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Individual variation, network heterogeneity and linguistic complexity: which way does the relationship go?

Sébastien Lérique, Dan Dediu, Márton Karsai, Jean-Philippe Magué

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Individual variation, network heterogeneity
and linguistic complexity:
which way does the relationship go?

Sébastien Lerique, Dan Dediu, Márton Karsai,
& Jean-Philippe Magué

The pr

Language must adapt to many

... in a comp

network heterogeneity
c complexity:
the relationship go?

n Dediu, Márton Karsai,
pppe Magué

The problem

Language must adapt to many

- ≠ landscapes
- ≠ situations
- ≠ sub-communities
- ≠ material conditions
- ≠ idiosyncracies

... in a complex network

Possible mechanisms

Lowest common denominator

“Train window” communication → rudimentary signs

Advertisements → pre-filtered interpretations

Administrative language → “syntax of abridgement” Marcuse 1964

Portable partial acts Di Paolo *et al.* 2018

Possible m

Super redund

com

Repairing breakdowns

Articulating something

Meaning something

Negotiating turns & interaction

Redundancy turns into cor

mechanisms
on denominator

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interpretations
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2018

Possible mechanisms

Super redundant-robust-complex

Repairing breakdowns
Articulating something
Meaning something
Negotiating turns & interaction

can each be done in many ways

+

Redundancy turns into complexity when not needed

Hypot

Standing variation in all aspects of
Network heterogeneity → [pressu](#)
Interactional disorder Di Paolo et al.

Are core factors gen
robustness &

mechanisms

redundant-robust-
complex

can each be done in many ways

+

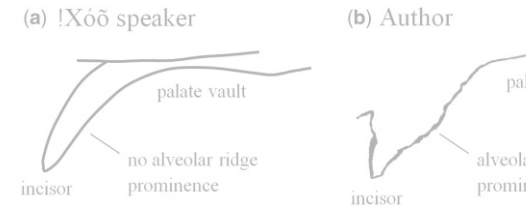
complexity when not needed

Hypothesis

- Standing variation in all aspects of language → fuel for redundancy
- Network heterogeneity → pressure for adaptation
- Interactional disorder Di Paolo *et al.* 2018

Are core factors generating redundancy,
robustness & complexity

Exam



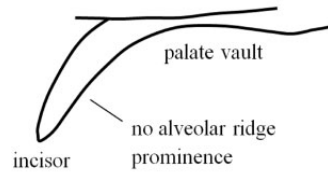
Chronic *otitis media* in Australian Aboriginal populations Butcher 2013

More diversity than expected Evans

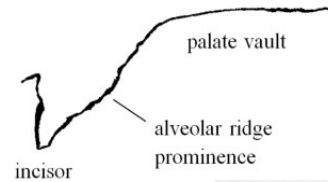
Japanese business-card exchange ru

Examples

(a) !Xóǀ speaker



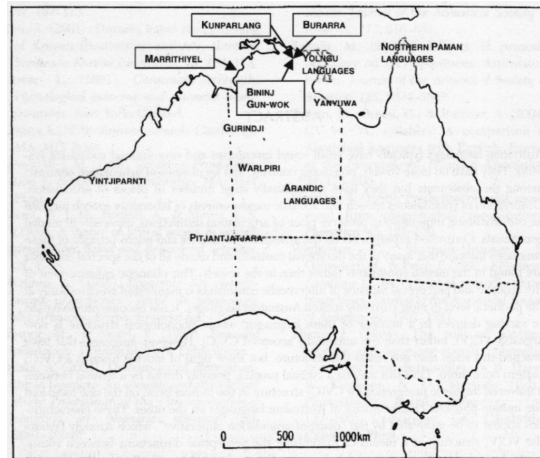
(b) Author



Vocal tract anatomy and articulation

Moisik & Dediu 2017

Chronic *otitis media* in Australian Aboriginal populations Butcher 2013



More diversity than expected Evans & Levinson 2009

Japanese business-card exchange rules Cuffari *et al.* 2015

is

ge → fuel for redundancy
aptation

redundancy,
xity

Inspirations

Evolutionary biology

Niche construction → speakers construct their environment

Developmental plasticity → learners adapt to their context

Evolution of development → more constraints and opportunities

Adaptation to different environments is dealt with dynamic,
recursive and complex processes

Inspira

Population struc

Minor changes in a population

Granovetter 1978

ations

ary biology

construct their environment
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mplex processes

