Doing and undoing social ties. Thinking about 'distributed action' using sensor-based data.

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GenTIC
Researching Gender in the Network Society

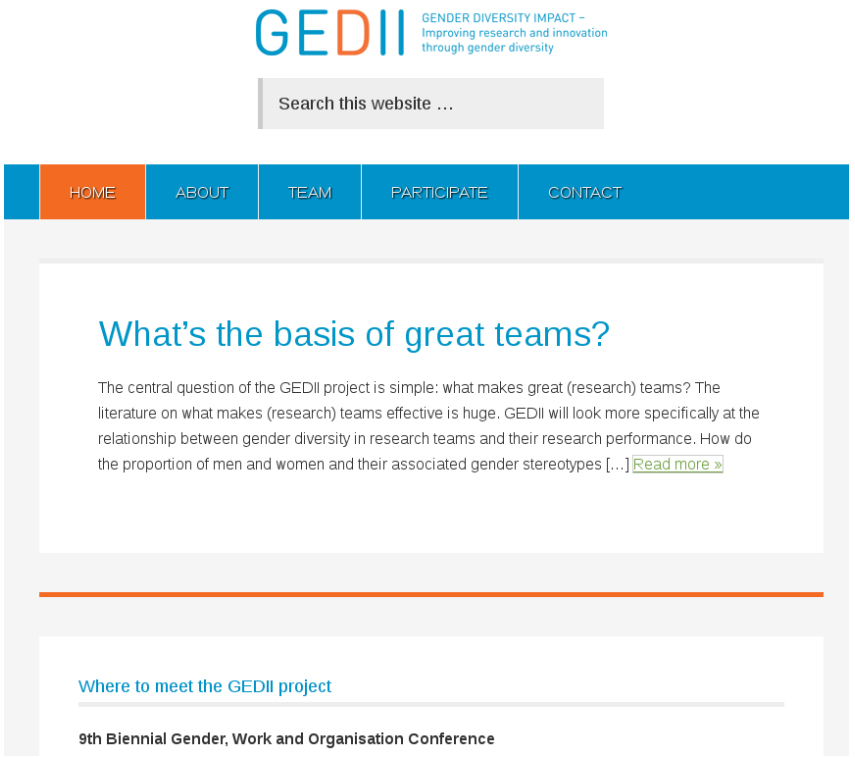
UOC R&I IN3 Internet Interdisciplinary Institute

GEDII

Horizon 2020 European Union Funding for Research & Innovation

Big Data in the Social Sciences. Center for Reasoning, Kent University, 22-23 June 2017

GEDII Project



http://www.gedii.eu

How does gender diversity affect research teams?

H2020 Science with and for Society

Duration: Oct 2015 – Sep 2018

Horizon 2020
European Union Funding
for Research & Innovation

Consortium

Spain - Coordination
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Objectives

Understand better how gendered role expectations shape team communication (detailed Case Studies)

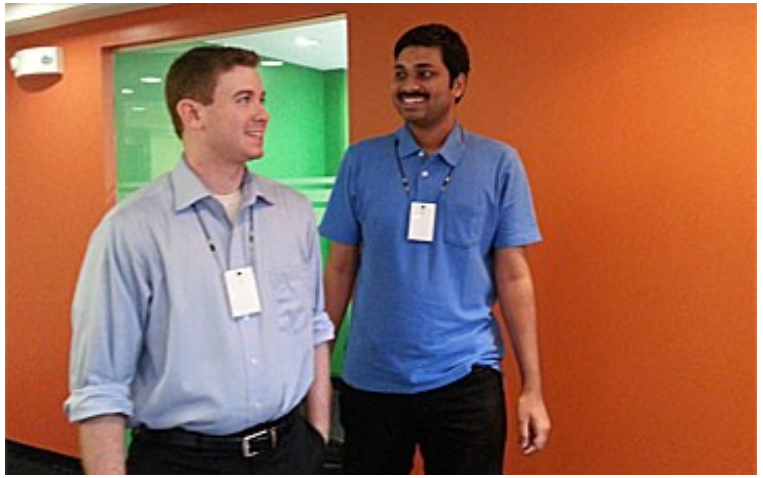
Make comparison of gender characteristics between teams more solid and sophisticated: development of Gender-Diversity-Index (GDI).

