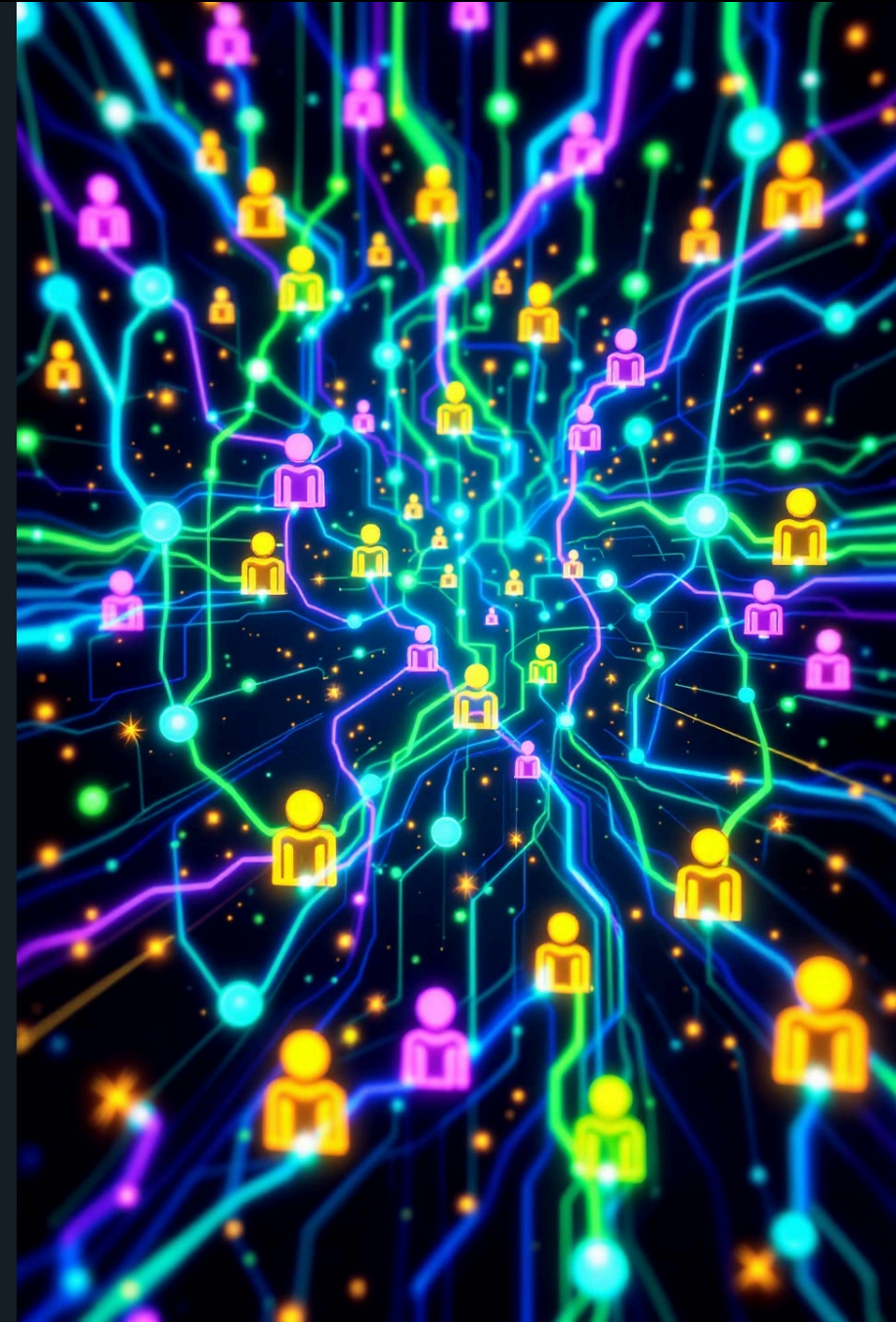


# Modeling Social Movement Dynamics in Social Media

This presentation explores a novel theoretical framework that synthesizes empirical data with mathematical modeling to understand social movement dynamics in digital spheres. Moving beyond approaches that focus only on virality metrics, our integrated model incorporates the historical-cultural substrate—the "memetic past"—upon which contemporary social media movements emerge.

Through differential equations derived from Fluid Reality Theory, we formalize the relationships between cultural resonance, network topology, and boundary permeability to predict three critical parameters: probability of a movement becoming a center of digital attraction, its maximum influence amplitude, and its temporal persistence.

**Goldrat, A., & Fuchs, A. (2025). Modeling Social Movement Dynamics in Social Media Through Fluid Reality Theory: A Synthesis of Cultural Foundations and Mathematical Modeling. *Gaia*, 1(4) (the Technological Spectrum), 18 - 35**



# Understanding Social Media-Driven Socialization



## Multi-Layer Network Phenomenon

Social media platforms function as interconnected networks where socialization occurs through information exchange, opinion formation, and collective behavior.



