Variety Dynamics: Defense and control of coercive multi-actor situations

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Prediction is the core of ALL systems thinking

ALL purposes of systems thinking comprise:

- Method providing **prediction** support for decision-making
- Method for gathering the data for **prediction**
- Method for developing and communicating **predictions**

Prediction is the essential core of all systems thinking

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Variety Dynamics Origins

Developed in 1990s by Terence Love and Trudi Cooper to address some systems analysis limitations - ongoing

- Systems and sub-systems changing in boundaries, existence, purpose and ownership
- Incoherent boundaries
- 2 feedback loop limitation on mental prediction of outcomes
- Coercive systems
- Wicked (and super-wicked) problems
- Hyper-complex and chaotic systems
- Corrupt systems
- Control of complex systems by less powerful actors
- Implications for systems theory of robotisation, automation, AI and ML
- Managing incoherent actions – e.g. surprise attacks

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Hyper-complex systems

Most problem situations in defense and security are **hyper-complex**

Causally-based mathematical modelling has difficulty producing predictions for hyper-complex situations

Two Feedback Loop Limitation Axiom means **hyper-complex** systems are not amenable to mental understanding, intuition and collaborative/participatory group decision-making methods

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Variety Dynamics

- **Variety** is the number of **options** possible of any aspect of a situation
- **Variety Dynamics** focuses on **distributions**, **dynamics**, **ownership** and **control** of the **dynamics** of **varieties (options) by different elements of** hyper-complex systems
- It does **NOT** address **causal** relations between elements
- The reason for not addressing **causal** relations is that causal prediction is ineffective, misleading, invalid, or in error for hyper-complex situations

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Challenges for systems thinking in the real world

- Systems with large numbers of dynamically changing feedback loops
- Coercive systems
- Multiple dynamics of power and control
- Asymmetric power where manager/controller has less power
- Unresolvable conflicts between multiple key stakeholders
- Systems with discontinuous behaviours
- Do not comply with standard system structure assumptions

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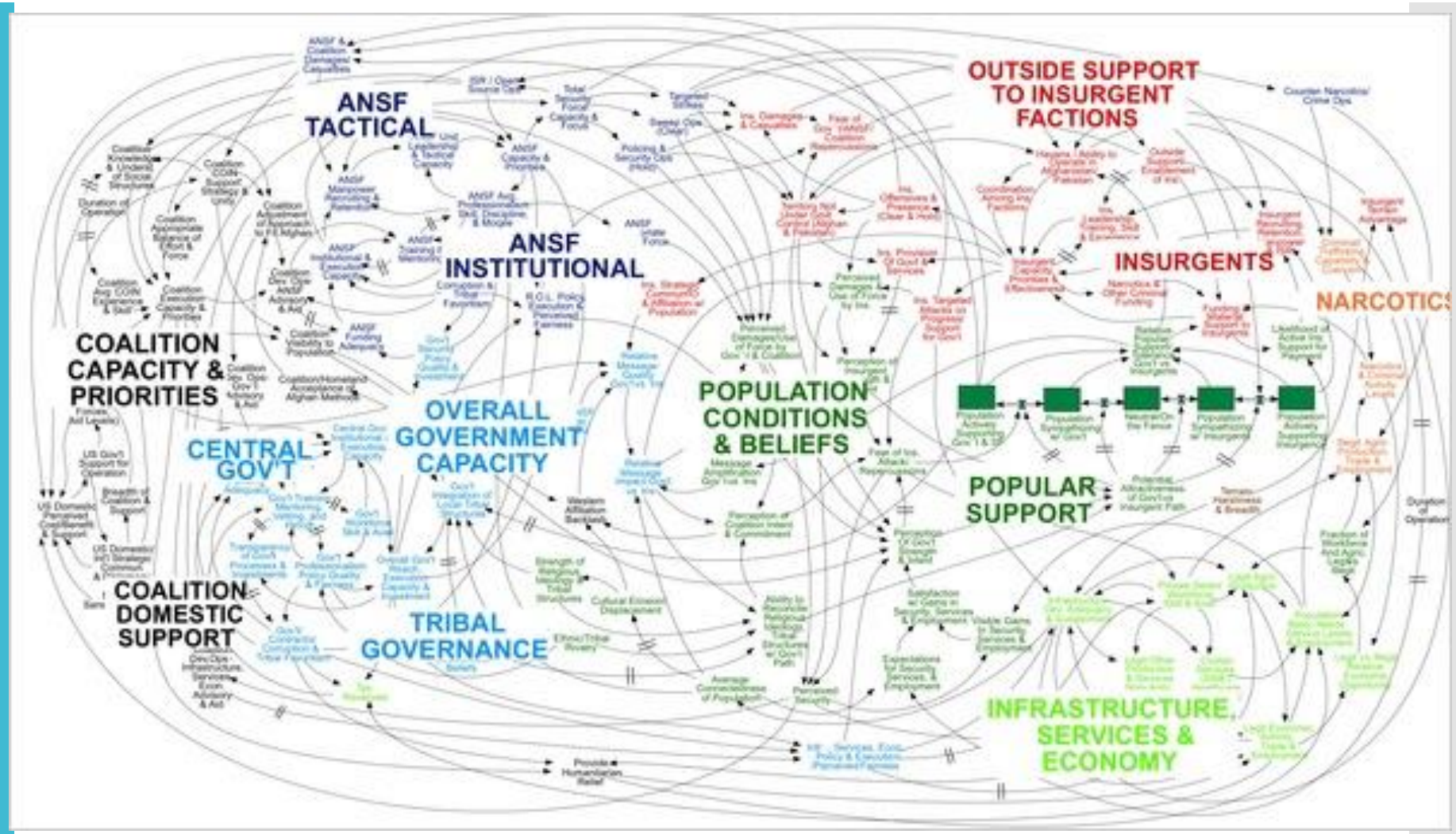
Typical real world power and control context



