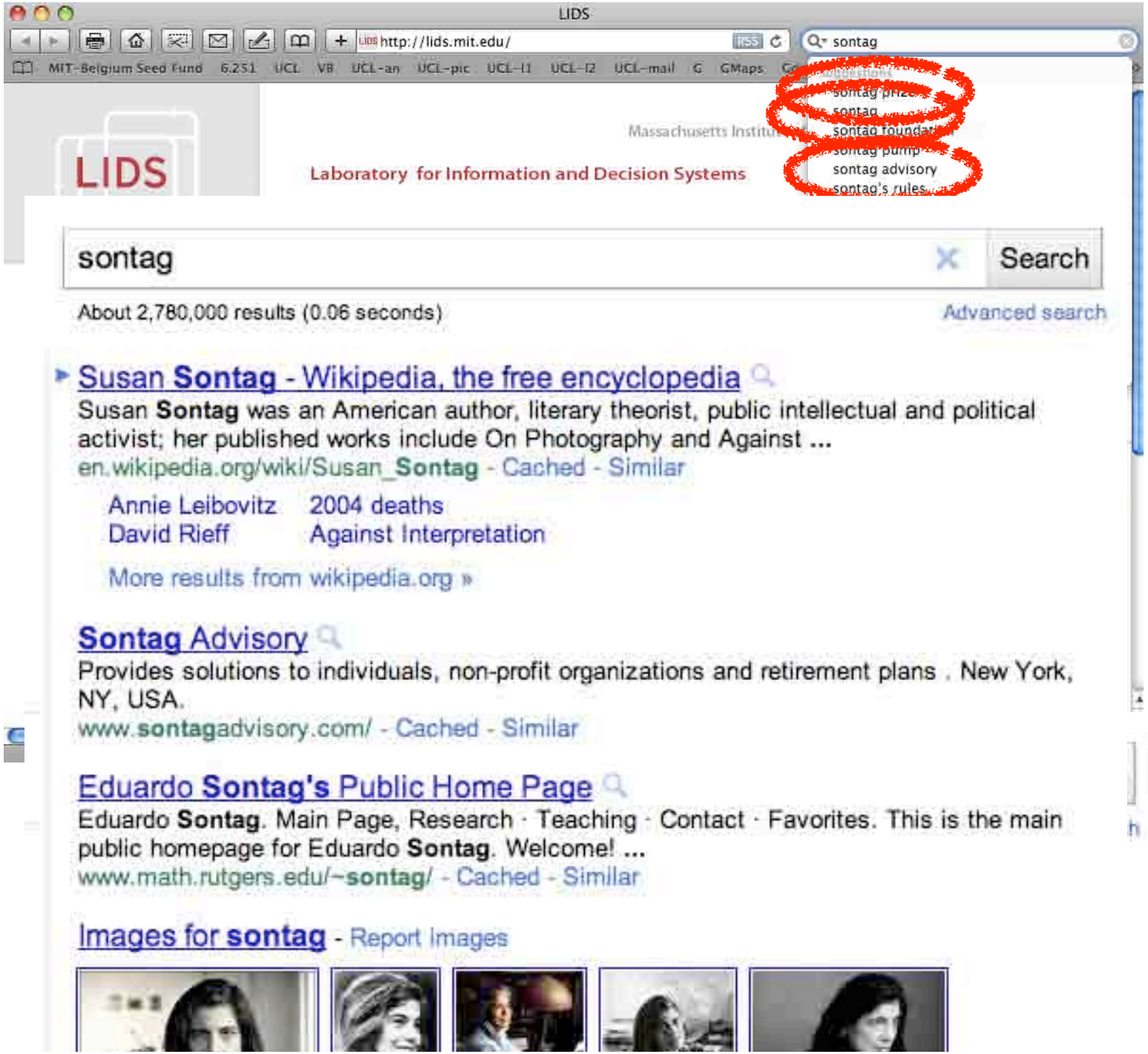
Geography and community in complex networks

Vincent Blondel
LIDS, MIT
On leave from UCLouvain (Belgium)

Sontag Fest
May 2011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Full color
Black and white

Any type
Face

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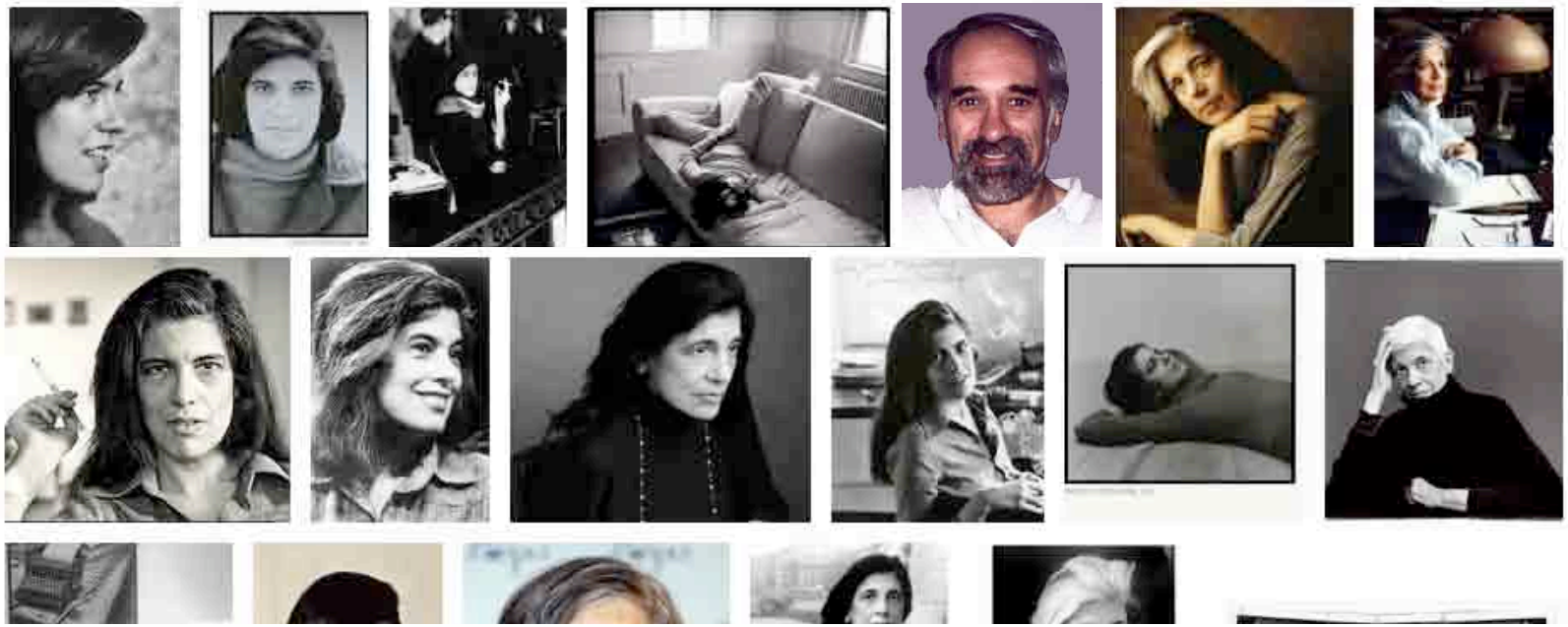
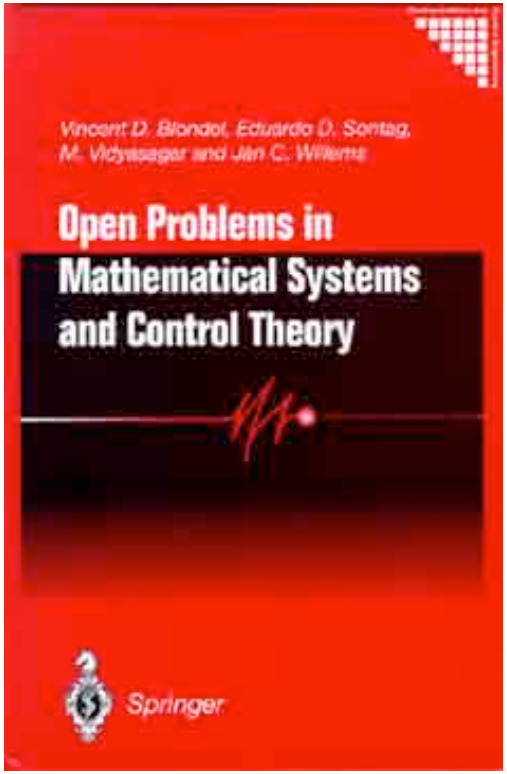




VB, Sontag, Vidyasagar, Willems, 1999

Panel on Theoretical Challenges
Moderator: M. Vidyasagar
Panel: Peter Caines, Jan van Schuppen

3. System approximation in the 2-norm
A.C. Antoulas

16. A stabilization problem
Roger Brockett

25. Input-output gains of switched linear systems
J. P. Hespanha, A. S. Morse

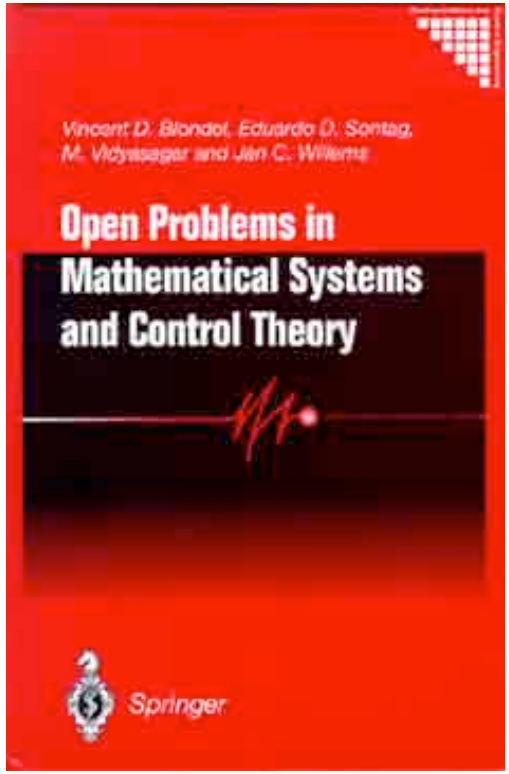
40. Control-Lyapunov functions
Eduardo D. Sontag

46. Shift policies in QR-like algorithms and feedback control of self-simila
Paul Van Dooren, Rodolphe Sepulchre

50. Lyapunov theory for high order differential systems
Jan C. Willems

51. Performance lower bound for a sampled-data signal reconstruction
Yutaka Yamamoto, Shinji Hara

77. Important computational complexity problems in systems and control
Peter Caines



VB, Sontag, Vidyasagar, Willems, 1999

Panel on Theoretical Challenges
Moderator: M. Vidyasagar
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«Clearly, the most important and pressing problems in system and control are problems related to computational complexity. These are problems that have had an enormous impact in control and will continue to do so for the next decades.»

Peter Caines at SontagFest, May 2011

77. Important computational complexity problems in systems and control
Peter Caines

[1] 2 Next »

Mobile Data: A Gold Mine for Telcos

A snapshot of our activities, cell phone data attracts both academics and industry researchers.

By Tom Simonite THURSDAY, MAY 27, 2010

Cell phone companies are finding that they're sitting on a gold mine--in the form of the call records of their subscribers.

Call center: This network shows phone calls between around two million cell phone users in Belgium over six months; each dot represents a tightly connected group of people, and its color represents the language they speak. The Dutch-speaking (green) and French-speaking (red)

Researchers in academia, and increasingly within the mobile industry, are working with large databases showing where and when calls and texts are made and received to reveal commuting habits, how far people travel for public events, and even significant social trends.

With potential applications ranging from city planning to marketing, such studies could also provide a new source of revenue for the cell phone companies. "Because cell phones have become so ubiquitous, mining the data they generate can really revolutionize the study of human behavior," says Ramón Cáceres, a lead researcher at AT&T's research labs in Florham Park, NJ.

If you were an AT&T subscriber and were near Los Angeles or New York between March 15 and May 15 last year, there's a 5 percent chance that your data was crunched by Cáceres and his colleagues in a study of the travel habits of the company's subscribers. The

TOP STORIES OF THE DAY

» Space Companies Get NASA's Attention
» Reinventing the Gasoline Engine
» Blog: How iTunes Genius Really Works

NetMob

Workshop on the
Analysis of Mobile Phone Networks

A satellite workshop to NetSci 2010
Tuesday, May 11, 2010
MIT, Cambridge, MA

NetMob2011

Given the success of NetMob2010, we consider the possibility of organizing a **NetMob2011**. If you wish to be included on the NetMob mailing list, please send an email to sympa2@listes.uclouvain.be with "subscribe netmob yourname" in the subject line (where "yourname" is your first and last name). You can also subscribe/unsubscribe by going to https://listes-2.sipr.ucl.ac.be/sympa/info/netmob.

Introduction

Mobile phone datasets have become widely available in recent years and have opened the possibility to improve our understanding of large-scale social networks by investigating how people exchange information, build trust, create markets and develop social interactions. Mobile phone data is also helping us understand complex processes such as the spread of information and viruses or transportation and the use of urban infrastructures.

This workshop will consist of a number of contributed talks on the analysis of mobile phone networks. The workshop format is flexible: no registration fees, a simplified submission procedure, and the possibility to present recent results or results submitted elsewhere.

Practical information

Date: Tuesday May 11, 2010 (this is the day prior to the conference NetSci).

Location: On the sixth floor of the newly built Media Lab (building E14 on MIT campus, map available here).

Registration: Attendance is free of charge but, due to limited seating, registration is compulsory. If you wish to register please send an email to netmob@uclouvain.be. Registration will be processed on a first-come first-serve basis. Although there is no registration fee for the workshop, participants are of course encouraged to also participate (and register) in the NetSci conference.

We have have received an unexectedly **large number of registrations** to the workshop. The workshop has been moved to a larger space (the multi media hall of the Media Lab). All those who have registered by sending an email or through the NetSci website are welcome to attend.

Submissions

All contributions that deal with the analysis of mobile phone datasets are welcome.

