Computational social science refers to the academic sub-disciplines concerned with computational approaches to the social sciences.
Computational Social Science

"The science that investigates social phenomena through the medium of computing and algorithmic data processing."

[adapted from CSSSA]

CSSSA: http://computationalsocialscience.org/

- Harvard iQS,
- Stanford IRiSS,
- CMU CASOS,
- ESRC COSMOS
- Web Observatories
- ...
Computational Social Science: Example

Stanley Milgram (1967)
- Social Scientist
- **Theory**: A small world
- 6 degrees of separation

Jure Leskovec (2008)
- Computer Scientist
- *(Found)* Data: 240 mio users
- 7 degrees of separation
What disciplines are interested in microposts?

Table 1. Count of Twitter Studies by Discipline (2007-2012)

<table>
<thead>
<tr>
<th>Discipline</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>3</td>
<td>9</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Communications</td>
<td>1</td>
<td>5</td>
<td>10</td>
<td>21</td>
<td>15</td>
<td></td>
<td>52</td>
</tr>
<tr>
<td>Computer Science</td>
<td>1</td>
<td>8</td>
<td>45</td>
<td>41</td>
<td>50</td>
<td></td>
<td>145</td>
</tr>
<tr>
<td>Economics</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Education</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>English</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Environmental Sciences</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Geographic Information Systems</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Information Science</td>
<td>1</td>
<td>6</td>
<td>17</td>
<td>33</td>
<td>25</td>
<td></td>
<td>82</td>
</tr>
<tr>
<td>Law</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Mathematics</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Medicine</td>
<td>2</td>
<td>7</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Physics</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Political Science</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Psychology</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Sociology</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Sport Sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2</strong></td>
<td><strong>2</strong></td>
<td><strong>28</strong></td>
<td><strong>96</strong></td>
<td><strong>145</strong></td>
<td><strong>109</strong></td>
<td><strong>382</strong></td>
</tr>
</tbody>
</table>

Assessing online conversational practices of political parties

Assessing online conversational practices of political parties on Twitter

During the German National Election 2013

OUR CHALLENGES:

- Quantitative understanding of Social Dynamics
- Prediction (and Control) of Social Phenomena

Social Contagion  Innovation Diffusion
Opinion Dynamics   Human Mobility

RESEARCH STREAMS:

- Theoretical and Data-Driven Models of Social Phenomena (Multi agent or Equation based)

- Detecting Observables from data
More realistic computational models (BIG PICTURE)

Epidemics: Simple Contagion

Ideas and behaviors: Complex Contagion

The idea of the social atom does not work

Intentionality
Trust
Information
Language polarization in New York City, NY, USA.
The second language by district or municipality (in the case of New Jersey state) is shown. Blue - Spanish, Light Green - Korean, Fuchsia - Russian, Red - Portuguese, Yellow - Japanese, Pink - Dutch, Grey - Danish, Coral - Indonesian.

Users-Users network of @Occupy Movements around the World

Geographical and Social Communities within the Occupy Movement on Facebook
Qian Zhang, Delia Mocanu, Ana Pastore, Luca Rossi Walter Quattrociocchi and Alessandro Vespignani
in preparation

HOW TO DO MORE THAN THIS?
Challenges
Huberty (2014)

- N ≠ all
  we have both $N < all$ and $N > all$
- All (today) ≠ All (tomorrow)
  user populations change
- Online behavior ≠ Offline behavior
  multi-faceted identities
- Behavior of all (today) ≠ Behavior of all (tomorrow)
  behavior changes and evolves
Agenda Setting is the process of the mass media presenting certain issues frequently and prominently with the result that large segments of the public perceive those issues as more important than others.

“The press may not be successful much of the time in telling people what to think, but it is stunningly successful in telling its readers what to think about.”

(Bernard Cohen, 1963)

The more coverage an issue receives, the more important it is to people.
What is Agenda Setting?

- Reality
  - Politics
  - Economy
  - Science
  - Society

- Media Reality
  - Selection by journalists
  - Political PR
  - Public affairs

- Public perception of reality
  - Direct impressions, discussions

- Public agenda

- Inter-media agenda setting

Agenda building

Agenda cutting
INTERACTION BETWEEN INFORMATION SOURCES

OLD MEDIA
- Follow the “Ritual of Objectivity”
- Publication patterns are driven by most followed sources (imitation) (Marlow 2005)

NEW MEDIA
- Information production is the work of interconnected actors spanning over organizations, professional identity and geographical location
- Imitation between mainstream agency on the internet (leader follower) in a shorter time span
COLLECTIVE INTELLIGENCE

• IS THE “MODERN SYNTHESIS BETWEEN PSYCHOLOGY AND THE NEW TECHNOLOGY”

• IT EMERGES IN THE FORM OF COLLECTIVE DEBATES ON BLOGS AND ON SOCIAL NETWORKS (TWITTER, FACEBOOK)

• COULD IMPROVE E-PARTICIPATION TO PUBLIC RELEVANT ISSUES
Mark Zuckerberg:
“We're not thinking about ourselves as a community — we're not trying to build a community — we're not trying to make new connections. [...] What we're trying to do is just make it really efficient for people to communicate, get information and share information. We always try to emphasize the utility component.”
Jul. 2007
COLLECTIVE INTELLIGENCE OR JUST ENTHUSIASTIC RHETORIC?

