Understanding Norm Change: An Evolutionary Game-Theoretic Approach

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Background & Motivation

- Human societies interact by developing and maintaining social norms. Empirical studies show *marked differences* in the *strength of social norms* around the globe:
  - **Tight:** High norm-adherence. High punishment of deviations from norms.
  - **Loose:** Weaker norms. More tolerance for deviations from norms.

How do such norms emerge and change in different societies?

- Will enable us to identify conditions that lead to stability/instability in established norms in different societies. Critical to identify potential social uprising and turmoil.

Our Approach: Evolutionary Game Theory (EGT)

Tight societies: High need for coordination

Loose societies: Low need for coordination

Study how the **need for coordination affects norm change** in societies using an EGT model

First work to provide a model of how cultural differences affect norm change

Proposed Model

c denotes tightness

$\boldsymbol{M = cM_c + (1-c)M_f}$

Coordination Game

Extremely Tight Society

$\boldsymbol{M_c}$	A	B
A	a_c , a_c	0 , 0
B	0 , 0	b_c , b_c

Fixed Payoff Game

Extremely Loose Society

$\boldsymbol{M_f}$	A	B
A	a_f , a_f	a_f , b_f
B	b_f , a_f	b_f , b_f

M	A	B
A	$ca + (1-c)a_f$	$(1-c)a_f$
B	$(1-c)b_f$	$cb_c + (1-c)b_f$

On adding a suitable constant

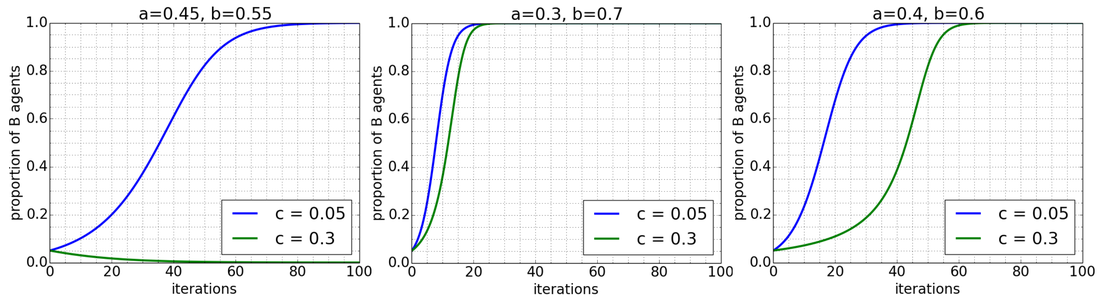
M	A	B
A	a	$(1-c)a$
B	$(1-c)b$	b

If $b > a$:
- (B, B) is a Nash Equilibrium (NE).
- If $c \geq \frac{b-a}{a}$, then (A, A) is a pure NE, and $((q, 1-q), (q, 1-q))$ is a mixed-strategy NE, where $q = \frac{b-(1-c)a}{c(a+b)}$.

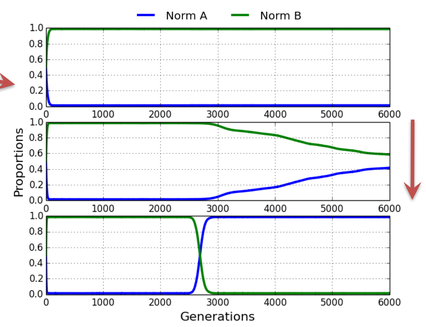
Examining Cultural Inertia

Cultural Inertia: *amount of resistance* of a society to changing a norm. Critical to understanding norm change.

Use *replicator dynamic* on infinite well-mixed populations: $\frac{dx_A}{dt} = xA\,(uA(x_A) - \phi(x_A))$



- Same results hold with finite agents arranged on a *network* (both grid and small world)
- **Fermi rule** used: an agent compares its payoff to a randomly selected neighbor, and switches to the better norm with probability.



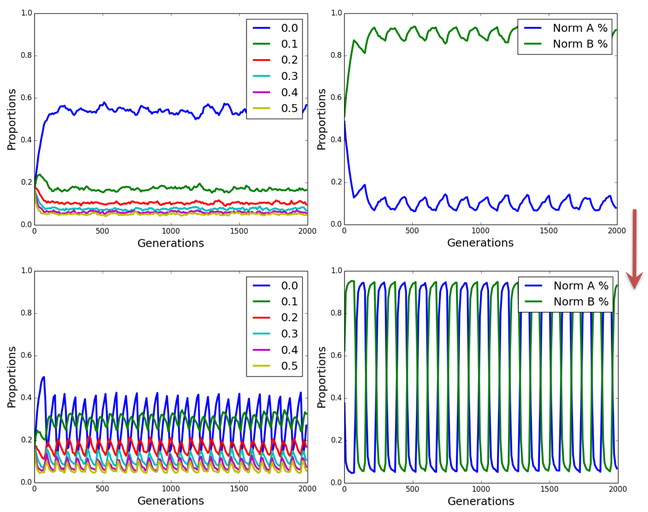
Higher the need for coordination, higher the cultural inertia

Evolving Exploration Rates

Exploration Rate: how willing are agents to *try out new behaviors* at random

- Understand agent's tendency to *learn socially*
- Critical to understand the rate at which new norms are *adopted in a population*
- Let exploration rate *evolve* as part of agent's strategy and study evolution in a *changing environment*

Higher the need for coordination, lower the exploration rate



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