Cross-country survey: 2 sectors 5 country survey on multiple effects of gender diversity on research performance combined with bibliometric and patent indicators

GEDII Case Studies

Understand better disciplinary context of teams, how excellence is conceived

Test the utility of sociometric badges for studying the role of (gendered) status cues during interaction

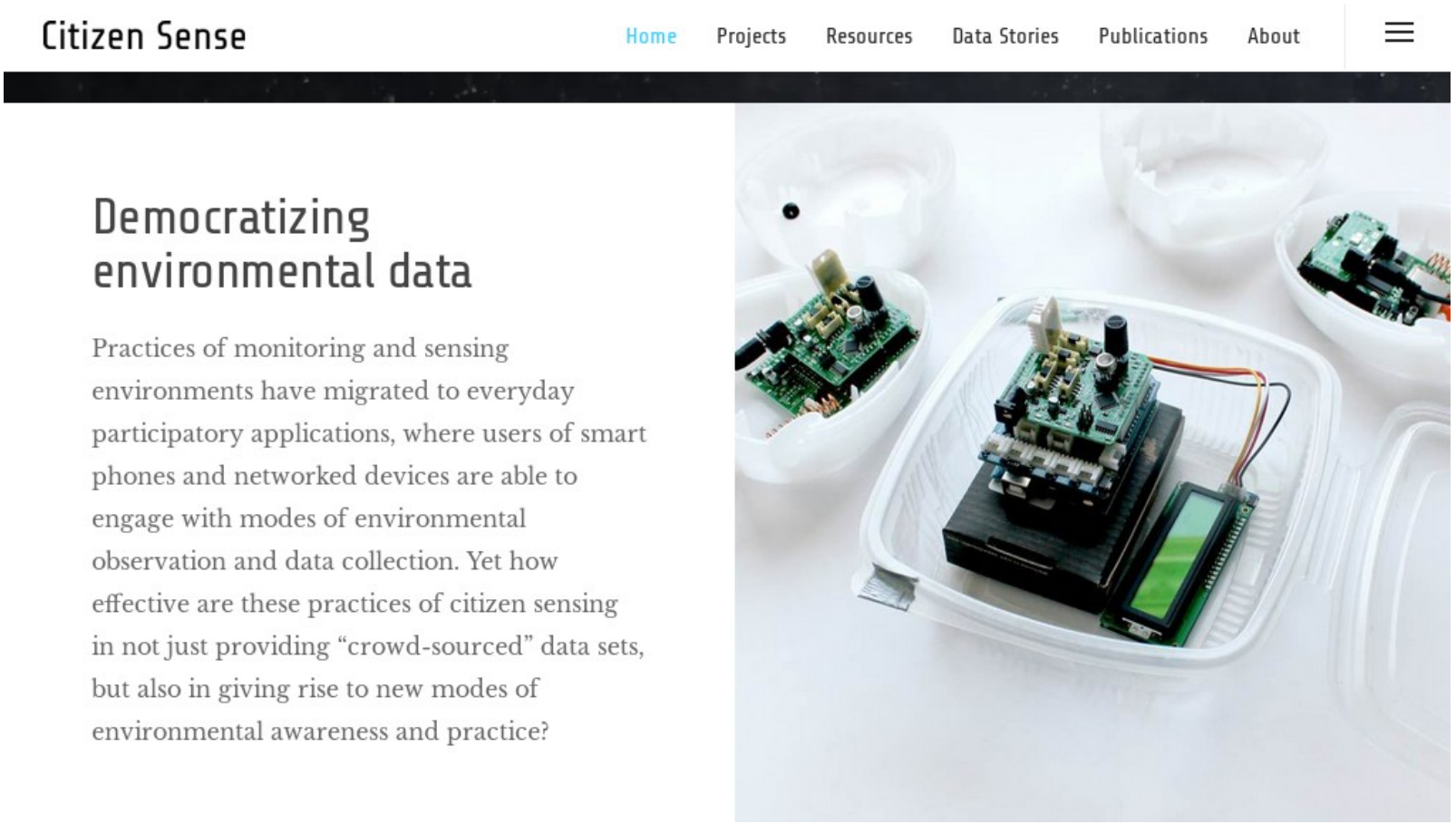


Sociometric badges
developed at MIT, then Sociometric Solutions, Boston, MA

Sensors & Big Data

Environmental Sensors

Air & water quality, traffic/people flows, “Smart”-housing, -city

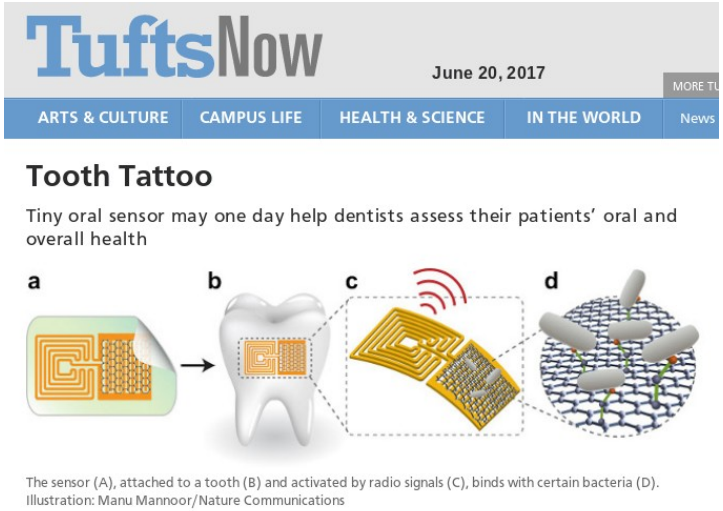


Wearables & health sensors

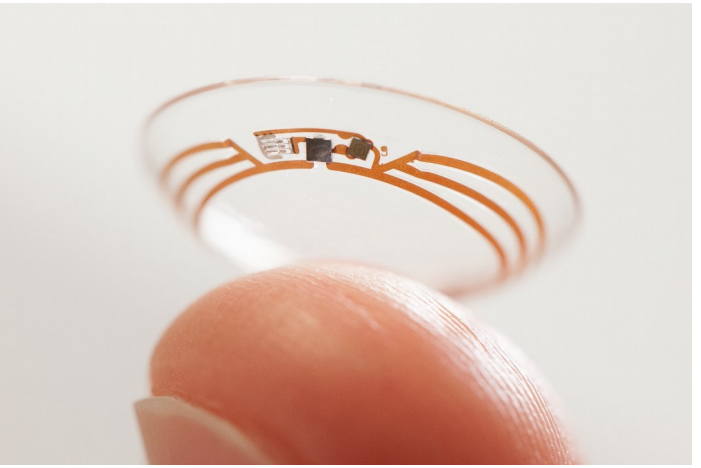
"Smart" - textiles, watches, phones, …

Medical devices, electronic tatoos, biosensors, …

Eddie Codel CC BY-NC-SA