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Two Feedback Loop Limitation Axiom

- Individuals cannot mentally predict the outcomes of situations whose behaviour is driven by two or more feedback loops
- There is a widely held delusion that individuals can predict behaviours and outcomes of situations with behaviours shaped by two or more feedback loops

The Two Feedback Loop Limitation was identified by Dr Terence Love in 1994.

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Robust definitions of complexity

- **Simple system:** Small number of elements and relationships with maximum of one feedback loop and fulfils system structure assumptions
- **Complicated system:** Any number of elements and relationships with maximum of one feedback loop and fulfils system structure assumptions
- **Complex system:** Any number of elements and relationships with two or more feedback loops and fulfils system structure assumptions
- **Hyper-complex system:** Any number of elements and relationships with two or more feedback loops and does not fulfil system structure assumptions

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Characteristics of hyper-complex systems

- System behaviours, purpose, ownerships, subsystems, subsystem relationships and control mechanisms vary continuously.
- System boundary(ies) do not separate system elements of interest from each other and from environment
- System boundary(ies) not static and not necessarily always owned and controlled by system owner
- Sub-systems are not static in ownership, purpose, roles or relationships
- Control is dynamic and exerted through a variety of changing subsystems and factors; some outside the system
- Multiple feedback loops exist with changing structure, dynamics, purposes, causal relations, existence and ownership
- Coercive situations involving multiple asymmetric power relations unaligned to subsystems
- Control and system behaviours operate outside of the variables being addressed
- Parts of system and environment are chaotic
- Most of the situation and its causal relations are unknown

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Examples of coercive hyper-complex systems

- US –Afghanistan and similar wars
- Epidemics with associated disasters and social breakdowns
- Middle East (Saudi, Iran, Israel, Lebanon, Palestine, US, Russia)
- Climate change control and politics
- Local government
- Health systems in impoverished countries with low levels of governance or conflicted governance
- Managing malnutrition
- Sectarianism in India
- Large-scale international business competition
- Improving the government of countries captured by criminal cartels or industry lobbies
- Any system with large number of feedback loops in which the systems structure and ownerships of system elements changes
- International political tension between elites (wars by any means)
- National systems subject to hidden control via psyops or similar

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Creation of Variety Dynamics

Dr Terence Love

Dr Trudi Cooper

Variety Dynamics developed by Professors Terence Love and Trudi Cooper starting around 1972 and includes:

- **Concepts** (systemic and mathematical)
- **Axioms** describing patterns of control influence and outcomes (currently 46 to date)
- **Practical strategies** for achieving control in hyper-complex coercive situations
- **New mathematical field** interacting with set theory, function analysis, combinatorics, topology of variable spaces, and hyper-complex vectors etc.