Authors are invited to submit an abstract (one to three pages) by the deadline of March 5, 2010. Submissions should include the title, author(s), affiliation(s) and e-mail address(es) on the first page. There will be no published proceedings; the material submitted to the workshop may also be submitted elsewhere.

Electronic submission of manuscripts in PDF format is required. Please send your manuscript directly to netmob@uclouvain.be by March 5, 2010.

The evaluation of submitted abstracts will be organized by the scientific committee and decisions will be made by March 26, 2010. Once an abstract has been accepted for presentation, at least one author is required to attend the workshop and present the paper. In case too many abstracts are selected, some of these may be moved to a special session taking place the next day at the NetSci 2010 conference.

Program

The **program** is available here (PDF format).

Book of abstracts

The **book of abstracts** is available here (5.5 MB, PDF format).

Scientific committee

Chair: Vincent Blondel, UCLouvain (Belgium)
Laszlo Barabasi, Northeastern University
Rob Clayton, British Telecom (UK)

Interdisciplinary Workshop on Information and Decision in Social Networks

May 31 - June 1, 2011

MIT

Recent technological and mathematical developments have opened the possibility to considerably i our understanding of how information flows and decisions are made in large social networks. workshop, we bring together researchers from different communities working on information prop and decision making in social networks to investigate both rigorous models that highlight capabili limitations of such networks as well as empirical and simulations studies of how people ex information, influence each other, make decisions and develop social interactions.

This workshop is being organized by the Laboratory for Information and Decision Systems.

Organizers

Vincent Blondel, UCLouvain (Belgium) and LIDS, MIT
Munther Dahleh, LIDS, MIT
Asu Ozdaglar, LIDS, MIT
John Tsitsiklis, LIDS, MIT

Scientific committee

Chair: Vincent Blondel, UCLouvain (Belgium) and LIDS, MIT
Daron Acemoglu, Economics, MIT
Sinan Aral, New York University
Albert-László Barabási, Northeastern University

[1] 2 Next »

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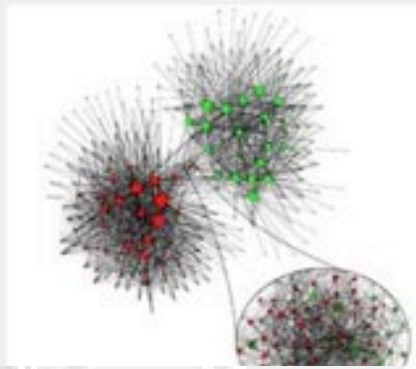

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91 zip codes,
10 New Jersey
range, and Ventura

TOP STORIES OF THE DAY

» Space Companies Get NASA's Attention

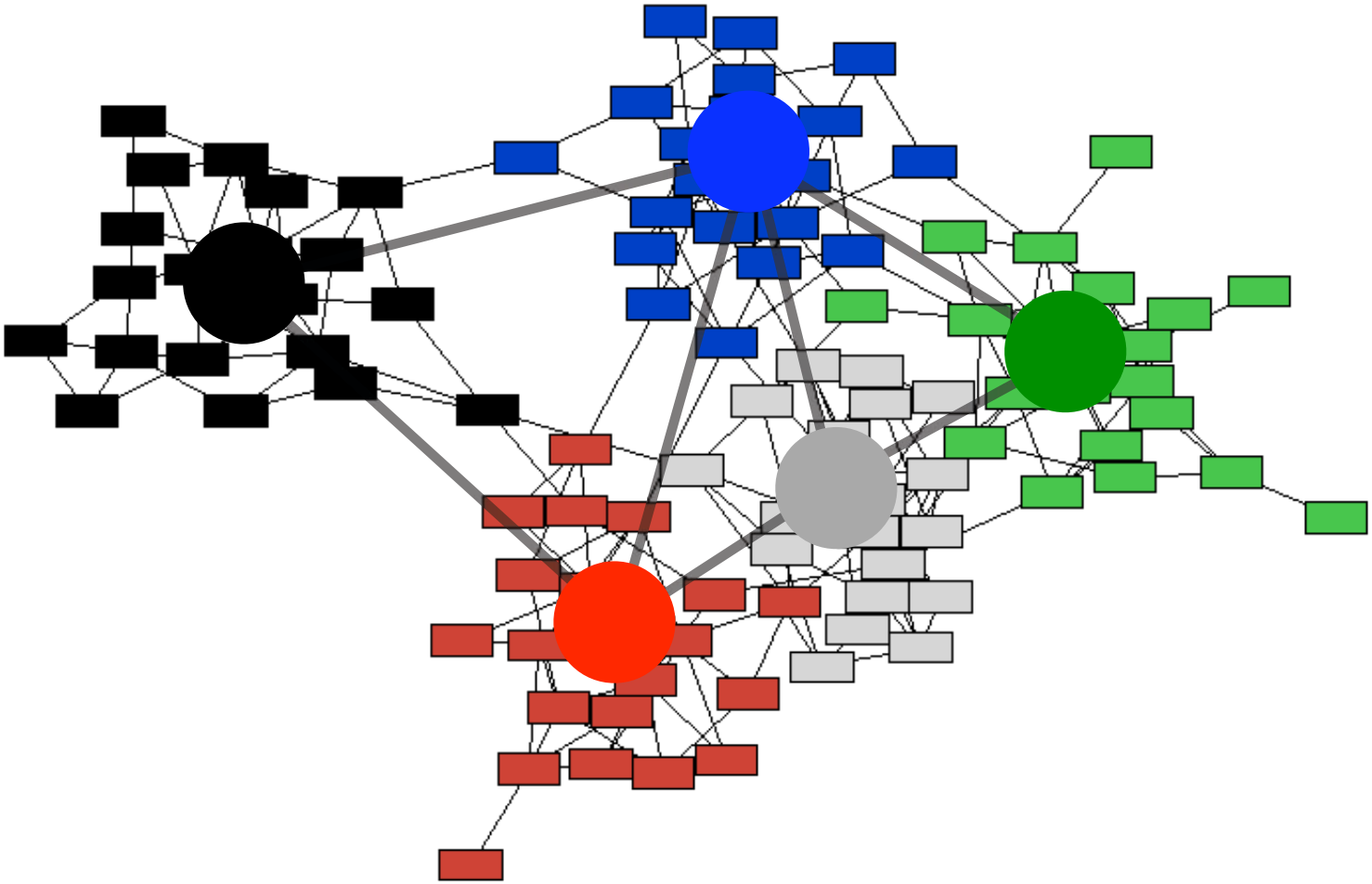
» Reinventing the Gasoline Engine

» Blog: How iTunes Genius Really Works

Large networks

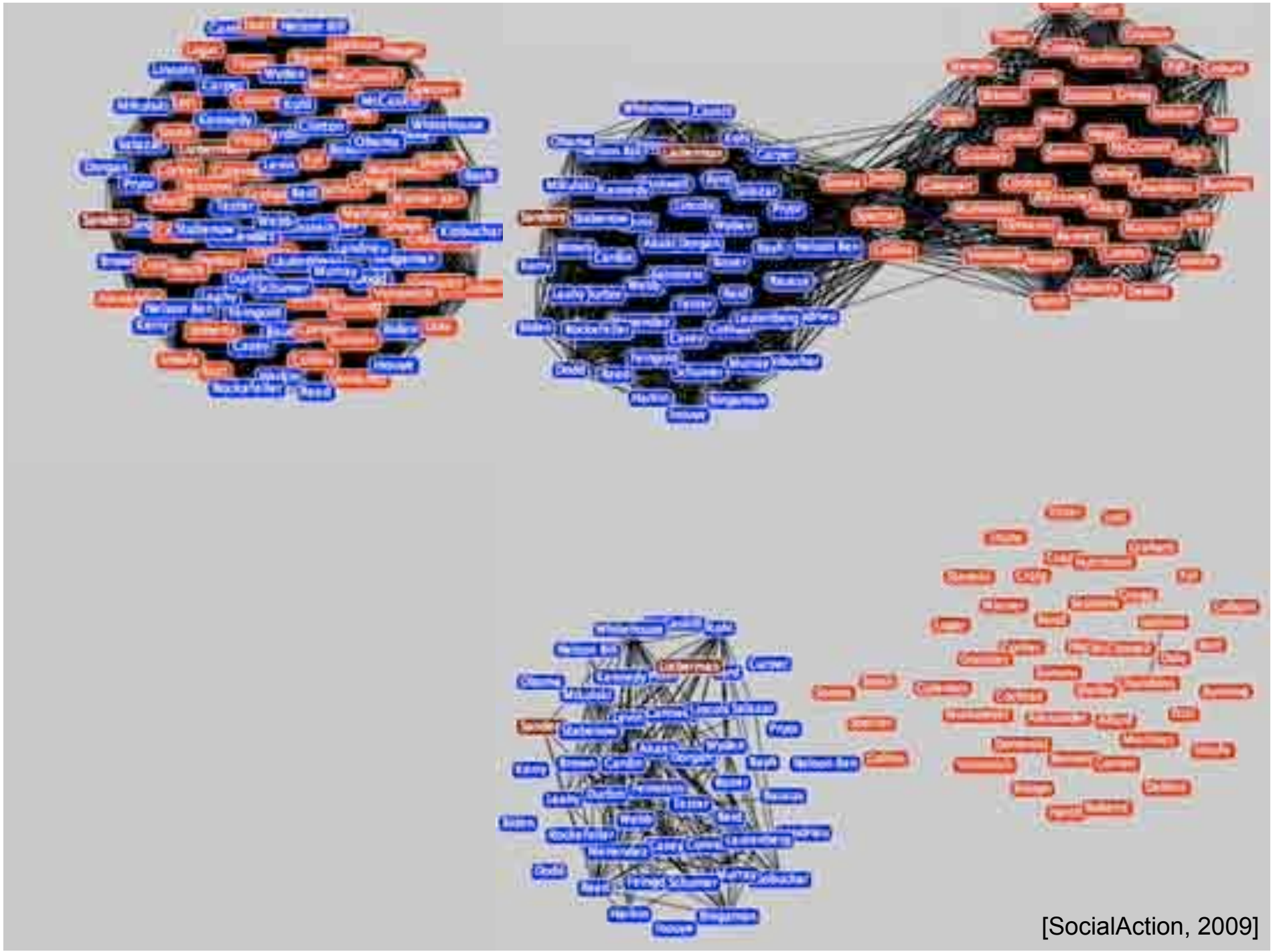
- Web graph
- Internet graph
- Email exchange networks
- Blogs networks
- Citation networks
- Social networking sites (facebook, linkedIn, etc)
- Instant messages
- Mobile phone networks
- Twitter
- Collaboration graphs
- ...

Communities in networks



Why look for communities?

- Visualisation
- Structural organisation of the network
- Analysis (information propagation, robustness, cohesive,...)
- Time-evolution



[SocialAction, 2009]

Physics Reports 486 (2010) 75–174

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Community detection in graphs

Santo Fortunato *

Complex Networks and Systems Lagrange Laboratory, ISI Foundation, Viale S. Severo 65, 10133, Torino, I, Italy

ARTICLE INFO

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editor: I. Procaccia

Keywords:
Graphs
Clusters
Statistical physics

ABSTRACT

The modern science of networks has brought significant advances to our understanding of complex systems. One of the most relevant features of graphs representing real systems is community structure, or clustering, i.e. the organization of vertices in clusters, with many edges joining vertices of the same cluster and comparatively few edges joining vertices of different clusters. Such clusters, or communities, can be considered as fairly independent compartments of a graph, playing a similar role like, e.g., the tissues or the organs in the human body. Detecting communities is of great importance in sociology, biology and computer science, disciplines where systems are often represented as graphs. This problem is very hard and not yet satisfactorily solved, despite the huge effort of a large interdisciplinary community of scientists working on it over the past few years. We will attempt a thorough exposition of the topic, from the definition of the main elements of the problem, to the presentation of most methods developed, with a special focus on techniques designed by statistical physicists, from the discussion of crucial issues like the significance of clustering and how methods should be tested and compared against each other, to the description of applications to real networks.

Contents

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E-mail address: fortunato@isi.it.

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doi:10.1016/j.physrep.2009.11.002

Communities in Networks

Mason A. Porter, Jukka-Pekka Onnela, and Peter J. Mucha

Introduction: Networks and Communities

"But although, as a matter of history, statistical mechanics owes its origin to investigations in thermodynamics, it seems eminently worthy of an independent development, both on account of the elegance and simplicity of its principles, and because it yields new results and places old truths in a new light in departments quite outside of thermodynamics."

— *Josiah Willard Gibbs,*
Elementary Principles in Statistical Mechanics,
1902 [47]

From an abstract perspective, the term *network* is used as a synonym for a mathematical *graph*. However, to scientists across a variety of fields, this label means so much more [13, 20, 44, 83, 88, 120, 124]. In sociology, each *node* (or vertex) of a network represents an *agent*, and a pair of nodes can be connected by a *link* (or edge) that signifies some social interaction or tie between them (see Figure 1 for an example). Each node has a *degree* given by the number of edges connected to it and a *strength* given by the total weight of those edges. Graphs can represent either man-made or natural constructs, such as the World Wide Web or neuronal synaptic networks in the brain. Agents in such networked systems are like particles in traditional statistical mechanics that we all know and (presumably) love, and the structure of interactions between agents reflects the microscopic rules that govern their behavior. The simplest types of links are binary pairwise connections, in which one only cares about the presence or absence of a tie. However, in many situations, links can also be assigned a direction and a (positive or negative) weight to designate different interaction strengths.

Traditional statistical physics is concerned with the dynamics of ensembles of interacting and noninteracting particles. Rather than tracking the motion of all of the particles simultaneously, which is an impossible task due to their tremendous number, one averages (in some appropriate manner) the microscopic rules that govern the dynamics of individual particles to make precise statements of macroscopic observables such as temperature and density [112]. It is also sometimes possible to make comments about intermediate (*mesoscopic*) structures, which lie between the microscopic and macroscopic worlds; they are large enough that it is reasonable to discuss their collective properties but small enough so that those properties are obtained through averaging over smaller numbers of constituent items. One can similarly take a collection of interacting agents, such as the nodes of a network, with some set of microscopic interaction rules and attempt to derive the resulting mesoscopic and macroscopic structures.