Tufts Tooth Tattoo
http://now.tufts.edu/articles/tooth-tattoo



Google Smart Contact Lens
bit.ly/2tIOwUN

Social Signal Processing

"Social signal processing is the new research and technological domain that aims at providing computers with the ability to sense and understand human social signals" (Vinciarelli et al. 2009)

<u>Behavioral cues</u>

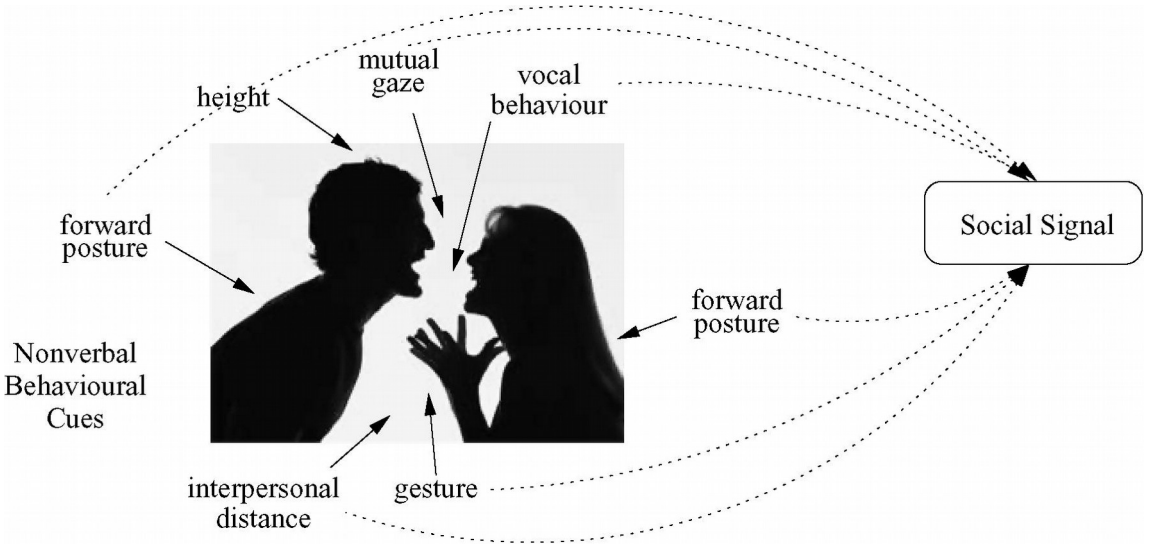
Physical appearance

Gesture and posture

Face & eye behavior

Vocal behavior

Space & environment



Social signal processing examples

“Automatic fight detection based on motion analysis”
(Fu, EY et al, 2015 IEEE)

“Online feedback system for public speakers”
(Nguyen, AT et al. 2012 IEEE)

“Hire me: computational inference of hirability...”
(Son Nguyen, L et al. 2014 IEEE)

“Vocal Analysis Software for Security Screening...”
(Elkins, A 2012)

