3P_g}$$

Using $E_d = \rho c^2$:

$$\boxed{T = E_d - 3P_g}$$

4. Fundamental Trace Condition

We impose the defining relation:

$$\boxed{T = -2E_d}$$

Substituting:

$$E_d - 3P_g = -2E_d$$

$$-3P_g = -3E_d$$

$$\boxed{P_g = E_d} \quad \Rightarrow \quad \boxed{w = 1}$$

Thus, the trace condition uniquely selects the **stiff gravitational regime**.

5. Curvature–Energy Relation

Einstein's field equations:

$$G_{\mu\nu} = \tfrac{8\pi G}{c^4} T_{\mu\nu}$$

Taking the trace:

$$-R = \tfrac{8\pi G}{c^4} T$$

Using $T = -2E_d$:

$$\boxed{R = \frac{16\pi G}{c^4} E_d}$$

Hence, scalar curvature is directly proportional to energy density.

6. Comparison of Different w -Regimes

Using

$$T = E_d - 3wE_d = (1 - 3w)E_d$$

we analyze key cases:

6.1 $w = 1$ (Stiff gravitational pressure)

$$P_g = E_d, \quad T = -2E_d$$

- Pressure equals energy density
- Trace condition satisfied
- **Master equation valid**
- Strong curvature sourcing

6.2 $w = \frac{1}{3}$ (Radiation)

$$P_g = \tfrac{1}{3}E_d, \quad T = 0$$

- Conformal matter
- No scalar curvature sourcing
- Master equation **not applicable**

6.3 $w = 0$ (Dust / Matter)

$$P_g = 0, \quad T = E_d$$

- Newtonian-like matter
- Pressureless gravity
- Incompatible with $T = -2E_d$

6.4 $w = -1$ (Vacuum / Dark Energy)

$$P_g = -E_d, \quad T = 4E_d$$

- Negative pressure
- Accelerated expansion
- Opposite sign curvature response

6.5 $w < 1$ (General sub-stiff regime)

$$T = (1 - 3w)E_d$$

- Partial pressure contribution
- Energy density does not fully convert to curvature
- Geodesic motion not governed solely by E_d

7. Geodesic Motion Equation

The geodesic equation remains:

$$\boxed{\frac{d^2x^\mu}{d\tau^2} + \Gamma^\mu_{\alpha\beta}\frac{dx^\alpha}{d\tau}\frac{dx^\beta}{d\tau} = 0}$$

In the $w = 1$ regime, the Christoffel symbols depend implicitly only on E_d, making geodesic motion **energy-density governed**.

8. Single Master Equation (Validity Condition Explicit)

$$\boxed{\begin{aligned}&P_g = wE_d, \quad w = 1 \\ &T = -2E_d \\ &R = \frac{16\pi G}{c^4}E_d \\ &\frac{d^2x^\mu}{d\tau^2} + \Gamma^\mu_{\alpha\beta}(E_d)\frac{dx^\alpha}{d\tau}\frac{dx^\beta}{d\tau} = 0\end{aligned}}$$

9. Physical Interpretation

> **Only in the $w = 1$ regime does gravitational pressure fully convert energy density into spacetime curvature, making geodesic motion a direct manifestation of energy-density structure.**

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10. Conclusion

This work presents a reformulation of geodesic motion using energy density and gravitational pressure. By assuming a general equation of state $P_g = wE_d$ and imposing the trace condition $T = -2E_d$, the theory uniquely selects $w = 1$. Other physically relevant regimes are shown to fall outside the validity of the proposed master equation. The results identify a special pressure-dominated gravitational state within General Relativity.

Declaration

This paper presents a theoretical framework within the mathematical structure of General Relativity and does not claim experimental confirmation.

> *"The master equation derived in this work is valid exclusively for the stiff gravitational equation of state* $w = 1$.*"*

PPC Law Statement:

> *PPC Law asserts that gravitational phenomena arise from energy density and gravitational pressure, where pressure acts as an active geometric agent. In the special regime $P_g = E_d$, gravitational pressure is fully determined by energy density, and spacetime curvature and geodesic motion are governed entirely by this energy-density–pressure equivalence, yielding a pressure-dominated realization of General Relativity.*