Mason A. Porter, Oxford Centre for Industrial and Applied Mathematics, Mathematical Institute, University of Oxford, and CABDyN Complexity Centre, University of Oxford. His email address is porterm@maths.ox.ac.uk.

Jukka-Pekka Onnela, Harvard Kennedy School, Harvard University; Department of Physics, University of Oxford; CABDyN Complexity Centre, University of Oxford; and Department of Biomedical Engineering and Computational Science, Helsinki University of Technology. His email address is jp_onnela@ksg.harvard.edu.

Peter J. Mucha, Carolina Center for Interdisciplinary Applied Mathematics, Department of Mathematics, University of North Carolina, and Institute for Advanced Materials, Nanoscience and Technology, University of North Carolina. His email address is mucha@unc.edu.

What the papers say

The art of community detection

Natali Gulbahce[1,2]* and Sune Lehmann[1,2]

Summary
Networks in nature possess a remarkable amount of structure. Via a series of data-driven discoveries, the cutting edge of network science has recently progressed from positing that the random graphs of mathematical graph theory might accurately describe real networks to the current viewpoint that networks in nature are highly complex and structured entities. The identification of high order structures in networks unveils insights into their functional organization. Recently, Clauset, Moore, and Newman,[1] introduced a new algorithm that identifies such heterogeneities in complex networks by utilizing the hierarchy that necessarily organizes the many levels of structure. Here, we anchor their algorithm in a general community detection framework and discuss the future of community detection. ***BioEssays*** **30:934–938, 2008.**

Structure everywhere

The view that networks are essentially random was challenged

interact with more than 200 other proteins, contrary t
proteins that interact with only a few other proteins.

Various local to global measures have been introdu
unveil the organizational principles of complex networ
Maslov and Sneppen[10] discovered that who links to
can depend on node degree; in many biological network
degree nodes systematically link to nodes of low degre
disassortativity decreases the likelihood of cross talk be
functional modules inside the cell and increases
robustness. Other networks, for example social netwo
are highly assortative—in these networks nodes with
degree tend to link to each other.

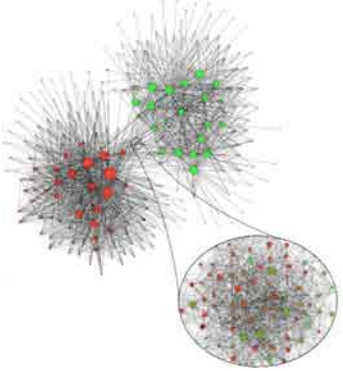
Going beyond the properties of single nodes and p
nodes, the natural next step is to consider structure
include several nodes. Interestingly, a few select mo
three to four nodes are ubiquitous in real networks[12
most others occur only as often as they would at ra
or are actively suppressed. Other measures of local str

Geography and community in complex networks

Large Graphs and Networks
UCL Université catholique de Louvain

Louvain method for community detection (and modularity)

[VB, Guillaume, Lambiotte, Lefèvre, 2008]



Communities in a mobile phone network

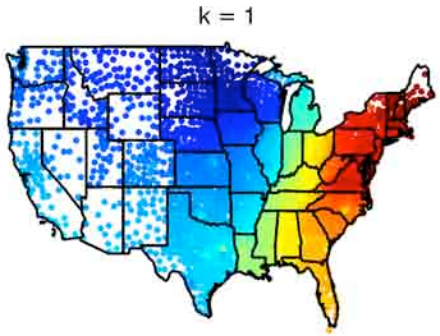
[Lambiotte, VB et al., 2009]

Geography in community detection

[Krings, Calabrese, Ratti, VB, 2009]

[VB, Krings, Thomas, 2010]

[Expert, Evans, VB, Lambiotte, PNAS, 2011]



Eigenvectors and communities

[Cucuringu, Vandooren, VB, 2011]

Vincent D. Blondel, Jean-Loup Guillaume, Renaud Lambiotte, Etienne Lefebvre, Fast unfolding of communites in large networks, Journal of Statistical Mechanics: Theory and Experiment, 1742-5468, P10008, 2008.
Web: 118M/1G

Divide and Conquer: Partitioning Online Social Networks
Josep M. Pujol, Vijay Erramilli, Pablo Rodriguez
arXiv, 2010
Twitter: 2.4M/38M

Mapping search relevance to social networks
Jonathan Haynes, Igor Perisic
Proceedings of the 3rd Workshop on Social Network Mining and Analysis, 2010
Linkedin, 21M

Tracking the Evolution of Communities in Dynamic Social Networks
Greene, D.; Doyle, D.; Cunningham, P.;
International Conference on Advances in Social Networks Analysis and Mining (ASONAM), 2010
Mobile phone, 4M/100M

Real World Routing Using Virtual World Information
Pan Hui, Sastry N.
International Conference on Computational Science and Engineering, 2009
Flickr 1.8M/22M, LiveJournal 5.3M/77M, YouTube 1.1M/4.5M

Community structure in audio clip sharing
Gerard Roma, Perfecto Herrera
International Conference on Intelligent Networking and Collaborative Systems, INCoS 2010
Freesound

Subject clustering analysis based on ISI category classification
Lin Zhang, Xinhai Liu, Frizo Janssens, Liming Liang and Wolfgang Glänzel
Journal of Informetrics, Volume 4, Issue 2, April 2010
ISI 6M papers

XTRACT

Solutions Services Customers Social I

Social Intelligence. THE POWER TO PROFIT FROM P

Social Links Use Cases Churn Prevention ›› Product Marketing ›› Custome

News

Blog › Jacob Fleming 3rd Annual Driving Loyalty in Telecoms event postponed to June 3-4.– April 22nd

Blog › Spring in Budapest! – March 19th

Events

3rd Annual "D
Budapest, Jun
The event has t
to June. Xtract

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makes graphs handy

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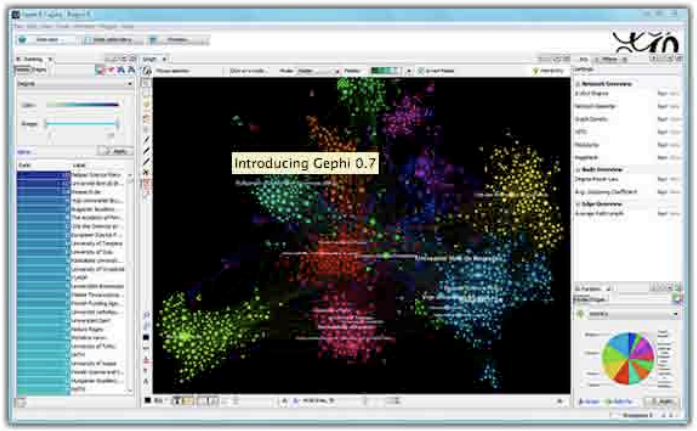
▶ Quick start ▶ Videos



NetworkX

NetworkX Home | Download | Developer Zone | Documentation | Blog » modules | index

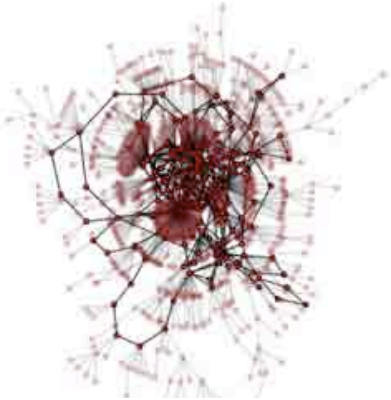
High productivity software for complex networks

NetworkX is a Python package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks.

Quick Example

```
>>> import networkx as nx

>>> G=nx.Graph()
>>> G.add_node("spam")
>>> G.add_edge(1,2)
>>> print(G.nodes())
[1, 2, 'spam']
>>> print(G.edges())
[(1, 2)]
```



Download

Current version: **1.3**

Get NetworkX from the Python Package Index, or install it with:

```
easy_install networkx
```

Questions? Suggestions?

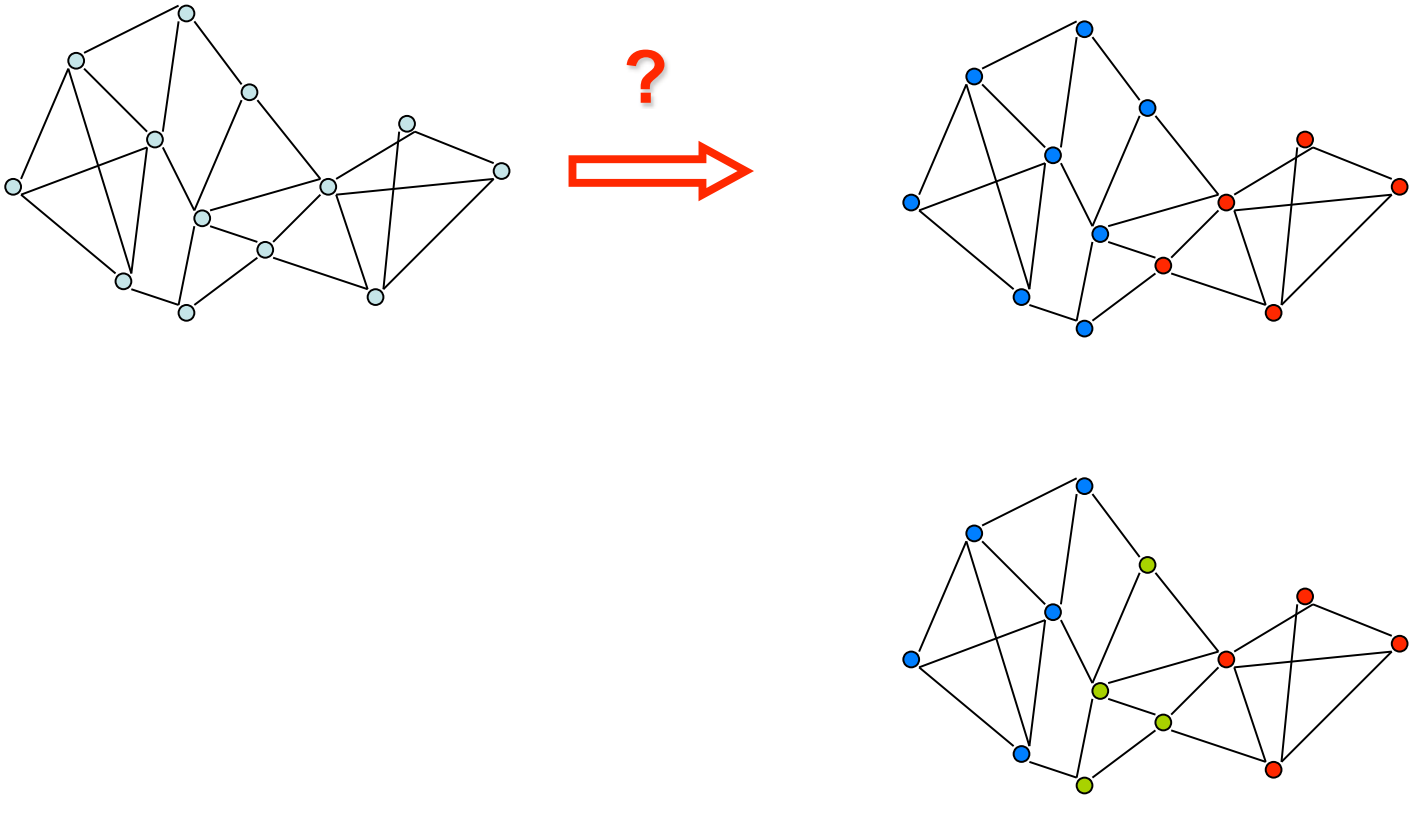
Join the Google group:

your@email Subscribe

You can also open a ticket at the NetworkX Developer Zone.

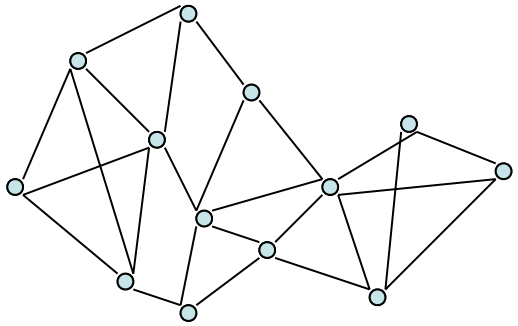
Quick search

Go



Modularity

Quality of a partition of a network in communities



[Newman, 2004]

Modularity

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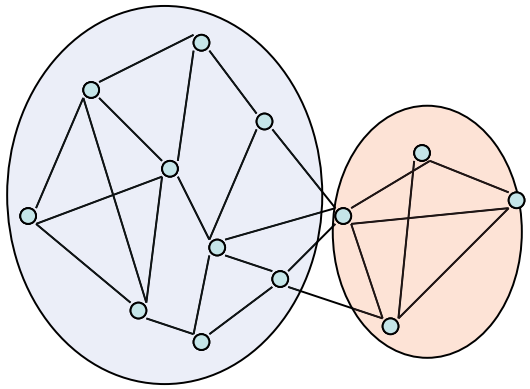
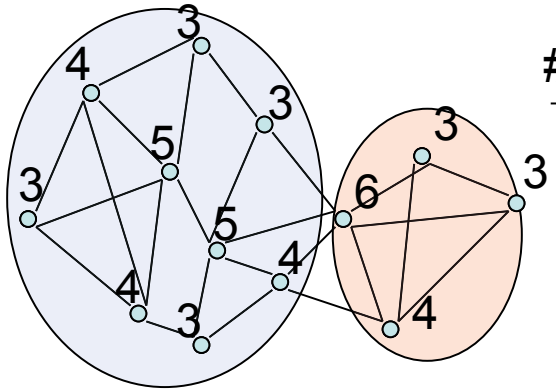


$$\frac{\text{\# edges in communities - expected \# edges in communities}}{\text{total number of edges}}$$

[Newman, 2004]

Modularity

Quality of a partition of a network in communities



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[Newman, 2004]