“Modeling dominance in group conversations...”
(Jayagopi et al., 2009 IEEE)

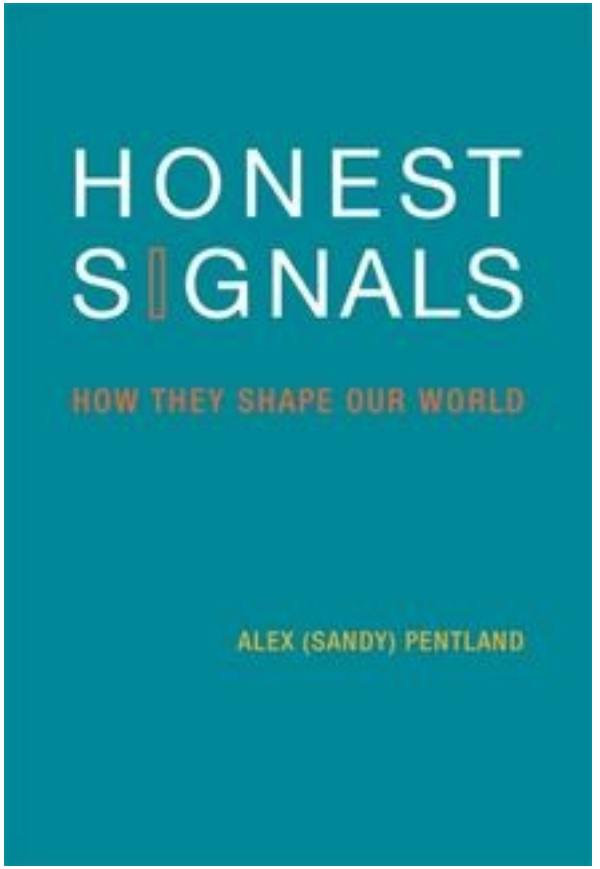
“Analysis of pedastrian behaviors...”
(Yoshimura et al., 2017)

Social-/behavioral research

"Beyond Contagion"
(Alshamsi, A et al. *PLOS ONE* 2015)

"Using sociometers to quantify social interaction patterns"
(Onnela, JP et al. *Sci. Reports* 2014)

"Evidence for a collective intellgience factor"
(Woolley, A *Science*, 2010)



Sociometric data features

Social network analysis

Proximity detection, face-2-face interaction

Social signal analysis / nonverbal comuni.

Speech and body movement: influence, mimicry, activity, consistency

Turn taking analysis

Un-/successful interruptions, average speaking length, etc.

→ Dimensions of social interaction that are conditioned by gender

Data features, detail

Proximity (Bluetooth)

Receive Signal Strength -90 < x < -60. 1-4 meters desirable. Every 25 secs.

Infrared (f2f)

Cone of 30º angle, 1-1.5 meter. Every 60 seconds.

Audio (speech)

8kHz Volume, voice pitch.

Body movement

Accelerometer energy magnitude. Sampled 0.1-0.5 seconds

All data timestamped: speech participation, turn-taking, synchronicity of body language.

From “Raw” Data to Higher Level Concepts

Nonvocal behavior

"Raw" audio signal, volume, frequency band

Prosodic voice features provide powerful behavioral cues

Distinguish between sexes, indicates personality traits, stress, hierarchy, or "hot spots" in conversations

Basis for higher level constructs such as turn-taking: speaking time & interruptions is a strong indicator of dominance.