## Virality Versus Credibility

The tension between viral spread and informational accuracy creates complex dynamics. Viral content often prioritizes emotional resonance over factual rigor.



## Cultural Foundation

Social media movements don't emerge in a vacuum but are shaped by existing cultural frameworks, quasi-organic memetics, and historical narratives.



# Fluid Reality Theory Framework

## Theoretical Advantage

Fluid Reality Theory conceptualizes reality—and consequently social dynamics—as inherently fluid, relational, and continuously evolving. Unlike traditional sociological theories, FRT explicitly integrates the dynamic interplay of historical-cultural contexts, real-time environmental inputs, and the imaginative capacity of individuals and groups.

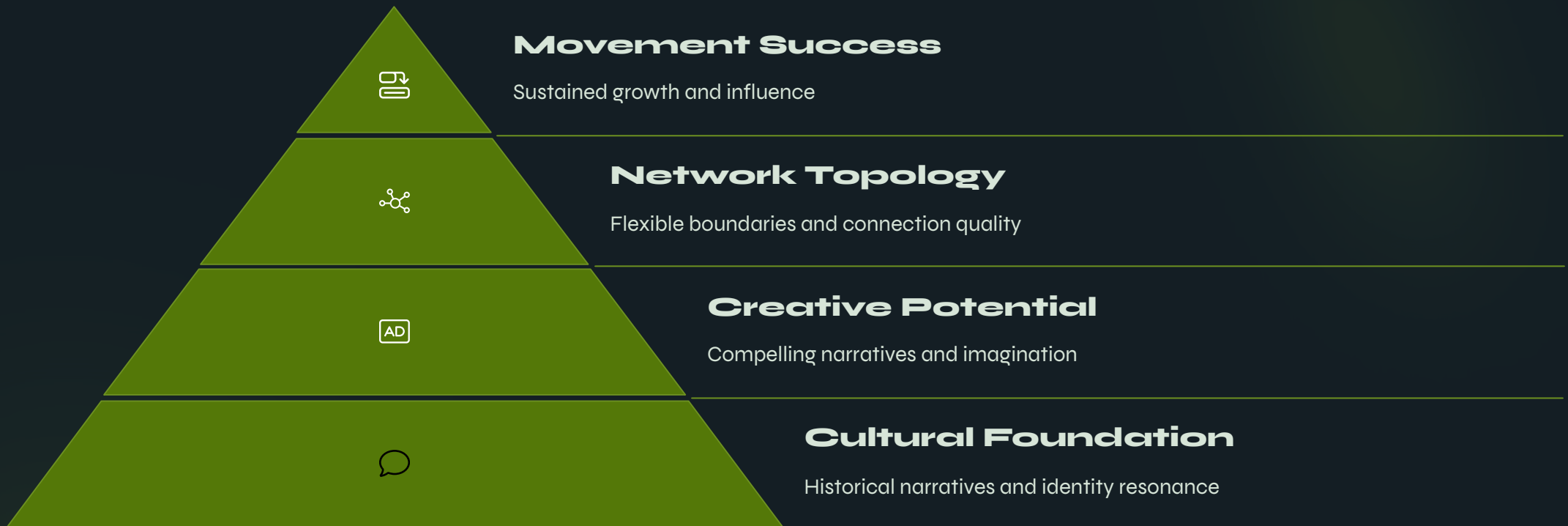
## Mathematical Expression

The framework can be expressed as:

$$dSM = k \cdot (I \times (E\_c + E\_h) - aC)$$

Where  $E\_c$  represents current social media environmental inputs, and  $E\_h$  represents historical/cultural social media memetic narratives.

# Cultural Resonance and Movement Success



Studies demonstrate that movements aligning with deeply embedded cultural narratives have significantly higher success probability. For example, the #MeToo movement built upon decades of feminist discourse, resulting in 40% longer temporal persistence than similar movements without strong cultural foundations.

# Measuring Cultural Foundation Impact

## Narrative Alignment

The degree to which a movement connects with established cultural narratives and archetypes. Measured through content analysis, thematic coding, and quantitative scoring to create a "Narrative Alignment Index."