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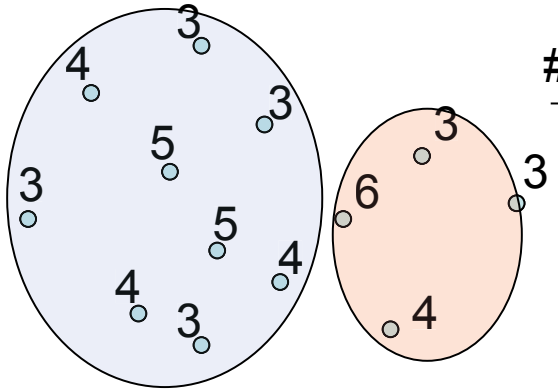

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[Newman, 2004]

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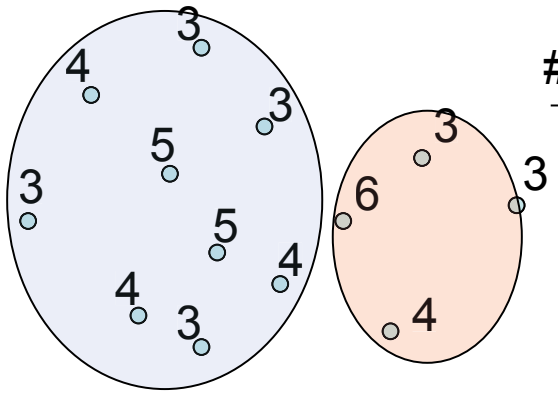


$$\frac{\text{\# edges in communities - expected \# edges in communities}}{\text{total number of edges}}$$

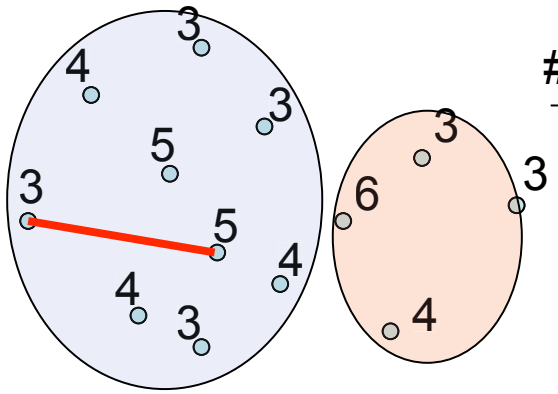
m edges, d_i degree of node i

expected # edges between node i and node j = $(d_i\, d_j)/(2m)$

[Newman, 2004]

Modularity

Quality of a partition of a network in communities



$$\frac{\text{\# edges in communities - expected \# edges in communities}}{\text{total number of edges}}$$

m = 25, expect **0.3** edges

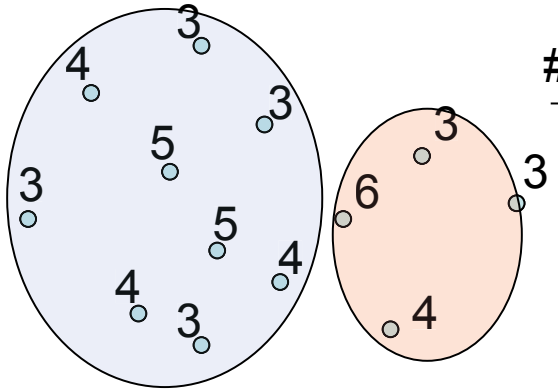
m edges, d_i degree of node i

expected # edges between node i and node j = $(d_i\, d_j)/(2m)$

[Newman, 2004]

Modularity

Quality of a partition of a network in communities



$$\frac{\text{\# edges in communities - expected \# edges in communities}}{\text{total number of edges}}$$

Expected **11.56** **2.56**

m nodes, d_i degree of node *i*

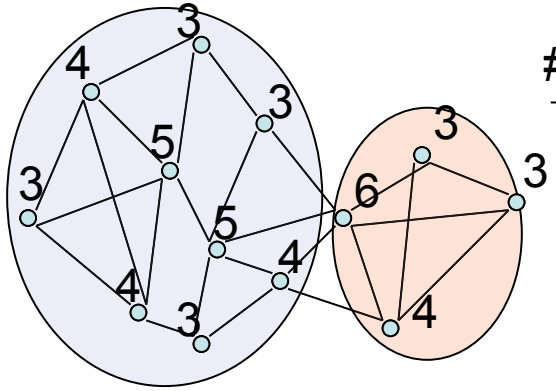
expected # edges between node *i* and node *j* = $(d_i\, d_j)/(2m)$

expected # edges in community $Sum_{i,\, j \text{ in } C}\ (d_i\, d_j)/(2m)$

[Newman, 2004]

Modularity

Quality of a partition of a network in communities



$$\frac{\text{\# edges in communities - expected \# edges in communities}}{\text{total number of edges}}$$

Expected	11.56	2.56
Observed	15	6

m nodes, d_i degree of node *i*

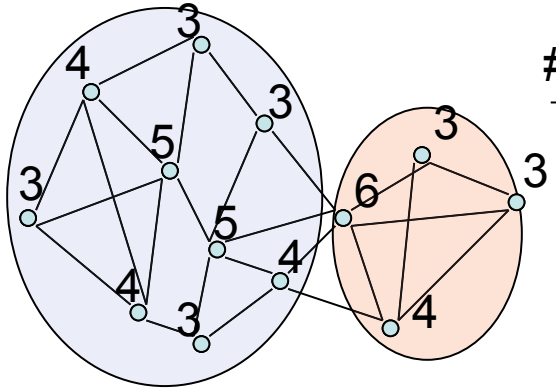
expected # edges between node *i* and node *j* = $(d_i\, d_j)/(2m)$

expected # edges in community $Sum_{i,\, j \text{ in } C}\ (d_i\, d_j)/(2m)$

[Newman, 2004]

Modularity

Quality of a partition of a network in communities



$$\frac{\text{\# edges in communities - expected \# edges in communities}}{\text{total number of edges}}$$

$$\frac{(15 + 6) - (11.56 + 2.56)}{25} = 0.275$$

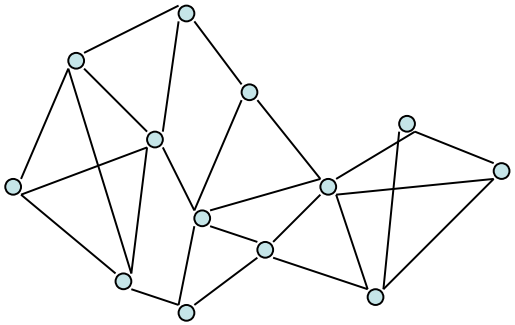
Expected	11.56	2.56
Observed	15	6

m nodes, d_i degree of node i

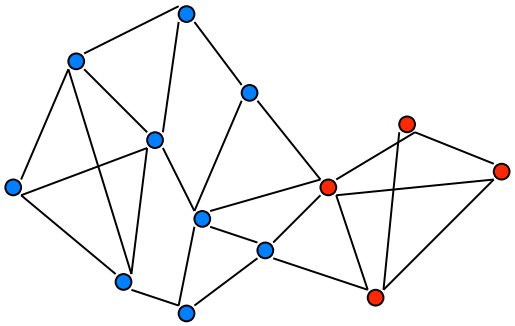
expected # edges between node i and node $j = (d_i\, d_j)/(2m)$

expected # edges in community $Sum_{i,\, j \text{ in } C}\ (d_i\, d_j)/(2m)$

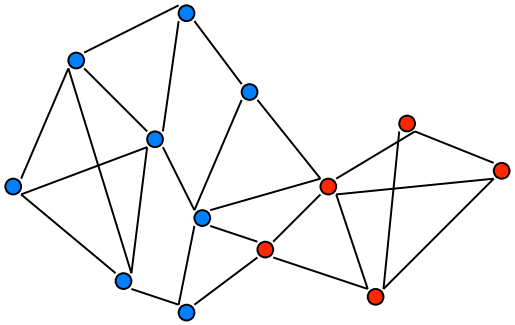
[Newman, 2004]



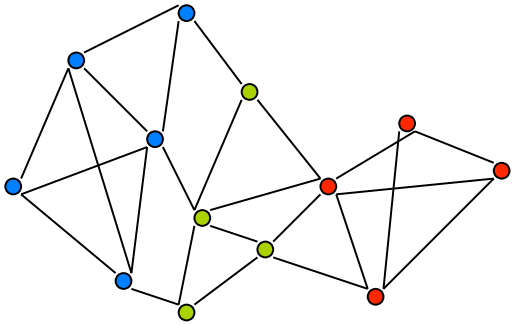
?



0.275



0.32

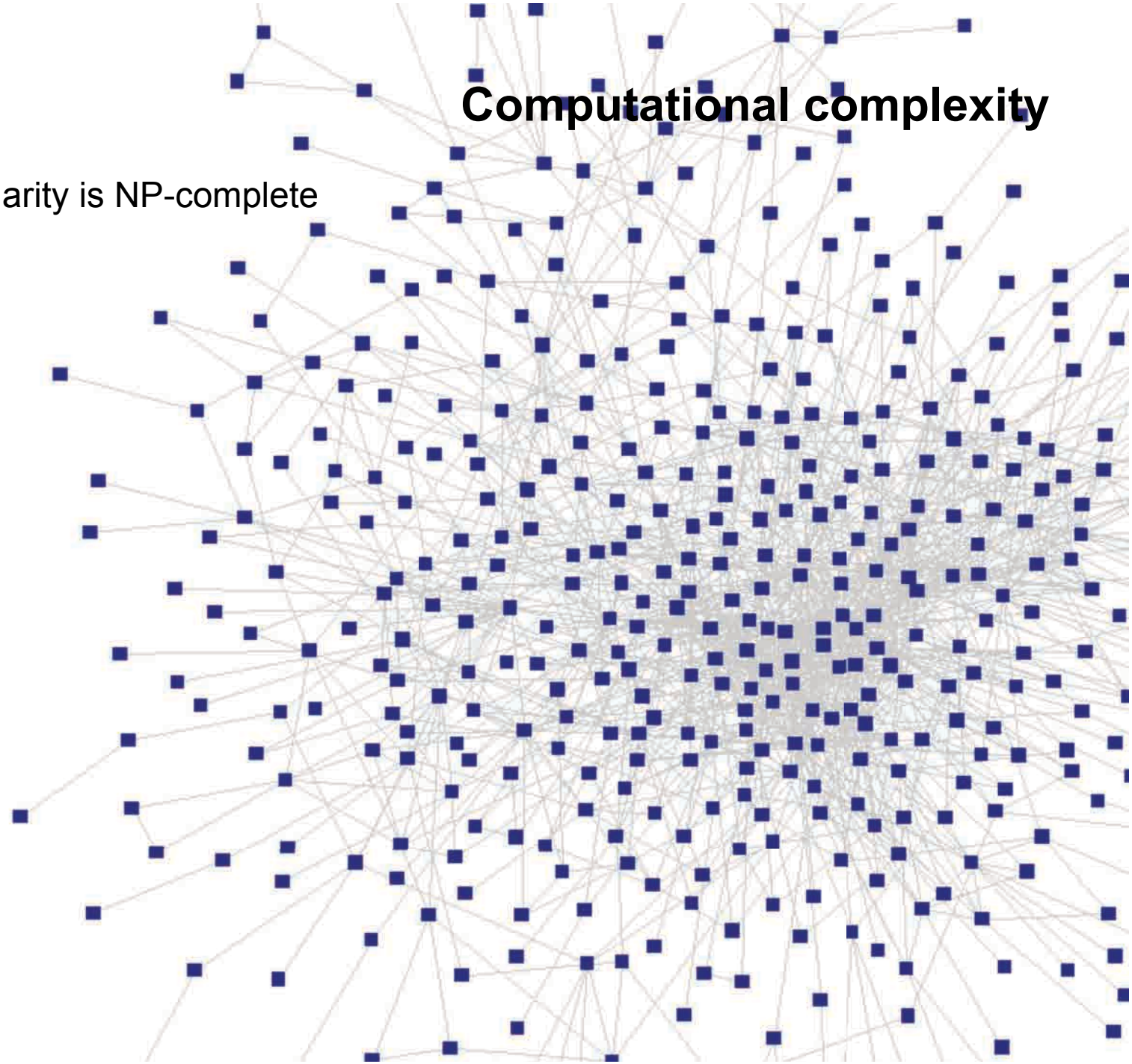


0.383

Computational complexity

Optimizing modularity is NP-complete

[Brandes, 2008]
[Caines, 2012]



The (greedy) Louvain method

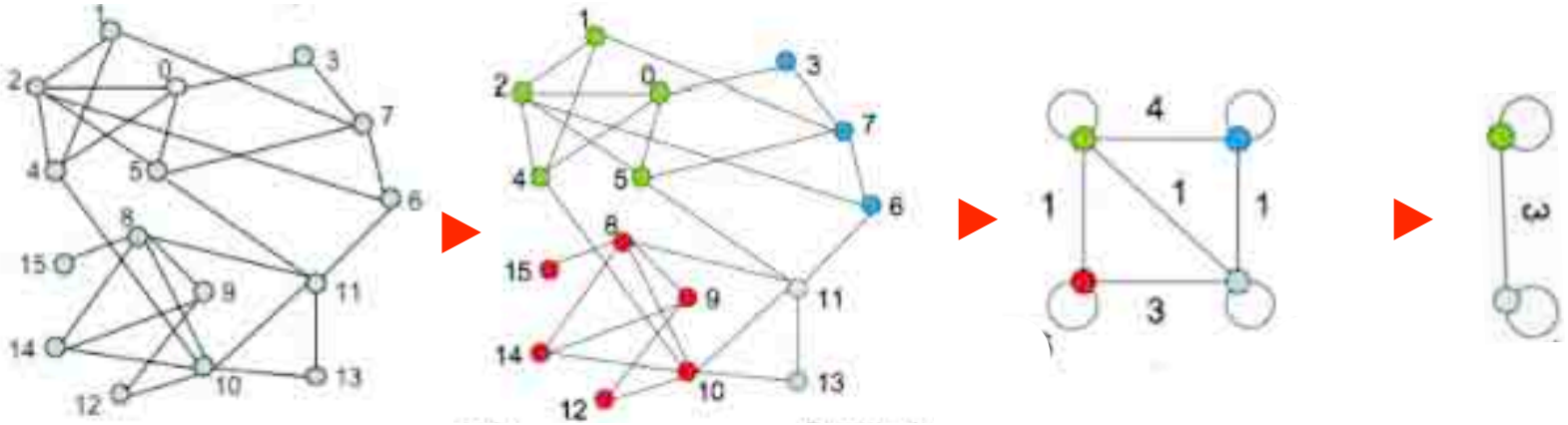
Initially every node forms a community.