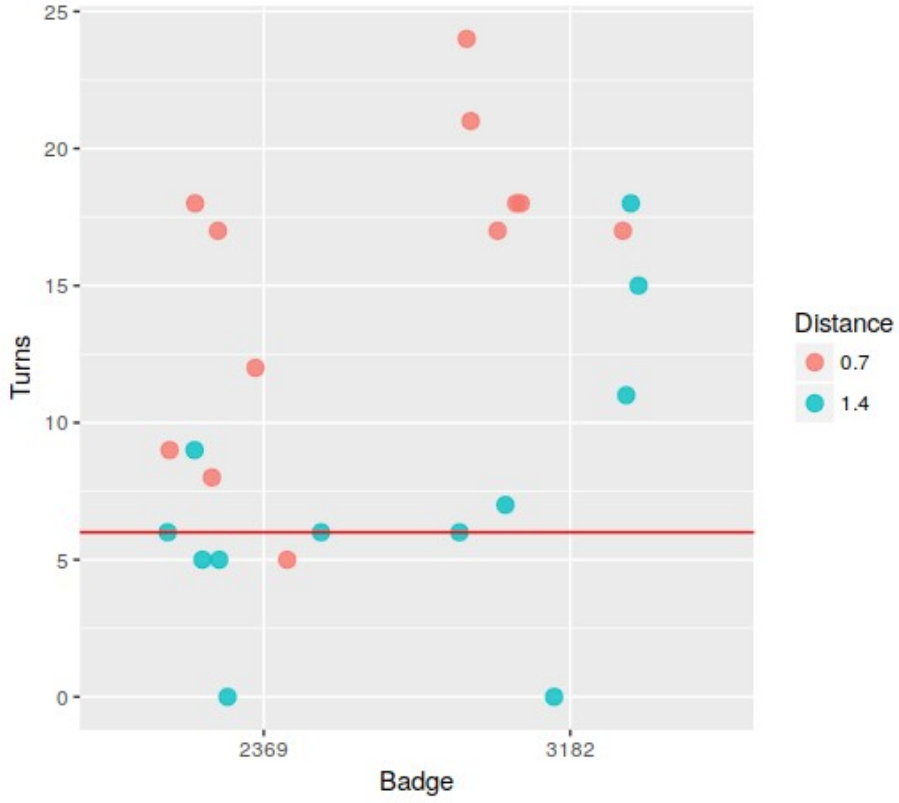
Measurement accuracy: audio

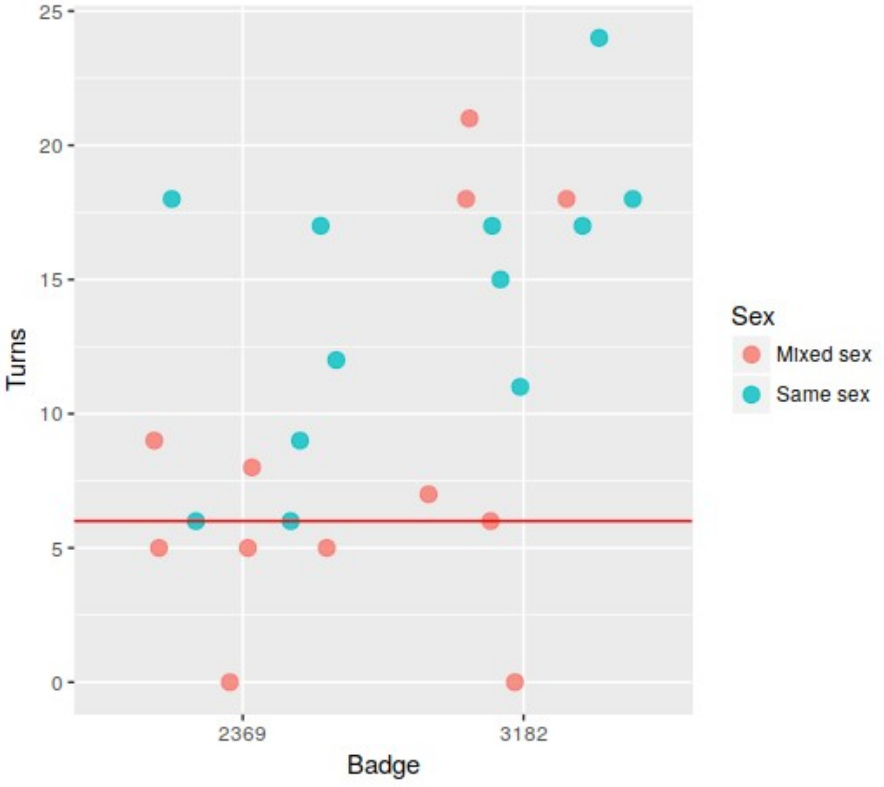
Turn-taking experiment - conditions

Two persons: same sex, mixed sex

Sitting close together (0.7m) and further away (1.4m)

3 x times reading the same text (< 2 min, no interruptions)





Dyadic tie formation in networks

Rivera et al., (2010) "Dynamics of dyads in social networks"

Assortative Mechanisms

Similarity between actors is indicator for their propensity to form a connection (homophily)

Relational Mechanisms

Shape and structure of network itself at prior moment predicts ties in the future (reciprocity, repetition)

