1 - Introduction to Digital Demography

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MAX-PLANCK-INSTITUT
FÜR DEMOGRAFISCHE
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Agenda

1. Course setup and final assignment
2. Introduction to digital demography
3. Data and approaches
4. Current topics

Hello from the Lab of Digital and Computational Demography!

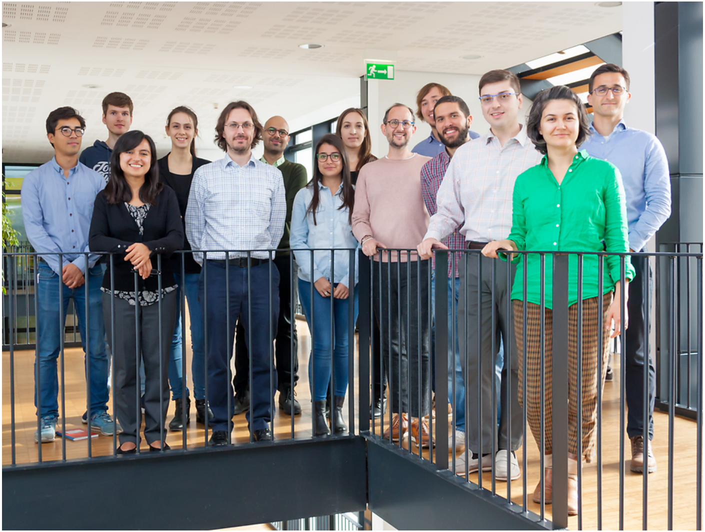


Figure 1: DiCoDe

Course setup

Week's schedule

- Monday 11:30-13.00 - “Introduction to digital demography”
- Tuesday 11:30-13.00 - “Crowd-sourced online data”
- Wednesday 11:30-13.00 - “Digital trace data”
- Thursday 15:00-17.00 - “Computational approaches”
- Friday - No class

Technical setup

- Online lectures, whenever possible at:
  - https://meet.jit.si/EDSD20_digital_demography
- Course materials (syllabus, presentations, readings, assignment)
  - https://github.com/alburezg/EDSD20_digital_demography
- Requirements
  - Running installation of RStudio
  - packages: ‘tidyverse’, ‘data.table’

Final assignment

Goal

- Hands-on experience using crowd-sourced digital data.
- Sample of Familinx database: user-generated genealogical records

Exercises

1. Compute: historical lifespan in Sweden
2. Discuss: lifespan and life expectancy
3. Evaluate: bias in the online genealogies

See full instructions in syllabus!

Evaluation

Assignments due Friday April 3 at midnight (CET):

1. A written report (Word document of pdf file).
2. The R scripts used to produce the empirical results.

See full instructions in syllabus!

Introduction to Digital Demography

What is ‘digital’ demography?

- Digital vs analogue
- Online vs offline
- ‘Big’ vs ‘small’ data

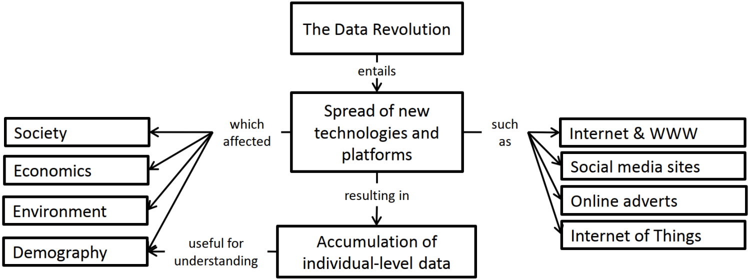


Fig. 1 The Data Revolution and new sources of data for demographic analysis.

Digital data sources for demographic research

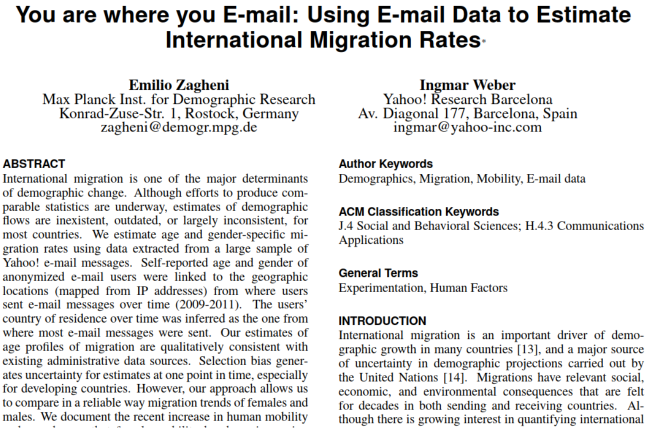
- Crowd-sourced online data
- Digital Trace Data (online and offline)
- Made-up data (simulations)
- User-generated content