For every node *i*, insert node *i* in a neighboring community that maximizes the resulting modularity gain.

Repeat until a local maximum is attained.

Construct the resulting network of communities and repeat the construction on the network of communities.

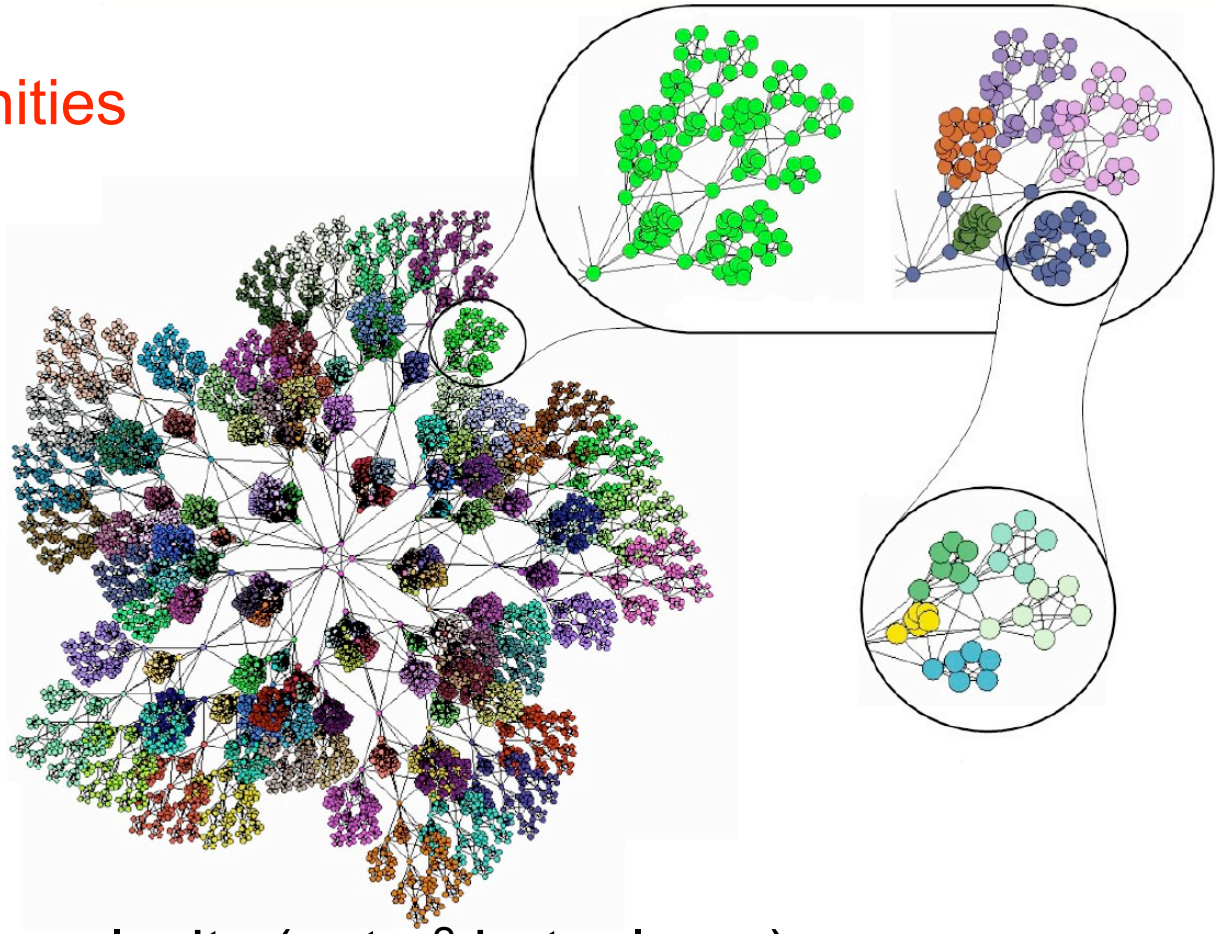
This way we construct a hierarchy of communities.



The (greedy) Louvain method

Hierarchy of communities

Simple to implement



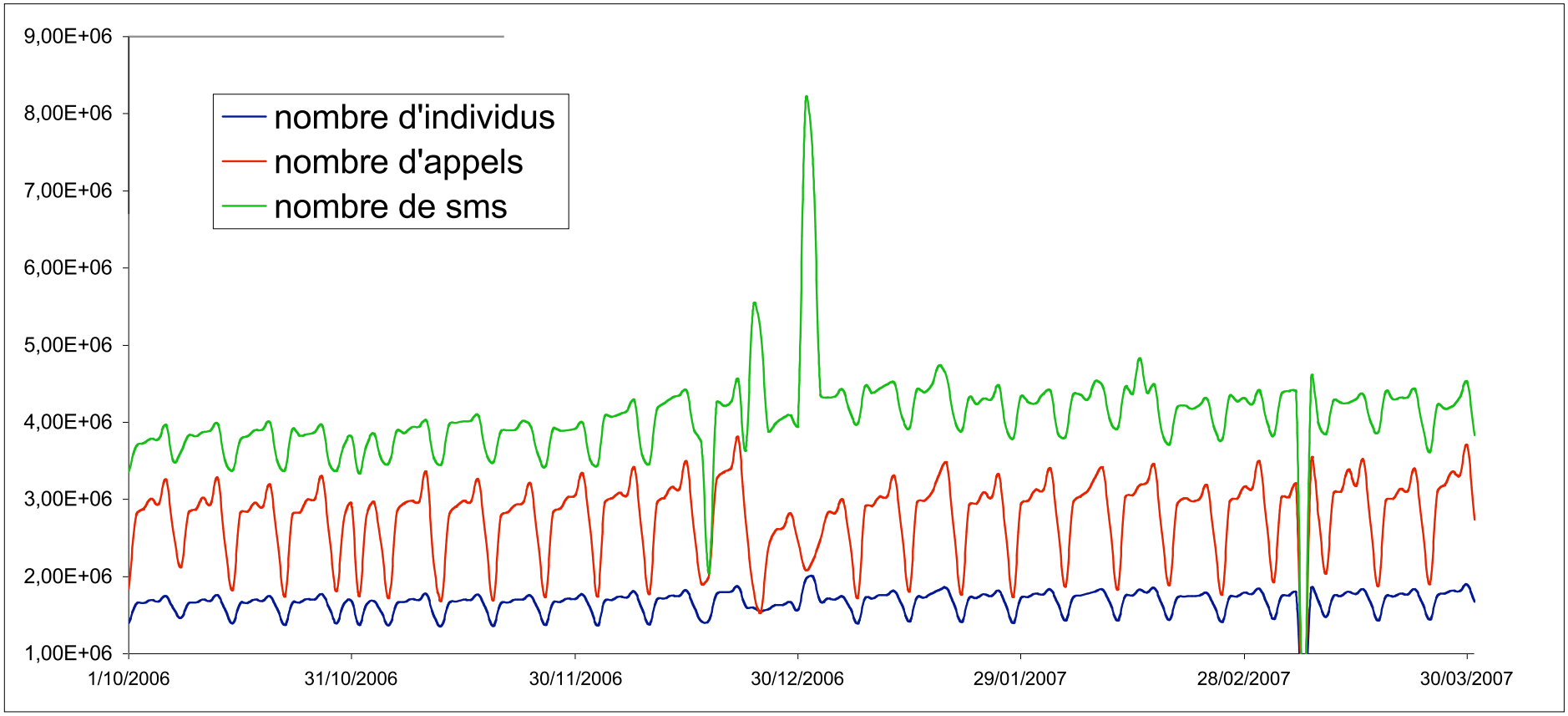
Low computational complexity (not n^2 but n log n).
118M nodes/1B links in 152mn

- Belgian phone call network
  - 6 months of communications
  - One Belgian main operator

- Network :
  - 2.6 M customers
  - 800M voice/text messages
  - language information (Dutch, English, French, German)
  - location information (ZIP)

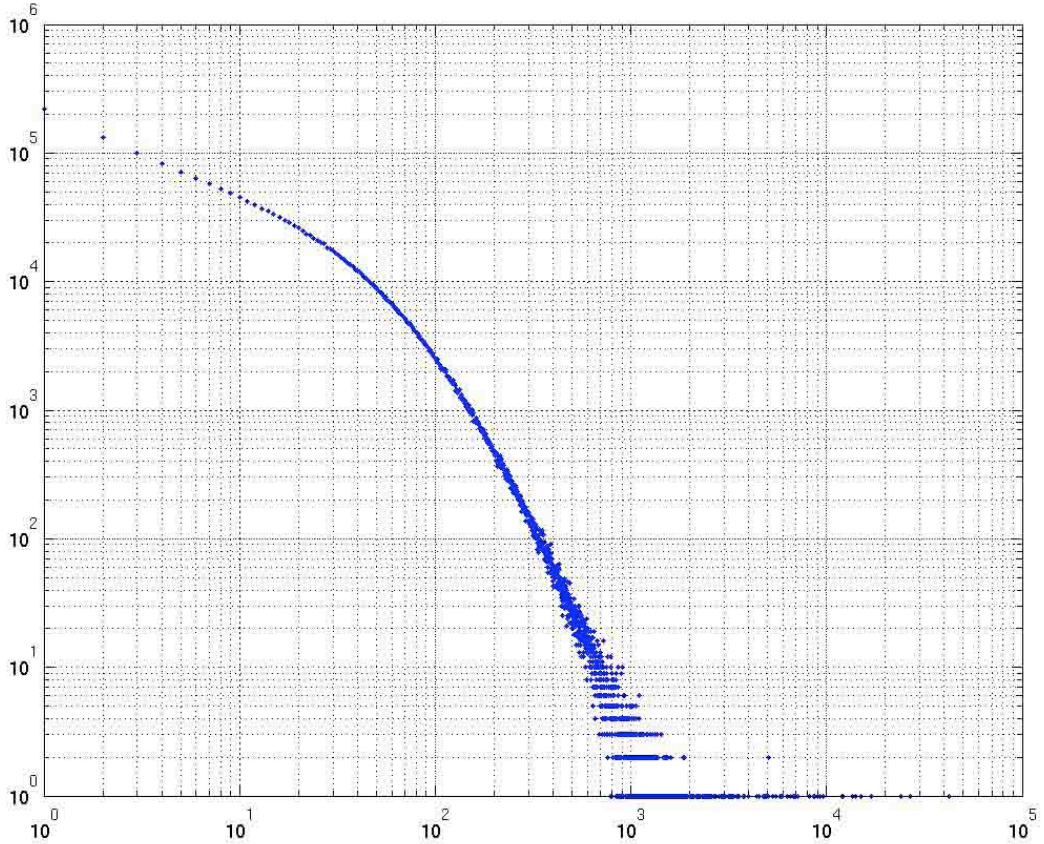
[Lambiotte, VB et al., 2008]