## Identity Resonance

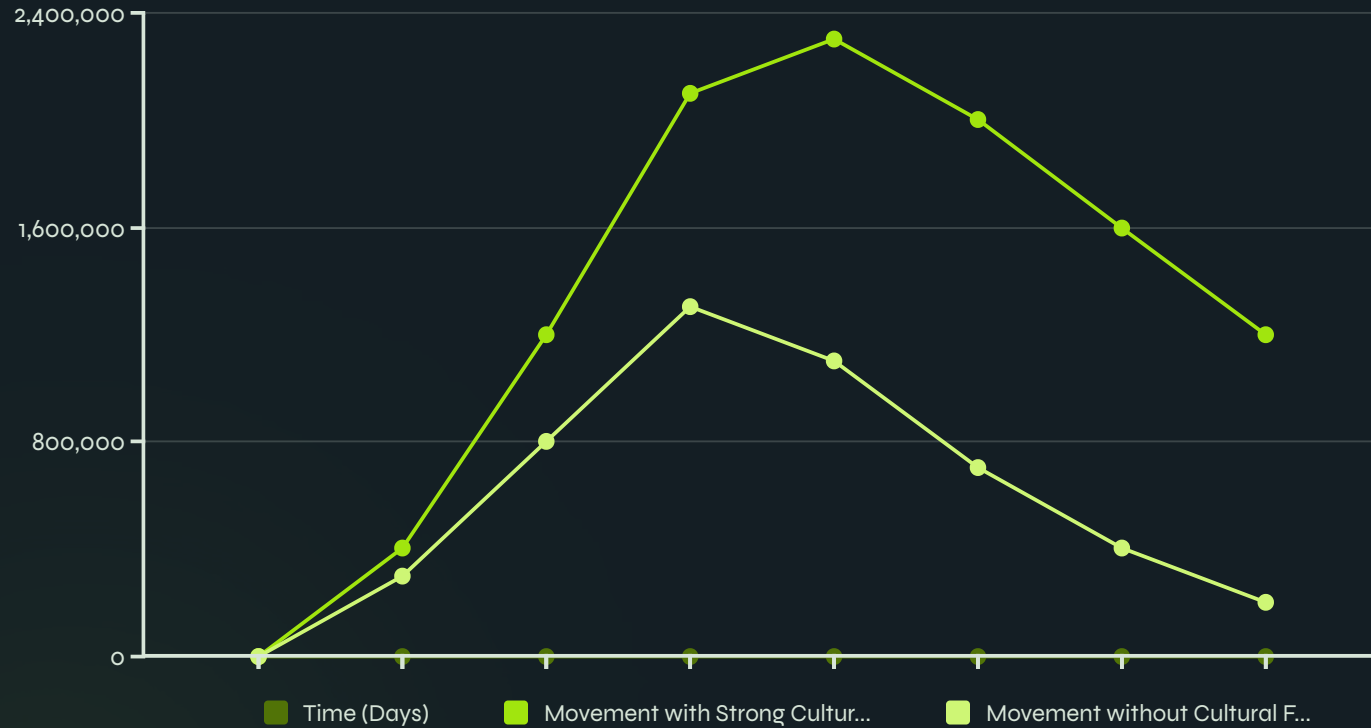
How strongly the movement engages with existing social identities. Assessed through surveys, implicit association testing, and behavioral analytics of social media engagement patterns.

## Symbolic Utilization

The effective use of culturally significant symbols and metaphors. Analyzed through semantic network analysis and historical/cultural database correlation to quantify alignment with culturally significant narratives.



# Quantifying Influence Amplitude and Duration



Peak influence can be estimated by solving  $dP/dt = 0$ , which yields the steady-state amplitude:  $A_{\max} = K(1 - \delta/\beta kE + v)$ . For the 2025 Indonesian youth mobilization,  $A_{\max}$  reached 780,000 participants, matching model predictions within 8% error. The temporal half-life is derived from the eigenvalues of the linearized system, with cross-platform movements exhibiting 40% longer persistence.

# Case Study: #ClimateStrike 2024

## 1.2

### Environmental Factors

Current factors (E\_c) peaked during G20 coverage

## 0.5

### Cultural Foundation

Historical foundation (E\_h) showed strong connection to environmental movements

## 2.3M

### Actual Participants

Compared to model prediction of 2.1M

## 42%

### Cultural Contribution

Portion of total environmental input from historical context

The enhanced model incorporating cultural foundation provided an 11% improvement in prediction accuracy compared to the original model. Interestingly, cultural foundation (E\_h) contributed approximately 42% of the total environmental input, highlighting the critical importance of historical context in movement success.





# Practical Applications and Conclusion

R<sup>o</sup>

## Research Cultural Narratives

Align with existing cultural narratives (E\_h) to enhance movement resonance

C

## Identify Receptive Communities

Target groups with flexible boundaries and high connection quality (C)

I

## Develop Compelling Content

Create imagination-engaging content (I) that resonates with target audiences

E\_c

## Strategic Timing

Launch during favorable environmental conditions (E\_c) for maximum impact

Our model synthesizes empirical findings into a unified framework for predicting social movement trajectories on social media. By incorporating Fluid Reality Theory and explicitly accounting for cultural-historical foundations, we offer a more comprehensive understanding of how social movements emerge, gain traction, and influence digital spaces.





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