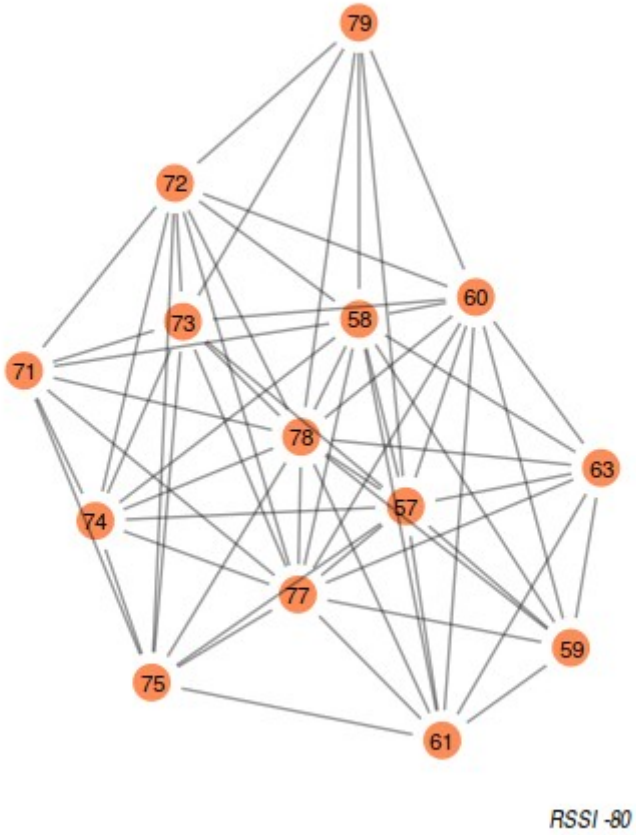
Proximity Mechanisms

Spatial and geographic proximity predict tie formation
"Shared path to the lab" (Kabo 2014)
"Human mobility networks" (Wang et al. 2011)