Mobile phone network

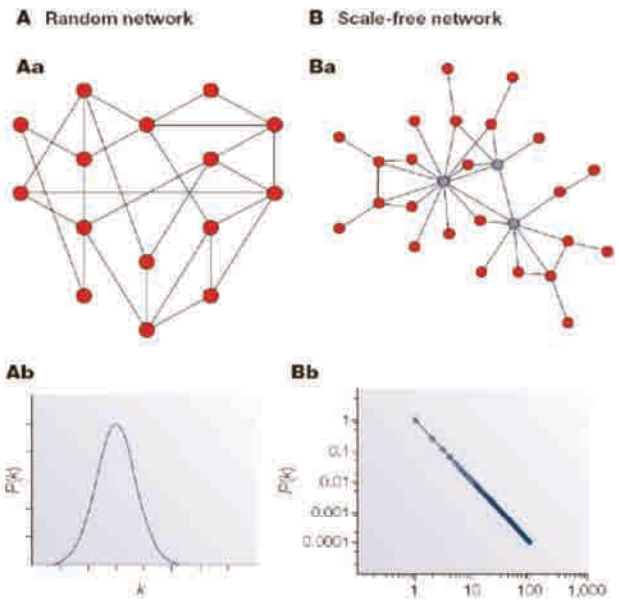


Distribution of calls received

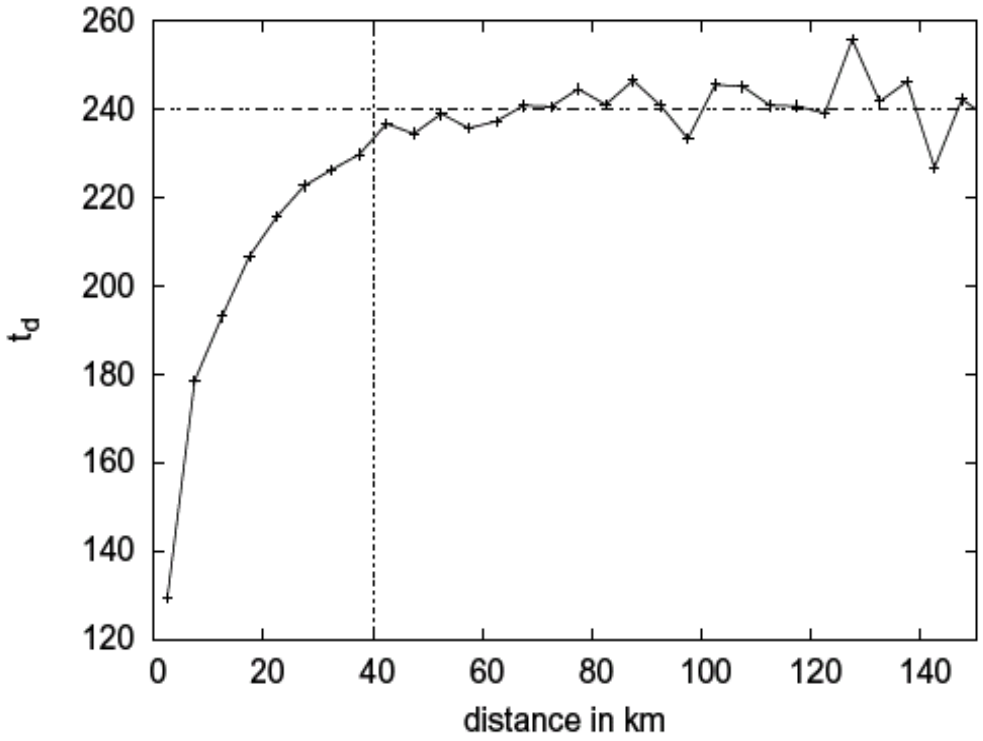
Number of customers



Number of calls received



Duration with distance



Connection with distance

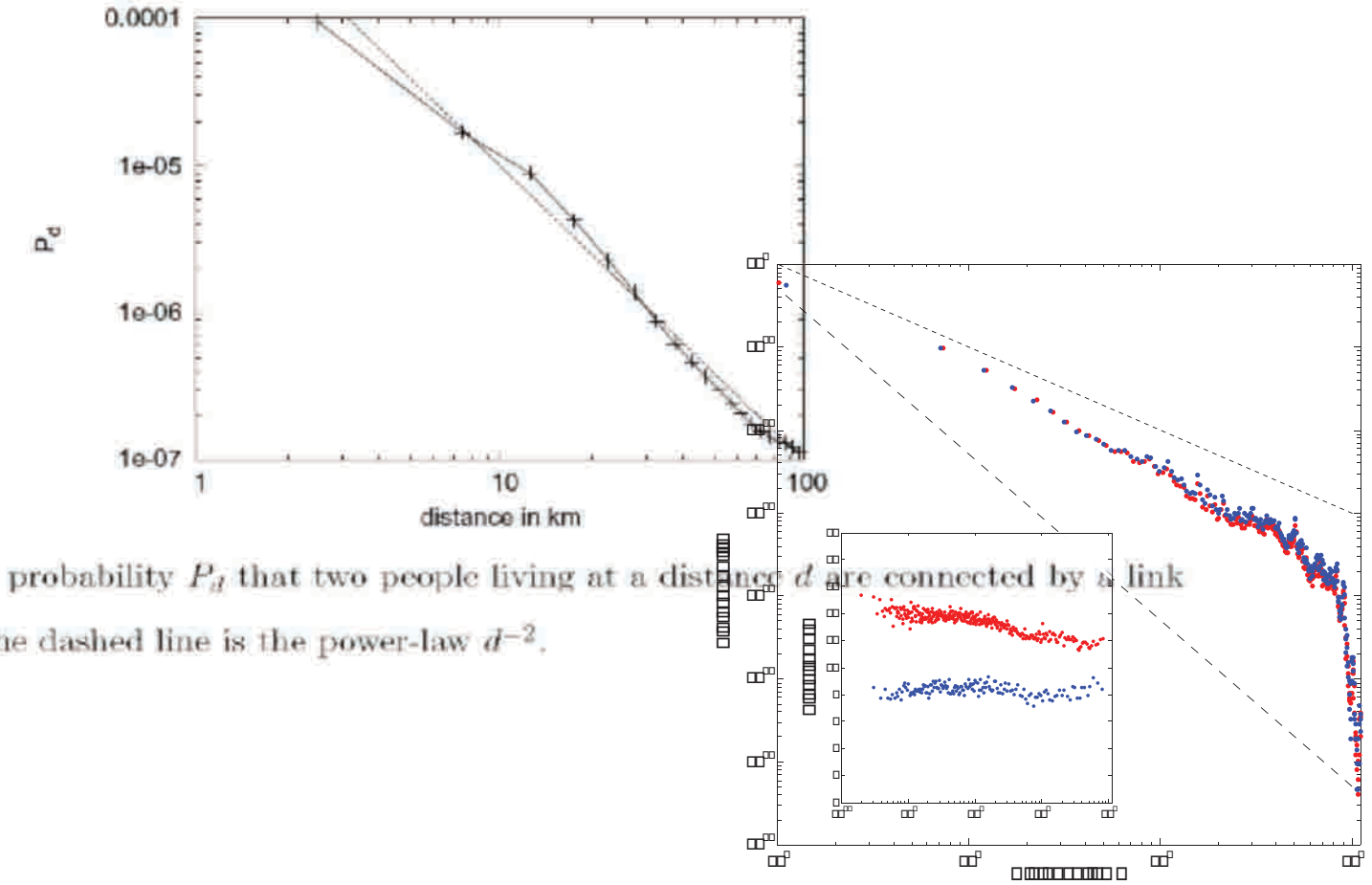
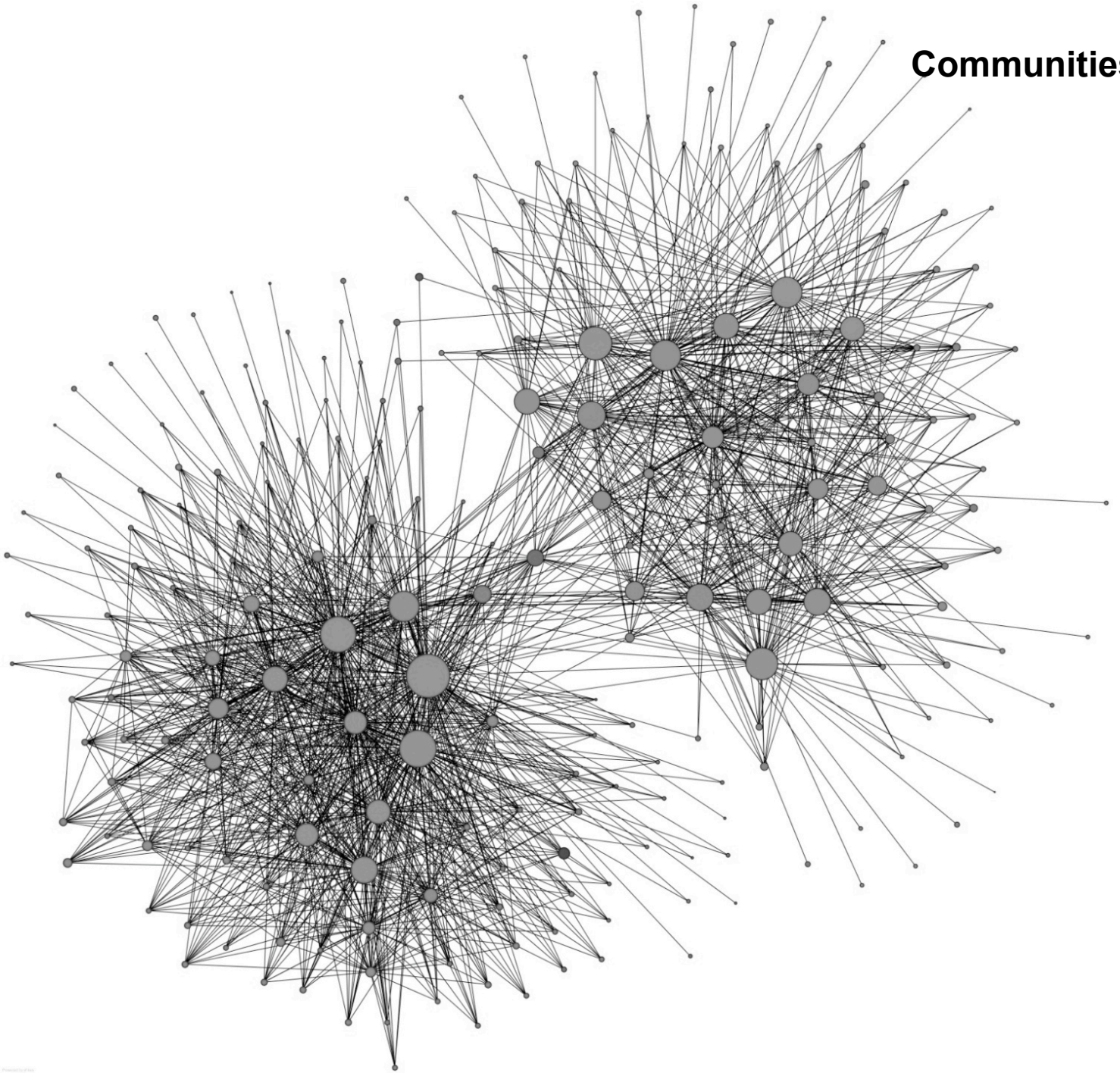


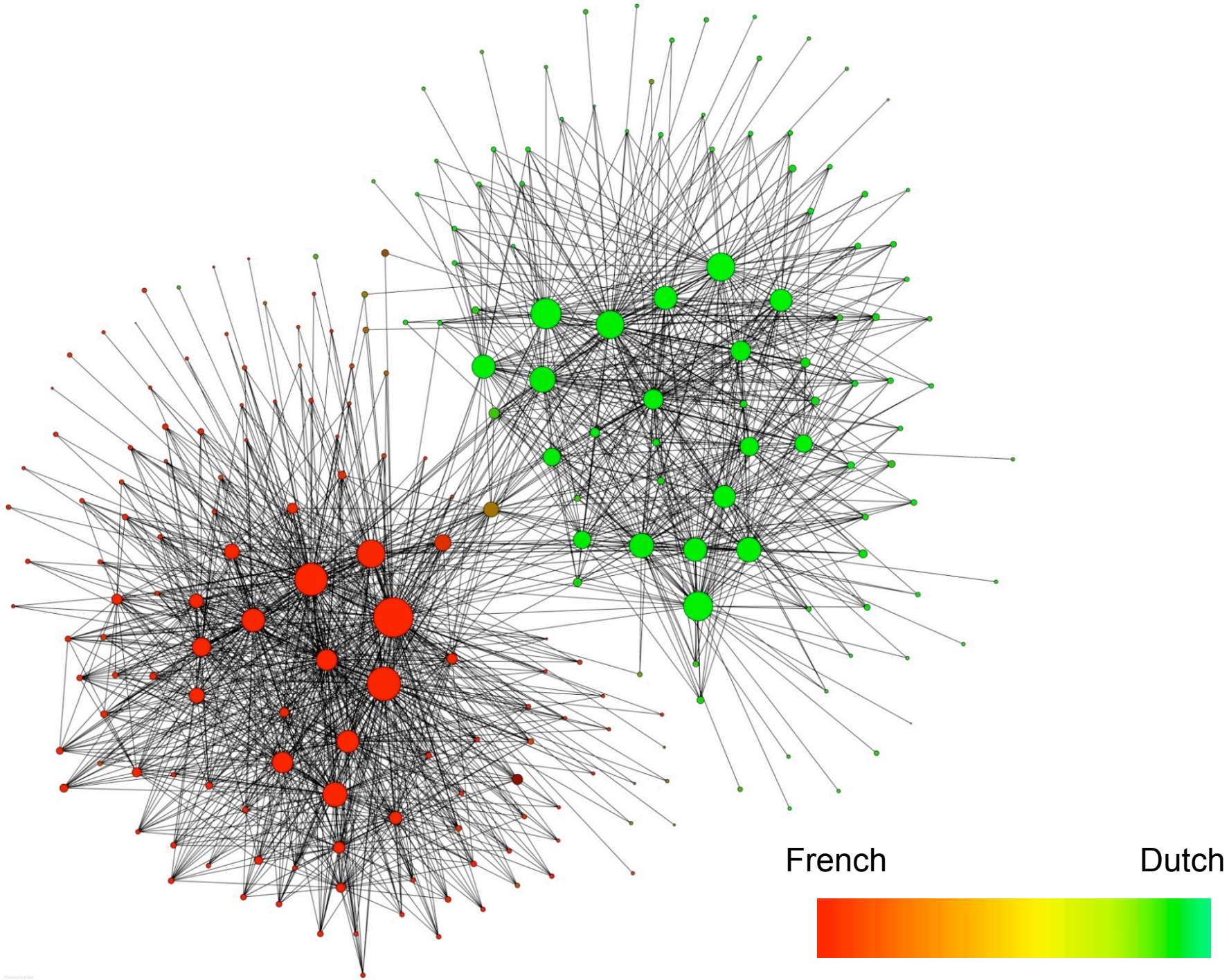
FIG. 2: We plot the probability P_d that two people living at a distance d are connected by a link in a log-log scale. The dashed line is the power-law d^{-2}.