‘Big data’ is not new data

Figure 2: Demographer collecting Big Data for the 1925 US census

https://commons.wikimedia.org/wiki/File:Volkstelling_1925_Census.jpg

Pioneering work



You are where you E-mail: Using E-mail Data to Estimate International Migration Rates*

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ABSTRACT

International migration is one of the major determinants of demographic change. Although efforts to produce comparable statistics are underway, estimates of demographic flows are inexistent, outdated, or largely inconsistent, for most countries. We estimate age and gender-specific migration rates using data extracted from a large sample of Yahoo! e-mail messages. Self-reported age and gender of anonymized e-mail users were linked to the geographic locations (mapped from IP addresses) from where users sent e-mail messages over time (2009-2011). The users' country of residence over time was inferred as the one from where most e-mail messages were sent. Our estimates of age profiles of migration are qualitatively consistent with existing administrative data sources. Selection bias generates uncertainty for estimates at one point in time, especially for developing countries. However, our approach allows us to compare in a reliable way migration trends of females and males. We document the recent increase in human mobility

Author Keywords
Demographics, Migration, Mobility, E-mail data

ACM Classification Keywords
J.4 Social and Behavioral Sciences; H.4.3 Communications Applications

General Terms
Experimentation, Human Factors

INTRODUCTION

International migration is an important driver of demographic growth in many countries [13], and a major source of uncertainty in demographic projections carried out by the United Nations [14]. Migrations have relevant social, economic, and environmental consequences that are felt for decades in both sending and receiving countries. Although there is growing interest in quantifying international

Figure 3: Using email data

Zagheni, E. and Weber, I. (2012). You are where you e-mail: Using e-mail data to estimate international migration rates. 3rd Annual ACM Web Science Conference.

International migration

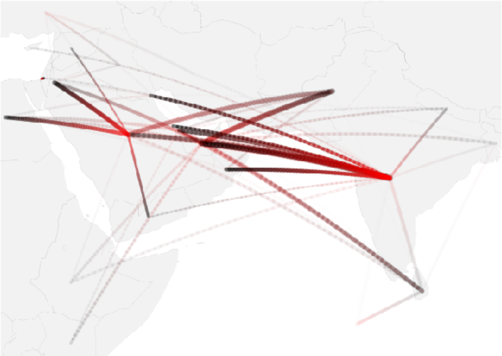


Figure 4: Conditional probabilities of migration using IP data

Bogdan State, Ingmar Weber, and Emilio Zagheni. 2013. Studying inter-national mobility through IP geolocation. In Proceedings of the sixth ACM international conference on Web search and data mining (WSDM '13).

Current topics in digital demography

1. Methological developments
2. Understand internet users and online use
3. Migration (internal and external)
4. Mortality and morbidity
5. Online and offline fertility dynamics

1. Methological developments

1. Inference from non-representative samples
2. Understand and adress online bias
3. Nowcast demographic processes

Big Data, Big Bias?

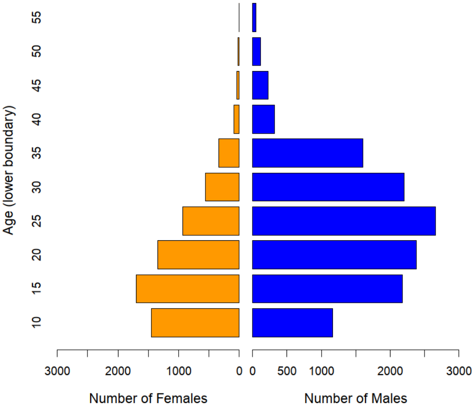


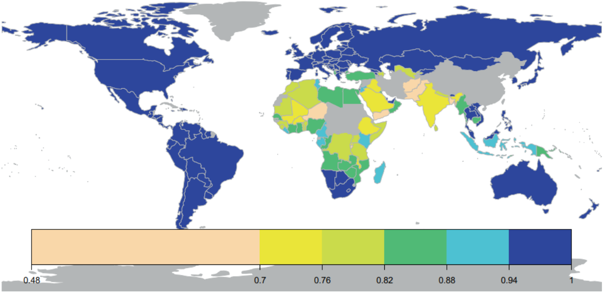
Figure 5: Looks a bit odd?

Zagheni, E., Garimella, V.R.K., Weber, I., and State, B. (2014). Inferring international and internal migration patterns from Twitter data. Paper presented at the 23rd International Conference

2. Understand internet users and online use

1. Infer demographics (age, sex, location, SE status, etc) from image and text
2. Track inequalities in online access
3. Consequences of platform use for users

The digital gender gap



(b) Mobile Phone Gender Gap Index predicted from Online model using the Facebook age 25-29 user Gender Gap Index

Figure 6: Inequalities in digital access

Fatehkia, M., Kashyap, R., and Weber, I. (2018). Using Facebook ad data to track the global digital gender gap. World Development 107:189–209.