People are increasing their participation on public debates and internet is used as a medium for organization and discussion of political activities.

What about the quality of information online?
Conspiracy theories running rampant: How misinformation spreads on Facebook

Researchers studied how people interacted with "trolls" posting false information -- the results are terrifying

SARAH GRAY

Topics: CONSPIRACY THEORIES, FACEBOOK, POLITICS, TECHNOLOGY, MISINFORMATION, INNOVATION, NEWS, TECHNOLOGY NEWS, POLITICS NEWS

From the steady roll of theories on what happened to Malaysian Airlines Flight 370, to Sarah Palin’s "death panels" panic, to Donald Trump’s birther theories, misinformation spreads like wildfire in the age of Facebook.

In 2013, professor Walter Quattrociocchi of Northeastern University along with his team studied how more than 1 million Facebook users engaged with political information during the Italian election. During that election a post appeared titled: "Italian Senate voted and accepted (257 in favor and 165 abstentions) a law proposed by Senator Cirenga to provide policy makers with €134 billion Euros to find jobs in the event of electoral defeat."
WHAT ABOUT THE EFFECT OF ONLINE RUMORS?

The case of Italian political activism organizing on the web
Sandro Pertini never said “when the government does not do what people want must be fired with stones and sledgehammers.” He has been President of the Republic (1978-1985).

“Italian Senate voted and accepted (257 in favor and 165 abstentions) a law proposed by Senator Cirenga aimed at funding with **134 billion** Euros the policy-makers to find a job in case of defeat in the political competition.”

Facebook pages used as a parodistic imitation of both alternative information sources and online political activism. Their activities range from **controversial comments** and posting **satirical content** mimicking alternative news sources, to the fabrication of **purely fictitious statements**, heavily unrealistic and sarcastic.
I Forconi: "Il Senato ha approvato una legge per i parlamentari in crisi". Chi non verrà rieletto, oltre alla buonuscita, si beccherà altri soldi. Sarà vero?

Nei ci crediamo. Infatti su facebook c’è anche il risultato della votazione...

La notizia la leggiamo sulla rete, per la precisione su facebook. L’ha postata il Movimento dei Forconi. Stando a quanto si legge in questo post, ieri il Senato della Repubblica avrebbe approvato una legge (257 voti favoravoli, 165 astenuti) che istituisce il "Fondo per i parlamentari in crisi".

A noi sembra uno scherzo. Soprattutto dopo che le più alte magistrature hanno fatto sapere che offendere la Repubblica e le istituzioni in generale – compresa quella parlamentare – è un reato, non possiamo credere che un ramo del Parlamento italiano abbia approvato una legge del genere.

Nel post dei Forconi si legge che il provvedimento attesta 134 miliardi di euro (e qui secondo noi c’è un errore: si tratterà, quasi certamente, di 134 milioni di euro, perché 134 miliardi di euro sarebbe assurdò) per sostenere i parlamentari che, finta la legislatura, dovessero avere difficoltà a trovare lavoro.

Visualizza la variazione nel tempo

Ricerche correlate

Volume di ricerca insufficiente per visualizzare i risultati.

<table>
<thead>
<tr>
<th>Argomenti</th>
<th>Più cercati in crescita</th>
</tr>
</thead>
<tbody>
<tr>
<td>senatorcirenga</td>
<td>100</td>
</tr>
<tr>
<td>cirenga</td>
<td>60</td>
</tr>
<tr>
<td>parlamentari in crisi</td>
<td>35</td>
</tr>
<tr>
<td>legge cirenga</td>
<td>25</td>
</tr>
<tr>
<td>legge senatore cirenga</td>
<td>100</td>
</tr>
</tbody>
</table>
CONDIVIDETE questa incredibile vicenda accaduta negli Stati Uniti d'America. I media non ne parlano, anzi dileggiano chi si azzarda a trattare l'argomento. QUESTE COSE NON LE SENTIRETE ALLA TV, CONDIVIDI PER INFORMARE. Quasimodo

Questa bella bambina si chiama Maggie Ducanan ed è nata a Boston in Connecticut. Sembrava una bambina sana e solare fino a quando non le sono state fatte le normali vaccinazioni post natali. Da quel momento la mamma della piccola Maggie ha notato che quando passava con sua figlia dalle porte antifurto dei centri commerciali la piccola Maggie faceva scattare l'alarme. La madre insospettita ha fatto una radiografia alla piccola Maggie e le è stato scoperto ed in seguito rimosso un microchip sub-cutaneo. E pensare che in Italia ancora crediamo che non esistano!!! CONDIVIDI questa storia!!!
Beyond pure observation of data by triggering viral phenomena.

The relationship between online political activism and online information sources.

**2.4 Million Facebook users**

**REAL**

**TROLL (1.6M sharing)**
Collective attention in the age of (mis)information

We study (over a period of 3 months) several Facebook communities centered around discussions (both directly and indirectly) related to the political scene.