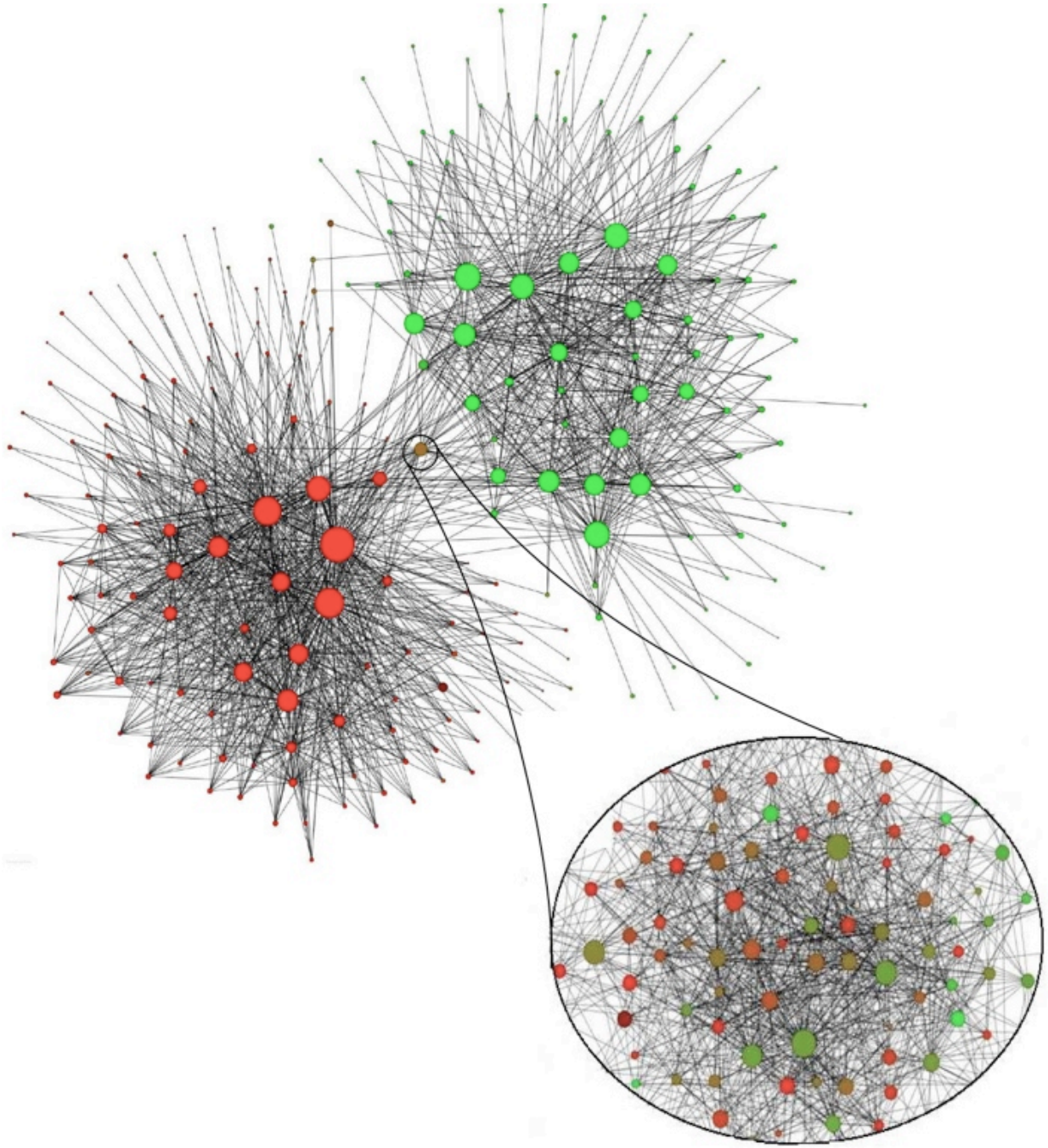
[Onnela, Arbesman, Barabasi, Christakis, 2010]

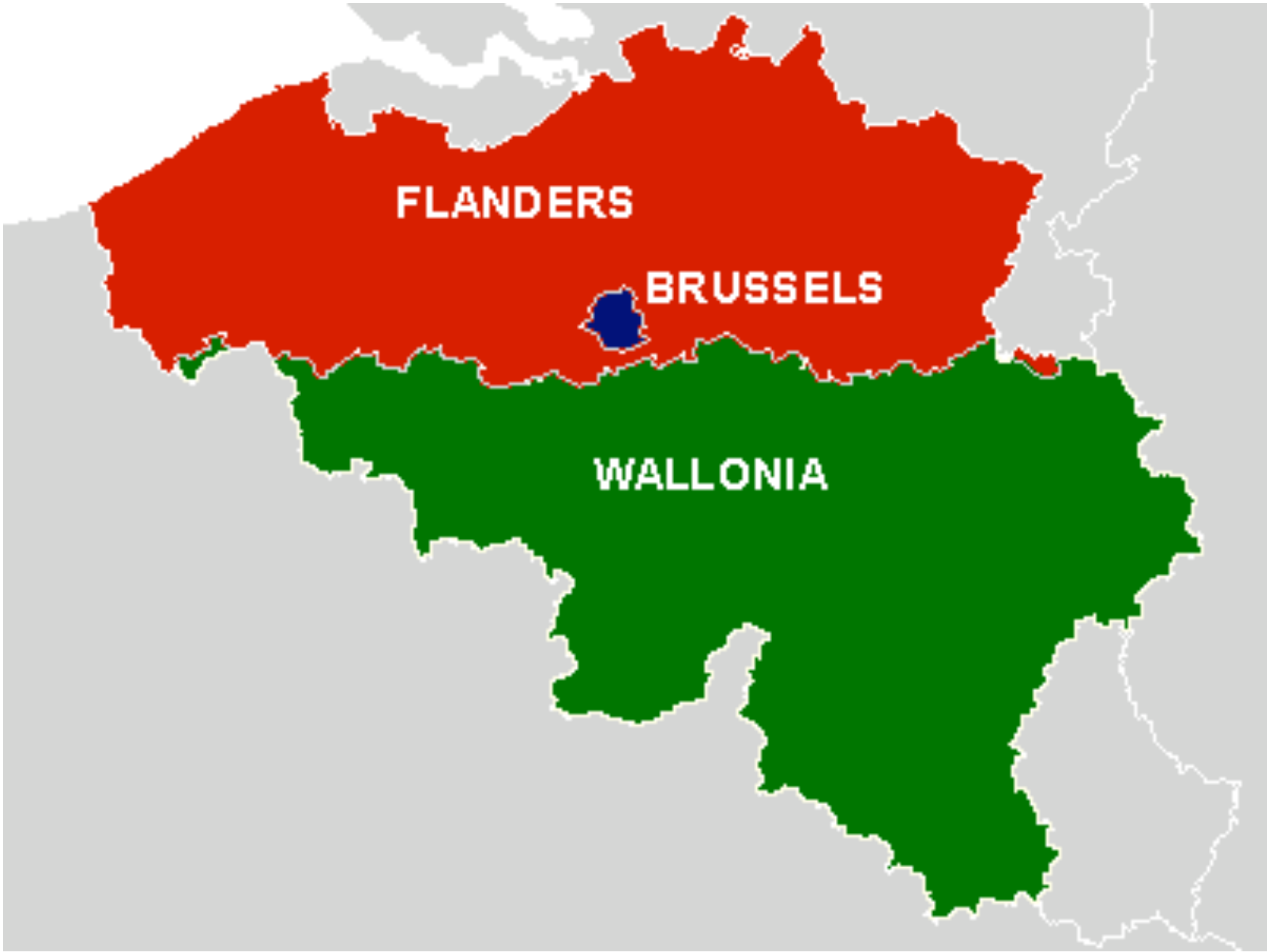
[Lambiotte, VB et al., 2008]

Communities in Belgium




French
Dutch




FLANDERS
BRUSSELS
WALLONIA

Bye bye Belgium?

With deep divisions between its French and
it's a wonder Belgium has stayed united for
heading for meltdown. Jon Henley reports

Jon Henley
Tuesday

Guardian

Belgium is
handsome
trains are
does the c

TIME
IN PARTNERSHIP WITH CNN

Wednesday, Jun. 30, 2010

No Love Lost: Is Belgium About to Break in Two?

By Leo Cendrowicz / Brussels

t, fourth-round victory over her compatriot
country could be to produce two stunningly
nd even that sports rivalry between the
division between the country's Dutch and
in's from the French.

ain excellent, of course, as
f petrol, which is new.

REUTERS

» Print

Flemish separatists triumph in Belgian election

Sun, Jun 13 2010

By Philip Blenkinsop

BRUSSELS (Reuters) - A Flemish party that wants to split Belgium triumphed in a parliamentary election on Sunday, a result that could make it hard to form a coalition quickly and deliver austerity to contain a rising national debt.

Belgium can ill afford drawn-out coalition talks because policy paralysis could make the country more vulnerable on financial markets that are closely watching a sovereign debt crisis among the 16 countries that use the euro.

The N-VA (New Flemish Alliance) was the strongest party in the Dutch-speaking Flanders region of northern Belgium. It won more votes there than the French-speaking Socialists (PS) secured in separate voting in the southern, Francophone region of Wallonia, nearly complete results showed.

"The N-VA has won the election today," N-VA leader Bart De Wever, 39, told cheering, flag-waving supporters

Le Monde.fr

"Oui, il faut se préparer à la fin de la Belgique"

05.09.10 | 16h29

Près de trois mois après les élections, la Belgique se retrouve de nouveau dans la crise après la démission, entérinée ce week-end, d'Elio di Rupo, chef de file du Parti socialiste francophone qui a renoncé à son tour à tenter de former un gouvernement. Le roi Albert II a accepté samedi soir la démission du socialiste wallon, qui n'a pu combler le fossé entre néerlandophones et franchophones paralysant la vie politique belge depuis plus de trois ans.

Conséquence de ce blocage, le tabou de la scission de la Belgique commence à tomber dans le monde politique francophone, dont plusieurs représentants de premier plan ont ouvertement évoqué cette éventualité, dimanche 5 septembre, en raison des difficultés à s'entendre sur l'avenir du pays avec les Flamands.

Poelvoorde : « Gardons nos barbes jusqu'à ce que la Belgique se relève »

Rédaction en ligne
jeudi 13 janvier 2011, 00:09

Benoît Poelvoorde suggère à la gent masculine de ne plus se raser « jusqu'à ce que la Belgique se relève » et soit dotée d'un gouvernement, alors que le royaume traverse la plus longue crise politique de son histoire.

les portfolios
- L'équipe de "Rien à Déclarer" en visite au Soir

lire aussi
- Chat : trois jeunes appellent à manifester
- Camping16 rue de la Loi, une manif virtuelle
- Pas de gouvernement ? Appel à manifester le 23 janvier
- La carte blanche : « Si ça continue, je ne vote plus : je tire ! »
- Geluck réagit à la proposition de Poelvoorde
- La Belgique championne du monde ?

sur le web
- La vidéo sur RTL
- Le site de "Shame"

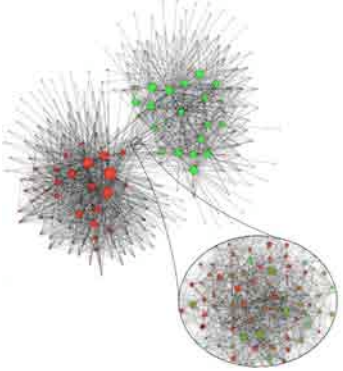
Dernie

Geography and community in complex networks

Large Graphs and Networks
UCL Université catholique de Louvain

Louvain method for community detection (and modularity)

[VB, Guillaume, Lambiotte, Lefèvre, 2008]



Communities in a mobile phone network

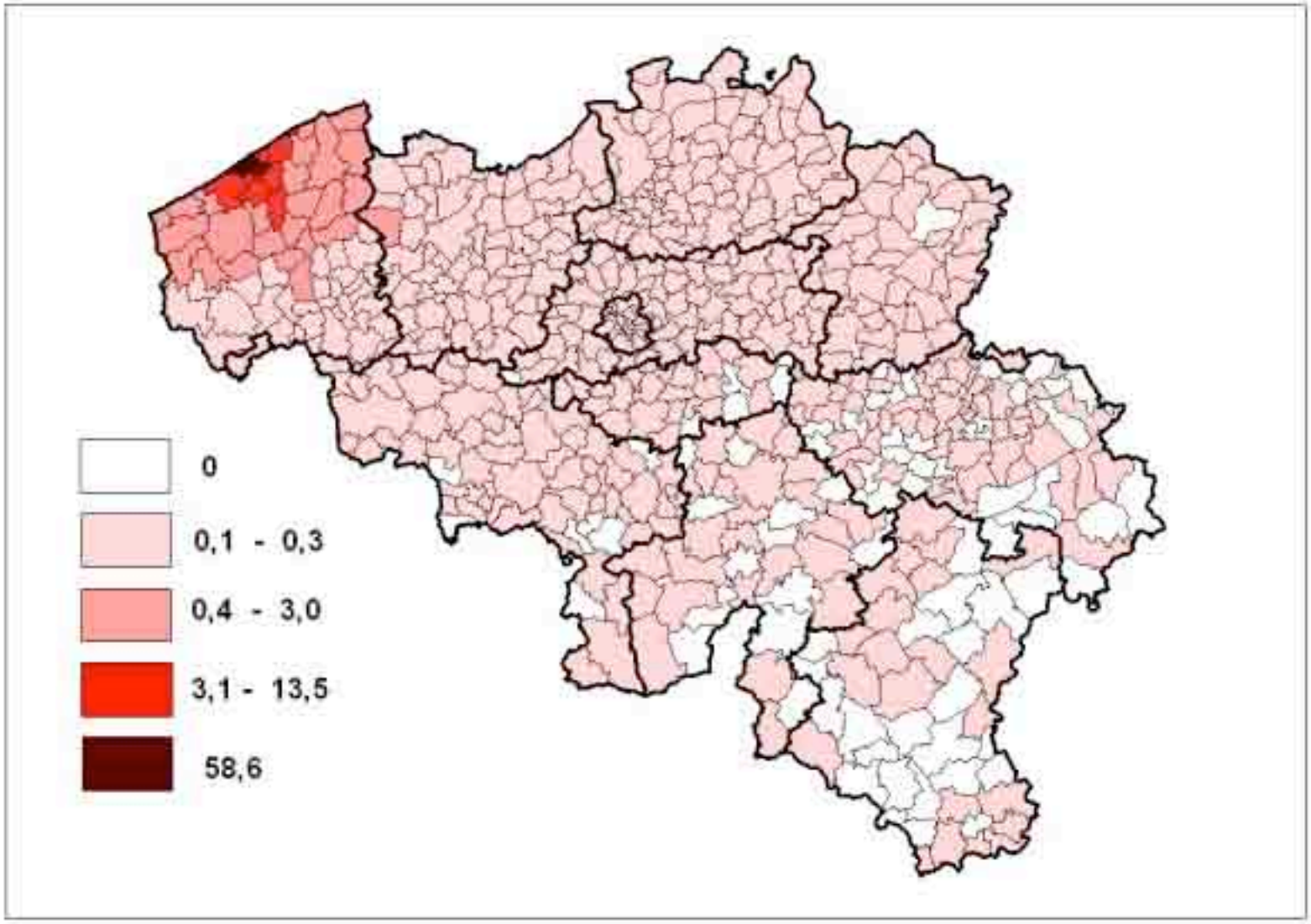
[Lambiotte, VB et al., 2009]

Geography in community detection

[Krings, Calabrese, Ratti, VB, 2009]