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Variety

Variety is the number of different possible options for elements in a situation

Variety and its dynamics can be represented in a dynamic multi-dimensional variety space

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Example: Variety in simple power and control context - school

Variety available to teacher must be greater than that generated by pupils

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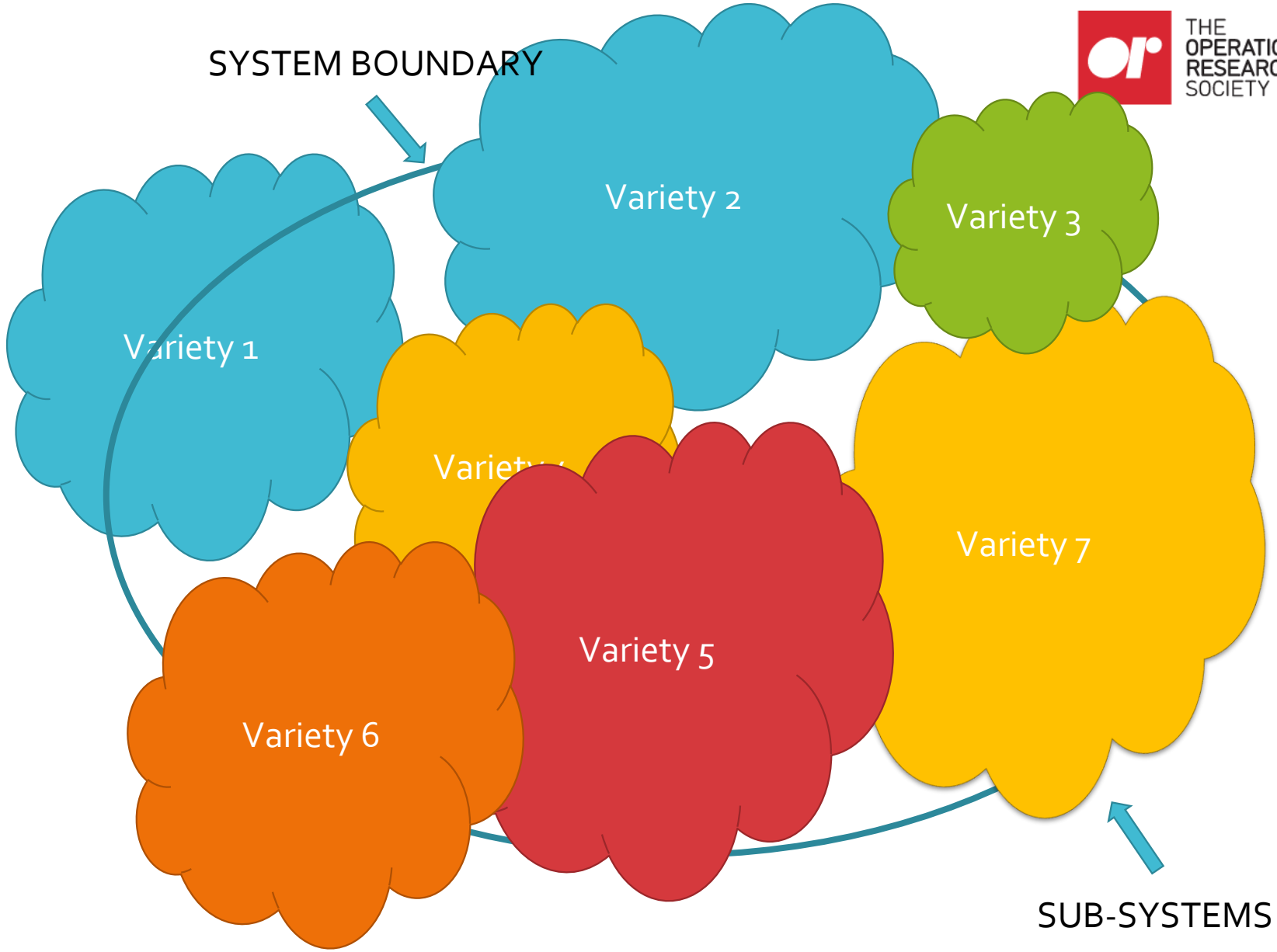
Real situations with dynamic variety distributions



- Distributions of variety and control and ownership are changing continuously in highly interrelated ways

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Variety Dynamics

Axiom 1

Foundational

For complex and hyper-complex systems involving multiple constituencies in which the distributions of variety generation and control variety is uneven across the system at any one time,

THEN

The differing distributions and dynamics of generated and controlling variety result in a structural basis for differing amounts of power and hegemonic control over the structure, evolution and distribution of benefits and costs of the system by different constituencies.