3. Migration (internal and external)

1. Estimate flows and stocks
2. Mobility by subgroup (eg. undocumented, highly-skilled)
3. Cultural assimilation of inmigrants

Quantifying international migration

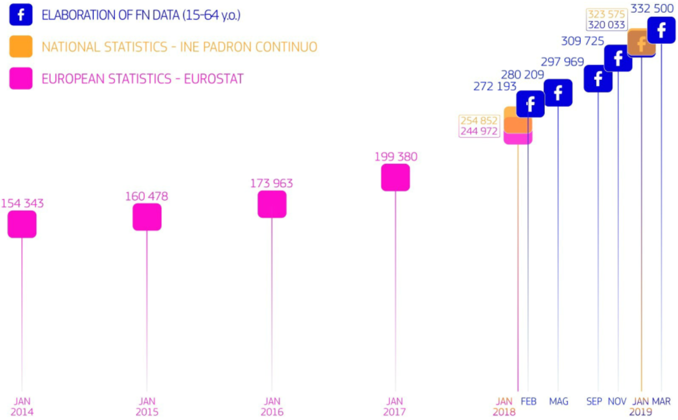


Fig 8. Stocks of international migrants and FN migrants from Venezuela in Spain. The national and Eurostat statistics refer to all ages, while the FN-derived estimates refer to ages 15–64.

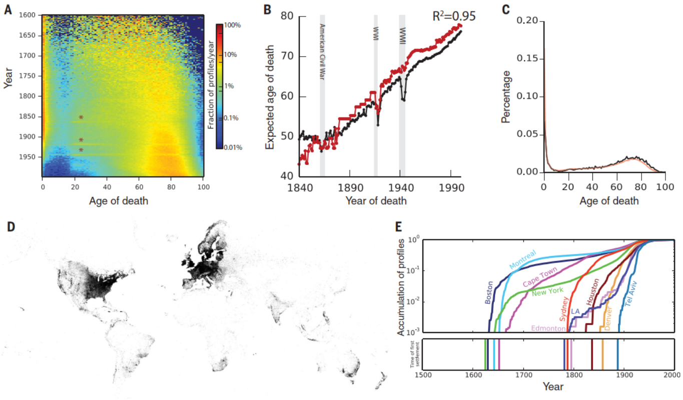
https://doi.org/10.1371/journal.pone.0224134.g008

Spyratos, S., Vespe, M., Natale, F., Weber, I., Zagheni, E., and Rango, M. (2019). Quantifying international human mobility patterns using Facebook Network data. PLOS ONE 14(10):e0224134. doi:10.1371/journal.pone.0224134.

4. Mortality and morbidity

1. “Historical” mortality estimates (obituaries, genealogies)
2. Enhanced data collection with IOT and online surveys
3. Morbidity from online behaviour (digital traces)

Long-term mortality patters



Kaplanis, J., et al. (2018). Quantitative analysis of population-scale family trees with millions of relatives. Science 360(6385):171–175.

5. Online and offline fertility dynamics

1. Estimate fertility from friendship networks
2. Online discourse around reproduction
3. Partnership formation and assortative mating (online dating)

Estimating male fertility from FB

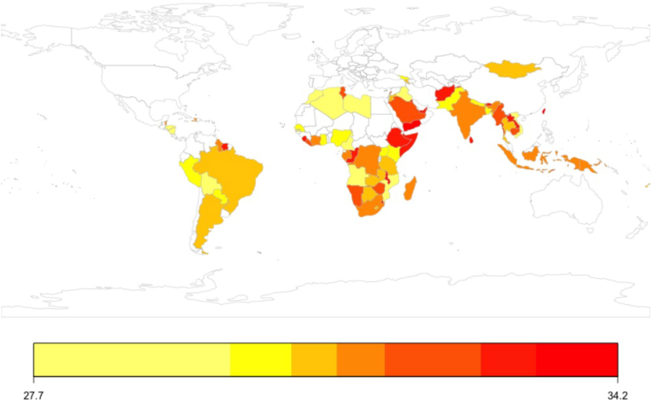


Figure 1: Prediction of Male MAC 2017 for countries without UN ground truth data.

Rampazzo, F., et al.(2018). Mater certa est, pater numquam: What can Facebook Advertising Data Tell Us about Male Fertility Rates? arXiv:1804.04632.

Homework

- Download Familinx sample data for Sweden: https://github.com/alburezg/EDSD20_digital_demography/tree/master/Assignment
- Use the script in the Assignment/R directory to load it in your R global environment
- Make sure you understand the instructions in the syllabus