[VB, Krings, Thomas, 2010]

[Expert, Evans, VB, Lambiotte, PNAS, 2011]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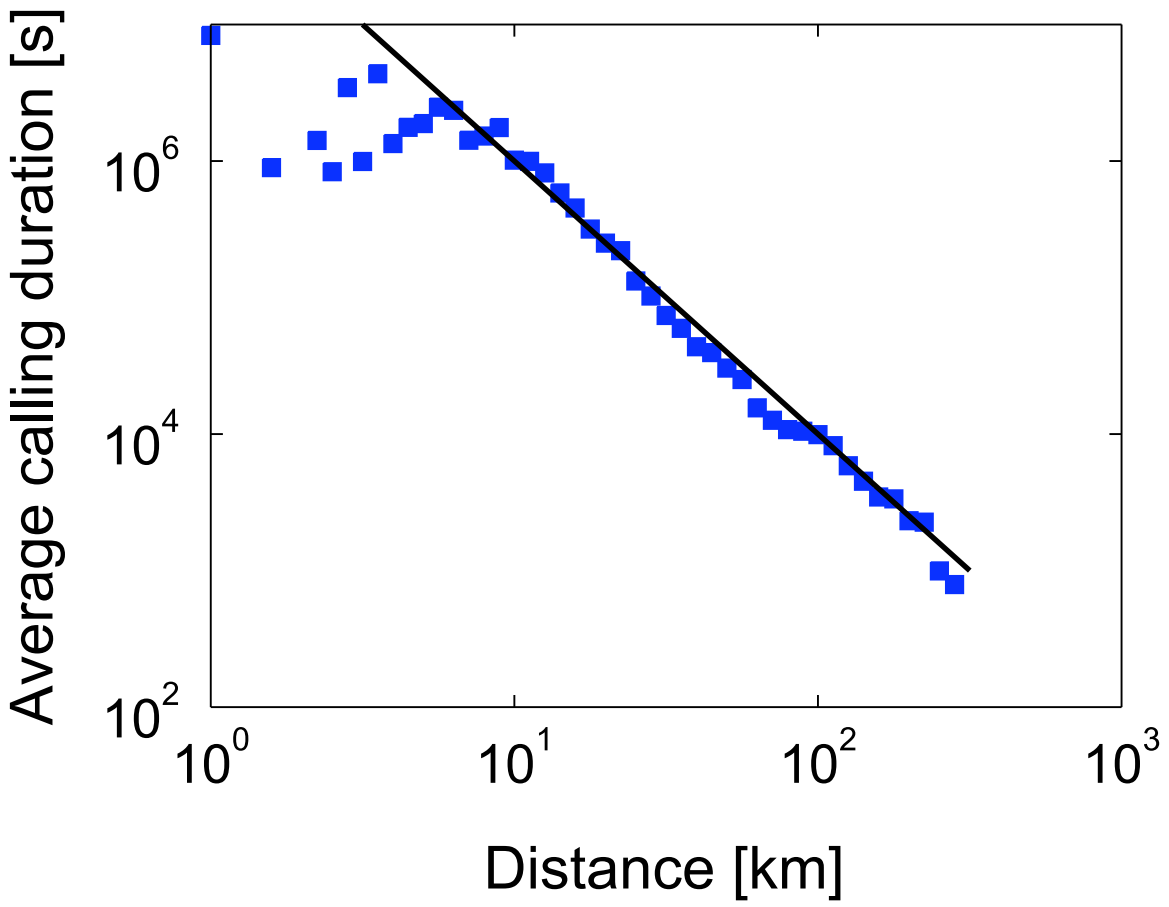
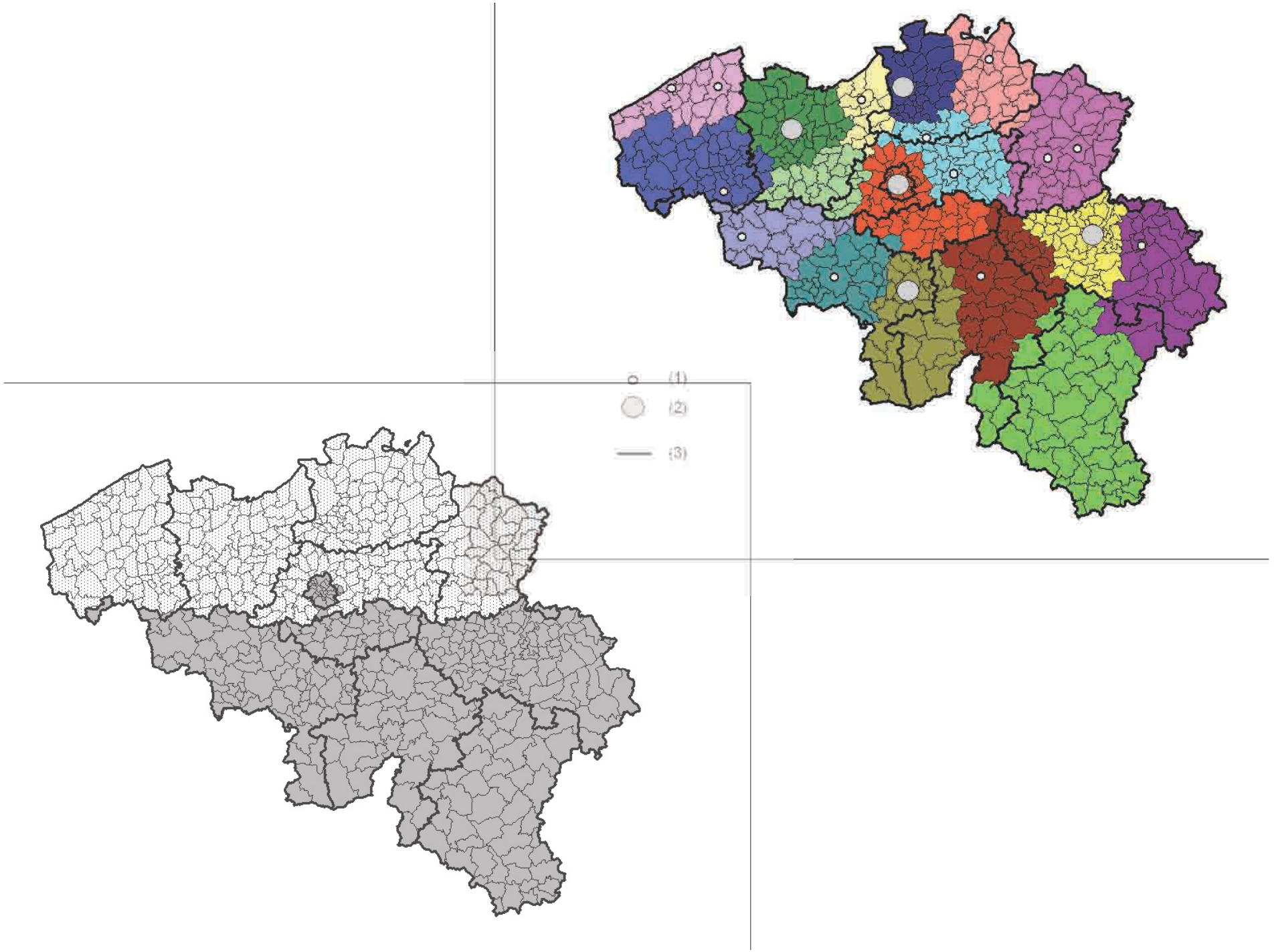
0,1 - 0,3
0,4 - 3,0
3,1 - 13,5
58,6



Gravitational law of interactions

[Krings, Calabrese, Ratti, VB, 2008]


(1)
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lesoir.be

LE SOIR

BELGIQUE

Libre

Deux millions et demi de vaccins contre la grippe saisonnière sont disponibles en Belgique actuellement, a indiqué jeudi Mark Van Ranst, du Commissariat interministériel Influenza. C'est un nombre similaire aux autres années. © AFP.

lasocié

Géographie / Une étude redessine la B

Les flux GSM éla

L'ESSENTIEL

- Trois chercheurs de l'UCL ont analysé pas moins de 200 millions de communications.
- Bruxelles et cinq communes à facilités sont francophones.

Et si la Belgique administrative et politique correspondait... aux flux de la téléphonie mobile. La Région bruxelloise serait élargie à 47 communes des Brabant flamand et wallon. Ou, à tout le moins, elle rejoindrait l'espace francophone en compagnie de cinq des six communes à facilités de la périphérie (sans Wemmel).

C'est une étude scientifique on ne peut plus rigoureuse qui illustre ce constat. Trois professeurs et doctorants de l'UCL ont analysé pas moins de 200 millions de communications mobiles passées entre le 1er octobre 2006 et le 31 mars 2007. Vincent Blondel, Gautier Krings (mathématiques appliquées) et Isabelle Thomas (géographie) ont utilisé un modèle mathématique inédit qui redessine la Belgique en ensembles cohérents.

, explique Isabelle Thomas.

La « vraie » Région bruxelloise

L'hinterland social bruxellois des communications de GSM s'étendrait à 47 communes de Meise et Asse à Perwez et Genappe en passant par Rebecq et Zaventem.

analyse la géographe.

Si l'on tient compte du critère de la durée,

ACTUALITÉ · RÉGIONS · BRUXELLES

Les flux GSM élargissent Bruxelles

Rédaction en ligne
vendredi 01 octobre 2010, 07:16

Si la Belgique administrative et politique correspondait aux flux de téléphonie mobile, la Région bruxelloise serait élargie à 47 communes des Brabant flamand et wallon, selon une étude menée par trois professeurs et doctorants de l'UCL. Les détails dans Le Soir

lire aussi

- Les détails dans Le Soir
- L'étude dans Brussels Studies

in extenso

- L'étude dans Brussels Studies

communications mobil
Proposer u
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THE WALL STREET JOURNAL.
WSJ.com

WHAT THEY KNOW | APRIL 23, 2011

The Really Smart Phone

Researchers are harvesting a wealth of intimate detail from our cellphone data, uncovering the hidden patterns of our social lives, travels, risk of disease—even our political views.

By ROBERT LEE HOTZ

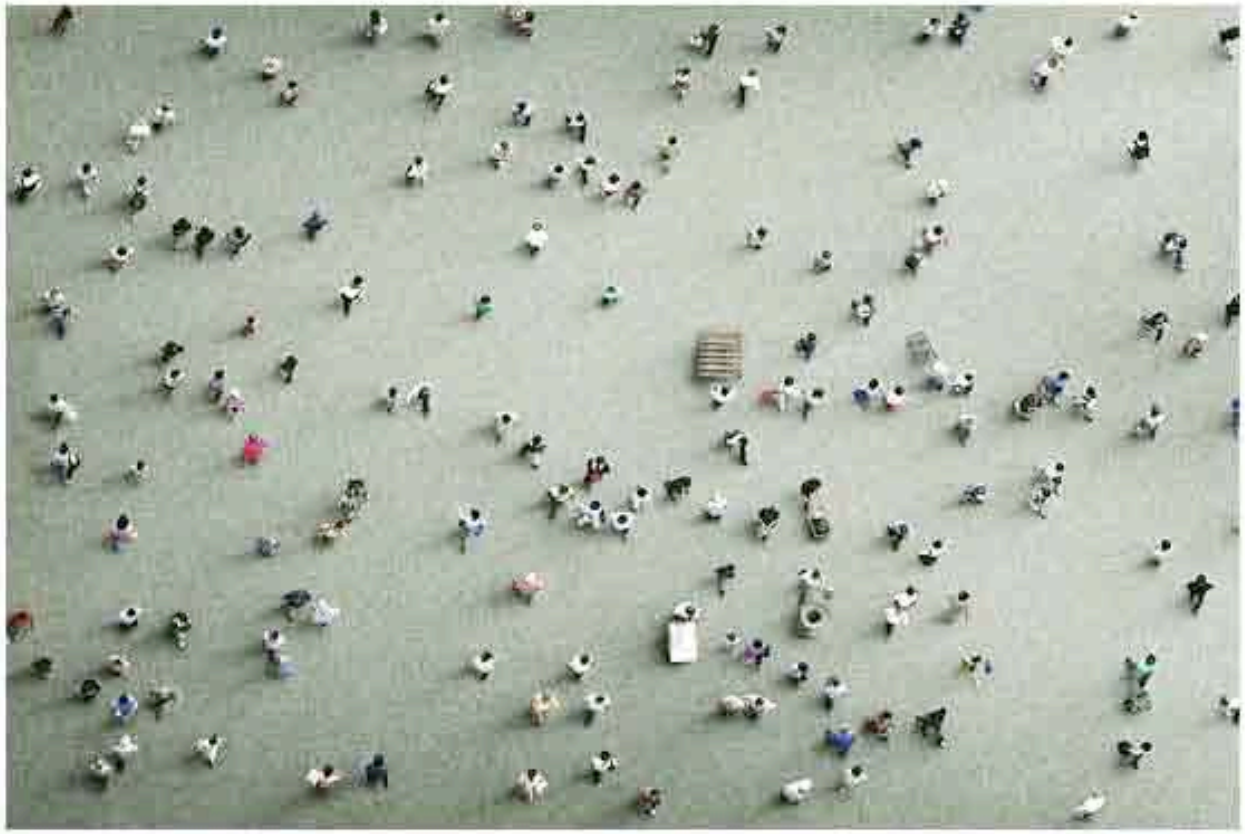

Photo-illustration by Adam Magyar

'Phones can know,' says an MIT researcher. 'People can get this god's-eye view of human behavior.'

Apple and Google may be intensifying p
concerns by tracking where and when p
use their mobile phones—but the true f
of consumer surveillance is taking shap
the cellphones at a weather-stained apa
complex in Cambridge, Mass.

For almost two years, Alex Pentland at
Massachusetts Institute of Technology
tracked 60 families living in campus qu
via sensors and software on their smart
—recording their movements, relations
moods, health, calling habits and spend
this wealth of intimate detail, he is findi
patterns of human behavior that could
how millions of people interact at home
and play.

Through these and other cellphone res
projects, scientists are able to pinpoint
"influencers," the people most likely to
others change their minds. The data car