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FALE FACULDADE DE LETRAS — UFMG

Agent-based Modeling of Language Change in a Small-world Network

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INTRODUCTION

In 1968, Weinreich, Labov and Herzog published the work "**Empirical Foundations for a Theory of Language Change**".

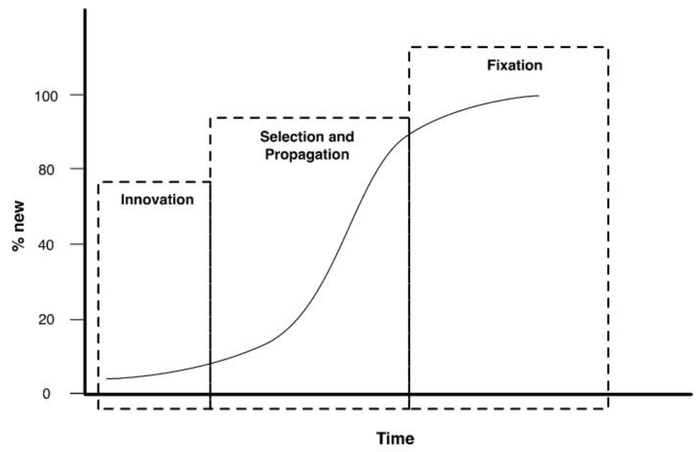
They argue that changes are part of the linguistic system. Language would be an ordered, but **heterogeneous** and **dynamic** system.

Why do languages change?

How do languages change?

How do we accept the change?

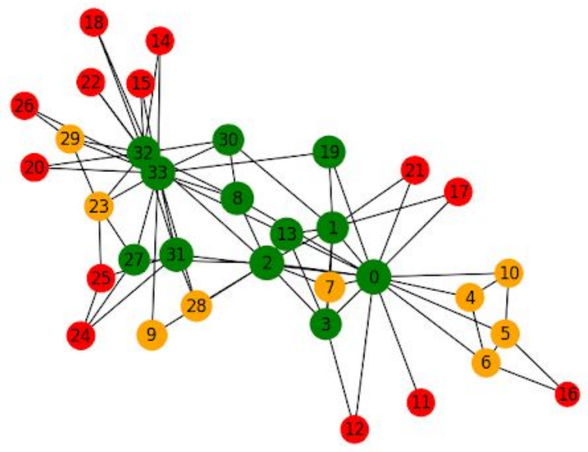
*By studying how we accept language change, we consequently analyze how change **propagates** in the **society**.*



Some linguists (Osgood et al., 1954; Fagyal et al., 2010; Blythe and Croft, 2012) have proposed that the trajectory of a competing linguistic variant might follow an S-curve trajectory.

METHODOLOGY

We use **computational agent-based modeling and simulation** to propagate innovations and analyze language change in a small-world network.



Zachary's karate club network (Zachary, 1977)

Based on **complex adaptive systems** (Beckner et al., 2009) and **network science** (Barabasi, 2003)

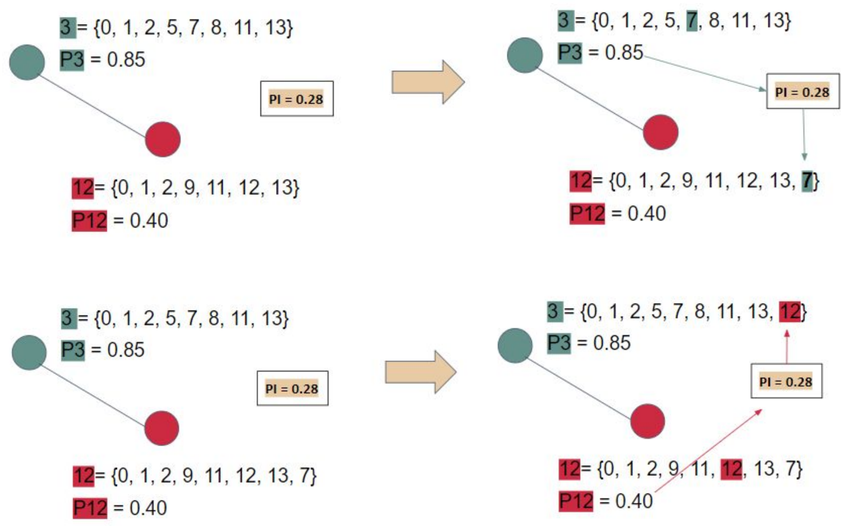
Each graph node represents an *individual* in a speech community. Each edge of the graph represents a *social interaction* between two individuals.

Each individual has an **idiolect**, with **shared** items and **individual** items.
A = {0, 1, 2, 5, 7, 8, 11, 13}
B = {0, 1, 2, 9, 11, 12, 13}

[0, 0.5[	Red
[0.5, 0.8[	Yellow
[0.8, 1.0]	Green

Each individual has a **social prestige**, correlated with network centrality. Values between 0 and 1.

In each round, if **two individuals** have a connection with each other, they will have the possibility to **exchange linguistic elements**.



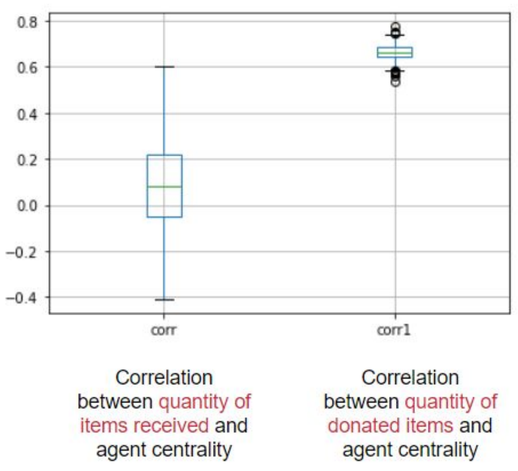
1st - Select a **random item** from each idiolect.

2nd - Compare the **prestige** P of each individual with a randomly generated value PI.

3rd - If P > PI, the item is passed (if the receiver already has the item in their idiolect, nothing happens).

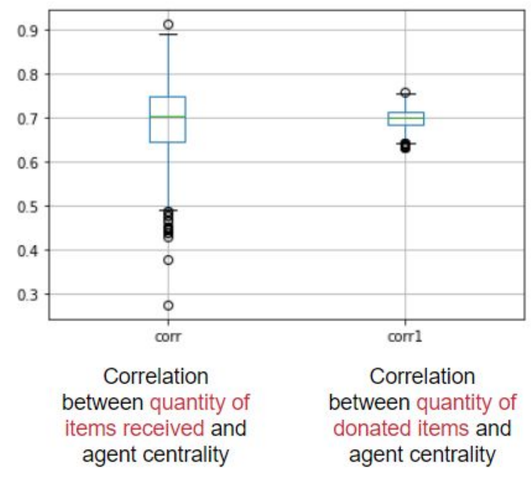
RESULTS

1,000 simulations x 100 rounds per simulation.



Idiolects diverging from each other by a standard deviation of 2.5.

High correlation between the quantity of items donated and the centrality of the agent. Low correlation between the number of items received and centrality.



Idiolects diverging from each other by a standard deviation of 10.

High correlation between the quantity of items donated/received and centrality. More central agents are more likely to exchange items, while more peripheral agents exhibit lower levels of item exchange: **isolation of peripheries** (e.g. Bartoli, 1945).

*In addition to the variable of **prestige** (centrality) of the individual, the distance between the idiolects of **high prestige** (acrolect) and **low prestige** (basilect) speakers significantly influences the results.*