<u>Proximity → social relations</u>

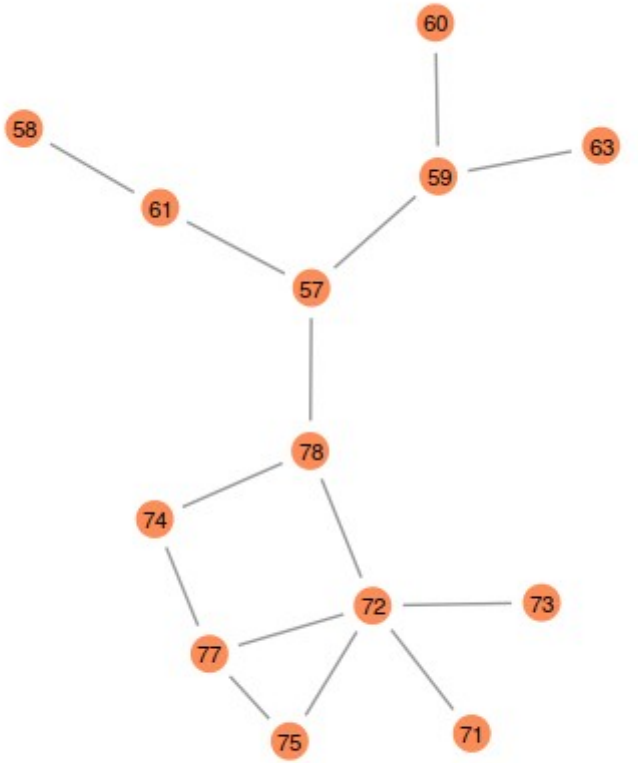
Measurement thresholds: proximity

Bluetooth Signal Strength -80



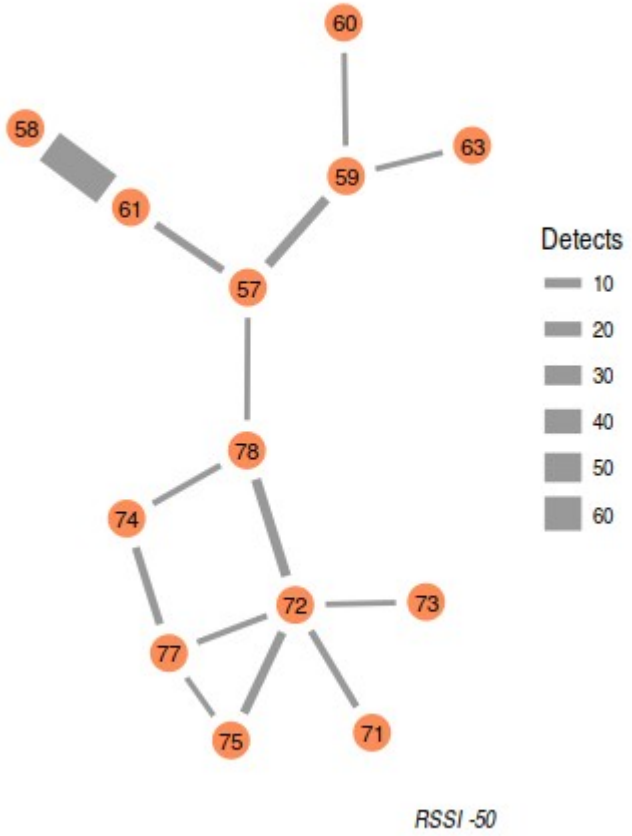
RSSI -80

Bluetooth Signal Strength -50



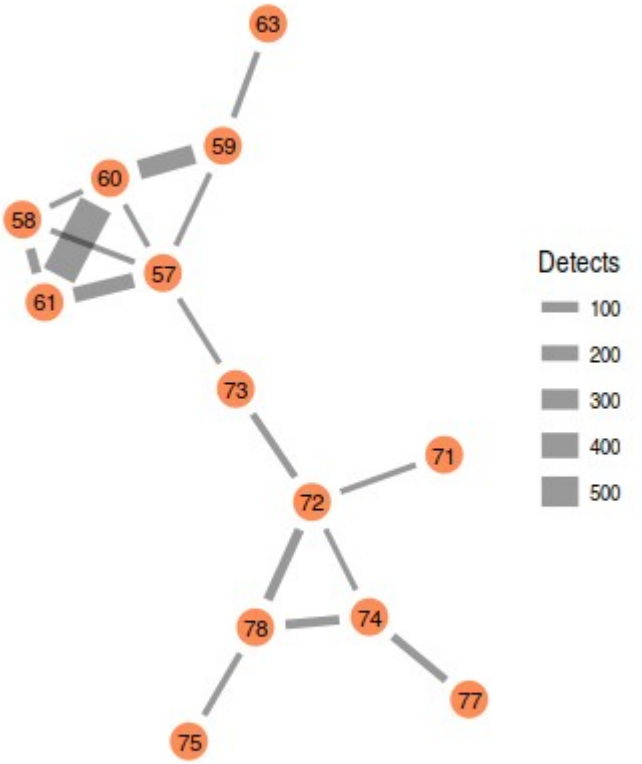
RSSI -50

Bluetooth Signal Strength -50



RSSI -50

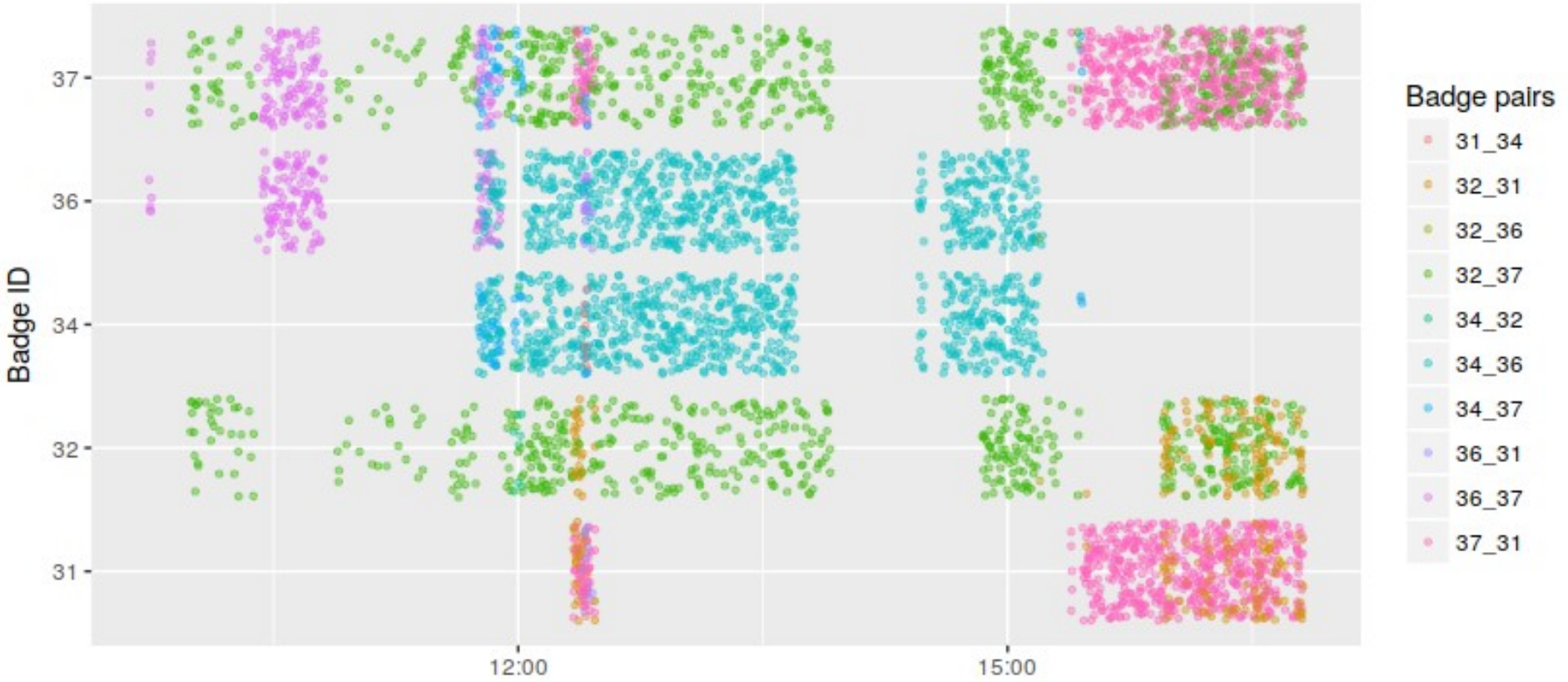
Face to Face /Infrared Detects



Face to face

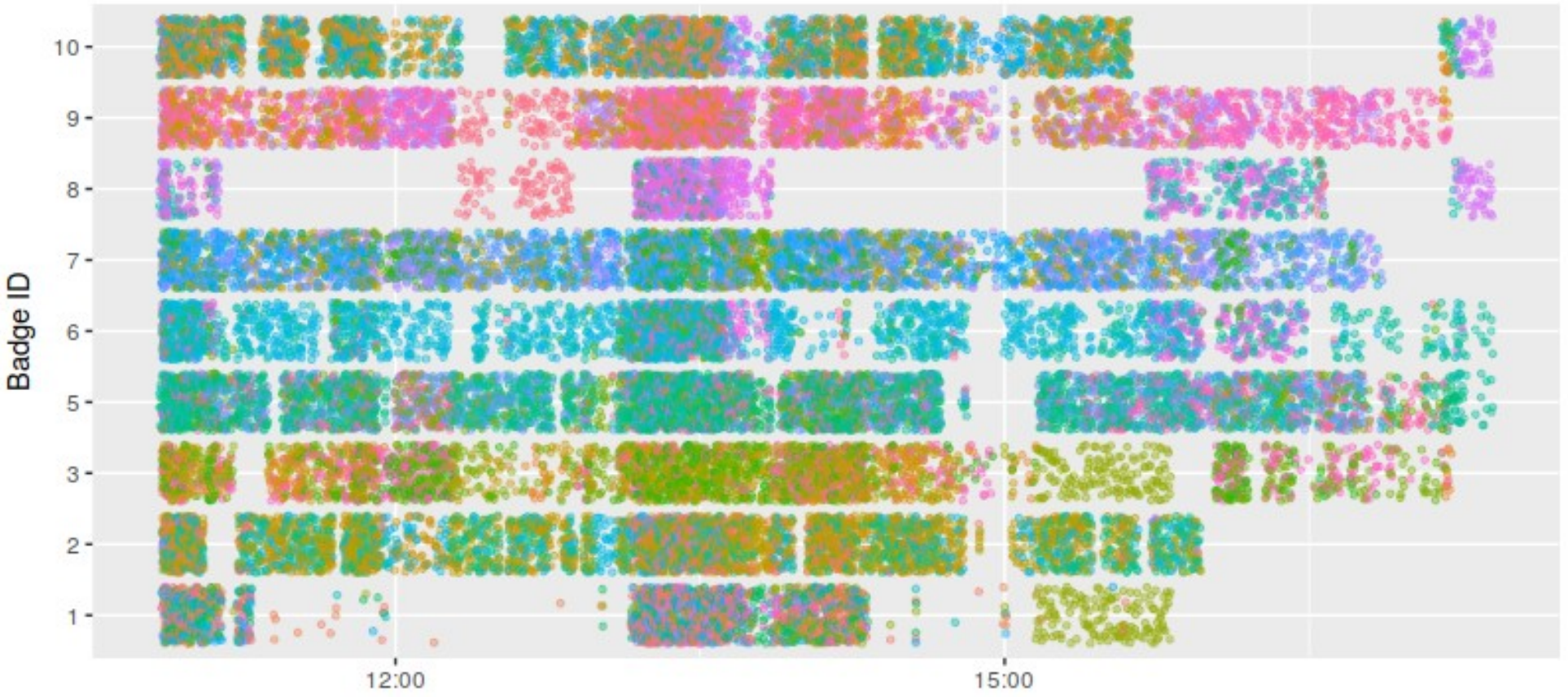
Proximity detects – Office

Signal strength -80



Proximity detects – Research lab

Signal strength -80



Proximity as indicator of… what?

Significant indicator	Limited indicator
Chance encounters	Research collaboration inside the team
Information sharing / spreading	Knowledge as "practice"

Ephemeral encounters ↔ Durable social relations

Outlook / challenges

Time based analysis of microlevel interaction processes

Behavioral data – access to otherwise “hard to observe” processes

Governance effects of behavioral data?!

Need of quality / decision criteria for thresholds and measurements

Thank you!

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http://www.gender-ict.net

http://www.gedii.eu

http://www.genderportal.eu