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Axiom 1 Example strategy

Variety is more important than power

Change variety distribution and variety dynamics to change ownership of power and change outcomes

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Practical example of use of Axiom 1:

Activists vs motor industry

1. Activists asked motor industry to implement strict emission control standard - motor industry refused
2. Activists persuades different states to implement **different** emission control standards (i.e. increased the variety to be addressed beyond motor industry's ability to control)
3. Offered to resolve via a single national emission standard
4. Motor industry agrees new national emission standard

Management of changes of variety resulted in power transfer TO the activists FROM the motor industry – without use of force or power

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Variety Dynamics

Axiom 10

Control via feedback loops in dynamic variety generation

In complex and hyper-complex systems in which multiple and variable sources of variety generation and variety control interact, and in which control varieties are generated dynamically to respond to changes in system varieties

THEN

Relative control of the feedback loops driving control varieties shapes the future distribution of power and hegemonic control between sub-systems and constituencies together with the structure, evolution and distribution of benefits and costs of the system.

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Axiom 10 Example strategy

Obtain ownership of the feedback loops that influence variety

Influence agendas, meeting minutes, reports, evaluations, planning policies

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Example Axiom 10:

Influence feedback loops policy, agenda, minutes, strategy….

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Variety Dynamics

Axiom 13

Create shortage of control leading to transfer of ownership of control

Where differing sub-systems of control are involved in the management of a system and some sources of control are able to increase their variety to accommodate the lack of requisite variety in other control systems

then

the overall distribution of control between sub-systems and constituencies will be shaped by the amount and distribution of transfer of control to the accommodating control system.

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Axiom 13

Example strategy

One agent creates shortfall of control variety overall then offers to address the subsequent issues

The resolution of problems caused by shortfalls in others' control variety results in a shift in power towards those who address the control variety shortfall

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Example Axiom 10:

Creating variety to exceed control then offer control to gain power

- Unions can increase variety by disrupting work in various ways to the point where it exceeds management's control variety
- Unions offer to provide the missing control variety by negotiating with and for workers to resume normal work
- Consequence is power flows from management to union and workers as a result of redistribution of variety

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Example Axiom 13:

Create extra system variety that exceeds control variety and then offer to manage it

Owners and management of a company have more resources and power than any individual worker.

Variety strategy to obtain power via Axiom 10:

- Union supports workers to increase system variety by disrupting work in different ways
- Management control variety is insufficient to control the system
- Union offers to provide the additional control variety for management by negotiating on behalf of workers
- Outcome is that Power is redistributed from management to union and workers

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Variety Dynamics

Axiom 32

Power flows between HQs and peripheral organisations from variety management

When an organisation has a powerful HQ and less powerful regional or similar organisations then HQ typically supplements its own power and controls them by:

- Ensuring HQ management has more control variety than the variety available to be generated by peripheral organisations
- HQ attenuates variety possible to be generated by peripheral organisations

If a peripheral organisation generates variety at a rate (variety changes/time) faster than HQ can cope, then

Power flows to peripheral organisation from HQ, and HQ must bear transaction costs and operational costs to increase its variety to address shortfall.

If peripheral organisation increase variety to only just exceed HQ abilities, then transaction cost limitations can ensure HQ does not develop sufficient responses by increasing its own control variety. The result will be ongoing transfer of power from HQ to the periphery.

However, if the value to HQ of the rate of change of variety by the peripheral part of the organisation exceeds the transaction costs of HQ to increases its control variety, then HQ can either increase its control variety or use its variety and power to attenuate and limit the variety generation of the peripheral organisation(s) by repressive action

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Axiom 32

Example strategy

Peripheral organisations can increase the variety that HQ has to provide control for.

This is an internal war for control between departments and HQ with departments wanting autonomy and HQ wanting control over them

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Variety Dynamics

Variety Dynamics currently consists of :

- A new field of systems and OR methods
- Over 45 axioms
- Robust analytical methods for devising strategies of obtaining power and control in hyper-complex coercive situations
- A new realm of mathematics
- A grounding in hyper-complex vectors
- A new perspective on physical and social phenomena including quantum superposition

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Variety Dynamics and Hyper-complex vectors

Hyper-complex vectors first used as part of Variety Dynamics in 1972

Advantages of hyper-complex vectors include:

- Can be combined via dot product
- Provide an alternative to neural net AI / data mining/machine learning
- Can be decomposed and hence reveal reasoning (unlike AI etc.)
- Use around 1/25 of the energy needed compared to AI/machine learning and less computer power
- Are around 25 times faster than conventional AI

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Contact details

For more information, for commercial consultancy and advice on specific issues, and for offers to fund/collaborate in research, contact:

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