



**HAL**  
open science

## Socioeconomic correlations in communication networks

Yannick Leo, José Ignacio Alvarez-Hamelin, Carlos Sarraute, Eric Fleury,  
Márton Karsai

► **To cite this version:**

Yannick Leo, José Ignacio Alvarez-Hamelin, Carlos Sarraute, Eric Fleury, Márton Karsai. Socioeconomic correlations in communication networks. 2nd European Conference on Social Networks (EUSN), Jun 2016, Paris, France. hal-01303751

**HAL Id: hal-01303751**

**<https://inria.hal.science/hal-01303751>**

Submitted on 18 Apr 2016

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Socioeconomic correlations in communication networks

Yannick Leo<sup>1</sup>, J. Ignacio Alvarez-Hamelin<sup>3</sup>, Carlos Sarraute<sup>2</sup>, Eric Fleury<sup>1</sup>, Márton Karsai<sup>1</sup>

<sup>1</sup> Univ Lyon, ENS de Lyon, Inria, CNRS, UCB Lyon 1, IXXI, LIP, 69342 Lyon FRANCE

<sup>2</sup> Grandata Labs, Buenos Aires, Argentina

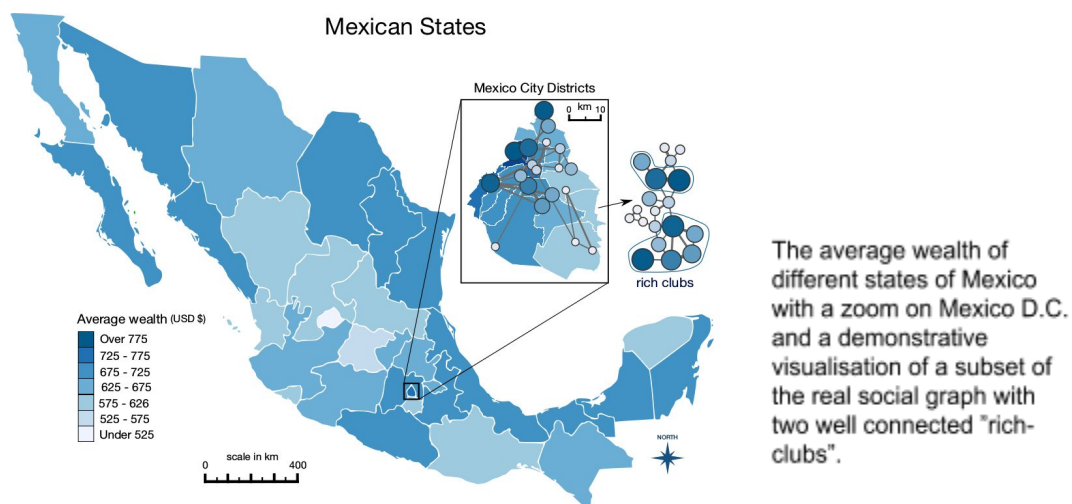
<sup>3</sup> CONICET, Universidad de Buenos Aires, Argentina

**Sessions:** 11. The Inequality–Social Network Nexus, 19. Large networks

**Keywords:** Social stratification; Socioeconomic correlations; Mobile communication;

The recent availability of large digital datasets gives us the opportunity to quantitatively study the structure and the dynamics of social networks of millions of individuals. However, although these studies consider the temporal, structural, and spatial characters of human interactions they commonly miss one important dimension regarding the economic status of individuals. Economic capacities of people may largely determine their communications and social behaviour thus the emerging structure of the global social-communication network. Studies combining the social network with economic data could help us to better understand spatial, and social segregation, or economic imbalances evolving in the society.

Here we consider information about the mobile communications, location, and economic capacities of people. We use a communication dataset recorded by a single mobile phone provider in Mexico, which collects geo-localised mobile phone interactions of 92M people over 2 years [1]. This anonymised dataset is combined with the credit informations of clients of a bank in the same country. The credit data collect the time and amount of bank card purchases and the monthly evolution of incomes, spendings, and debts of 1M clients of the cell phone operator.



Using these informations we estimate the economic status of people via their average monthly purchases, income, and debts. Beyond a demographic analysis and correlations between individual economic status indicators we provide empirical evidences about present economic imbalances suggesting not only the distribution of wealth but also the distribution

of debts to follow the Pareto principle. We categorize individuals into economic classes to understand the internal and interconnected structure of socioeconomic groups. From the classification, we observe a strongly stratified social structure, and detect assortative correlations between people in terms of their economic capacities. We provide quantitative results about the existence of “rich-clubs”, economic and spatial segregation in the social structure.

[1] C. Sarraute, P. Blanc, and J. Burrioni. A study of age and gender seen through mobile phone usage patterns in Mexico. *In Advances in Social Networks Analysis and Mining (ASONAM), 2014 IEEE/ACM*, 836–843 (2014).