Inspirations

Population structure & variation

Minor changes in a population can have macroscopic effects

Granovetter 1978

Bikhchandani *et al.* 1992

Inspira

Network spread

Watts



Generate

Structure

n = 25



p = 0.12
<z> = 3



Seed 0

Thresholds

Dirac Normal

loc = 0.18



Seed 0



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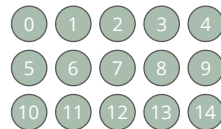
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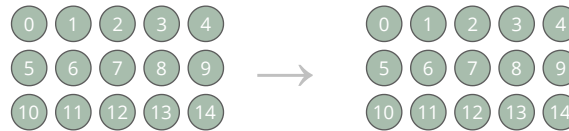
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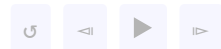
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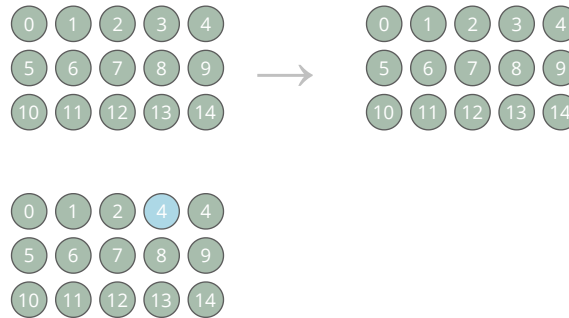
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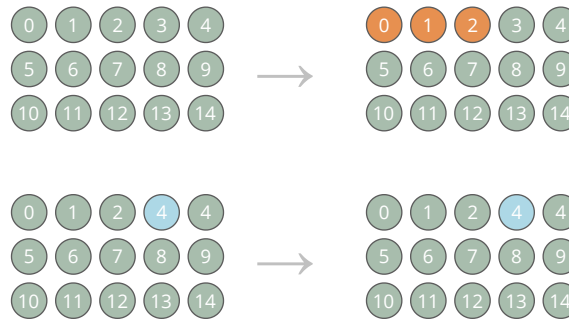
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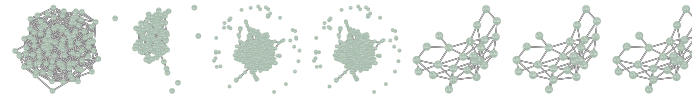
Seed 0



Inspirations

Network spreading processes

Watts 2002



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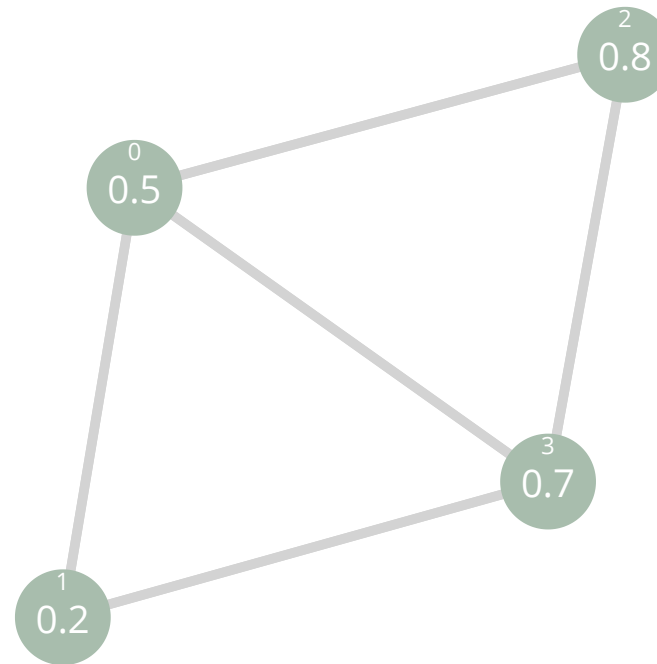


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Seed 0    

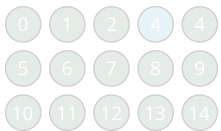
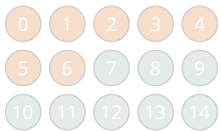
save

ations

cture & variation

can have macroscopic effects

Bikhchandani *et al.* 1992



Projects

Simulations

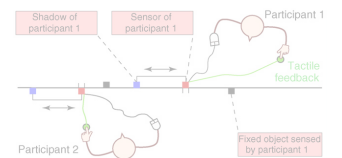


When competing, how many nodes/edges are necessary for global adoption?

What are the effects of

- node diversity
- network topology
- placement of seed nodes or constrained edges

- One-way communication
 - ~ Iterated Learning
- Interactive communication
 - ~ Experimental Semiotics
- Minimal interactive coupling
 - ~ Perceptual crossing



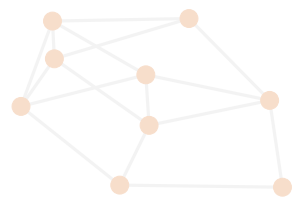
De Jaegher *et al.* 2010 [cc-by]



Projects

Experiments

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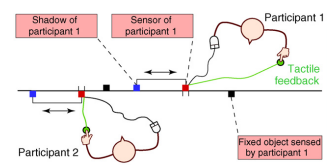
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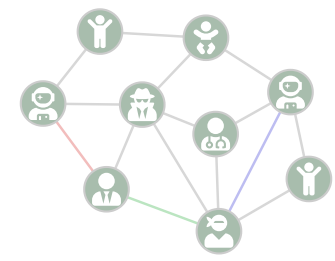
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- playing with
- Network topology
 - Edge constraints
 - Individual sensitivities



De Jaegher *et al.* 2010 [CC-BY]



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Possibly Twitter
25% GMT+0/1
tweets in French

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Examples

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 yoke talk → yoke talk
 to other edge → to other edge
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Chronic otitis media in Australian Aboriginal populations → Radchew 2013

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Granovetter 1978 → Bhattacharya et al. 1992

Inspirations

Network spreading processes

Watts 2002

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n = 25
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 β = 0.12
 γ = 3

Seed [0]

Thresholds

Dirac Normal
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Seed [0] save

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- Network topology
- Edge constraints
- Individual sensitivities

Possibly Twitter 20k-60k-80k tweets in French → Di Jaeger et al. 2010