Sept 1st, 2012 - Feb 28th, 2013

Table 1. Breakdown of Facebook dataset. Mainstream News: all the national newspapers present on Facebook. Alternative News: pages which disseminate controversial information, most often lacking supporting evidence and sometimes contradictory of the official news. Political Activism: gathering users to publicly convey discontent against the current political and socio-economic situation.
PARADOX: USERS INTENTIONALLY AVOIDING THE “MAIN STREAM MEDIA MANIPULATION” ARE THE MORE PRONE TO BE MANIPULATED
THE WORLD ECONOMIC FORUM HAS POINTED OUT MASSIVE DIGITAL MISINFORMATION AS ONE OF THE MAIN RISKS FOR OUR SOCIETY

UNSUBSTANTIATED CLAIMS REVERBERATE AS LONG AS MORE VERIFIED INFORMATION AND IT IS REALLY EASY FOR THEM TO PASS THE CREDULITY BARRIER
WHY?

COMPLEXITY OF THE WORLD AND SOCIETY IS INCREASING

GLOBALIZATION

INTERCONNECTIVITY

TECHNOLOGICAL AND SCIENTIFIC PROGRESS
On the internet several and differentiate cultures coexist:

- On Facebook, they are mainly organized around **PAGES SPECIALIZED ON SPECIFIC TOPICS**, e.g. against or pro vaccination, vegan, politics, science, conspiracy, etc.

- On these pages users interact between them by commenting the posts and thus **SHARING, DEBATING** and **REINFORCING** their opinions.
CONSPIRACY THINKING

THERE IS A SECRET PLOT AIMED AT MANIPULATING SOCIETY. SOME SECRET ORGANIZATION MOTIVATED BY ECONOMIC INTEREST IS:
- HIDING THE EXISTENCE OF SECRET TECHNOLOGIES
- MANIPULATING THE WEATHER
- TRYING TO UNIFY THE WORLD UNDER A UNIQUE GOVERNMENT
- MANIPULATING THE PUBLIC OPINION THROUGH MAIN STREAM MEDIA

- MYTHOLOGICAL NARRATIVES TO THE COMPLEXITY OF THE WORLD -
SCIENTIFIC THINKING

SCIENCE AND SCIENTIFIC THINKING COULD BE THE CORRECT NARRATIVE TO UNDERSTAND REALITY.
- TRYING TO DISENTANGLE COMPLEXITY
- SKEPTICISM
- LOOKING FOR EVIDENCE

- DIFFICULT TO DISSEMinATE BECAUSE OF ITS COMPLEXITY
Science Vs Conspiracy: Collective Narratives in the Age of Misinformation

FACEBOOK PAGES IN THE ITALIAN CONTEXT FROM TWO CATEGORIES, **SCIENCE** AND **CONSPIRACY**, OVER A 4 YEARS TIMESSPAN (2010 - 2014)

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Science News</th>
<th>Conspiracy News</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pages</td>
<td>73</td>
<td>34</td>
<td>39</td>
</tr>
<tr>
<td>Posts</td>
<td>271,296</td>
<td>62,705</td>
<td>208,591</td>
</tr>
<tr>
<td>Likes</td>
<td>9,164,781</td>
<td>2,505,399</td>
<td>6,659,382</td>
</tr>
<tr>
<td>Comments</td>
<td>1,017,509</td>
<td>180,918</td>
<td>836,591</td>
</tr>
<tr>
<td>Likers</td>
<td>1,196,404</td>
<td>332,357</td>
<td>864,047</td>
</tr>
<tr>
<td>Commenters</td>
<td>279,972</td>
<td>53,438</td>
<td>226,534</td>
</tr>
</tbody>
</table>

Polarized Users activities in their community

<table>
<thead>
<tr>
<th></th>
<th>Comments</th>
<th>Likes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SCIENCE</strong></td>
<td>44,965</td>
<td>255,225</td>
</tr>
<tr>
<td></td>
<td>84,14%</td>
<td>76,79%</td>
</tr>
<tr>
<td><strong>CONSPIRACY</strong></td>
<td>218,27</td>
<td>790,899</td>
</tr>
<tr>
<td></td>
<td>96,35%</td>
<td>91,53%</td>
</tr>
</tbody>
</table>
Global consumption patterns for polarized users.
Here we continue our analysis on 95%-threshold polarized users, i.e. users that liked at least 95% of posts in a specific category. The figure shows Cumulative Distribution Function for likes (panel a) and comments (panel b) of polarized users. Also the analysis on polarized users show some similarities in consumption patterns.

Commenting activity of polarized users.
Out of 7551 posts (1991 in Science and 5790 in Conspiracy), we look at the activity of 95%-threshold polarized users on the opposite category in terms of comments.

Users polarized on Science makes the 9.71% of their total commenting activity on Conspiracy posts, whereas

users polarized in Conspiracy commented on Science posts only the 0.92% of their total activity in terms of comments.

Hence, users polarized in Science pay attention to the activity on the opposite community and try to interact with users polarized in Conspiracy; conversely, users polarized in Conspiracy are focused on the inner dynamics of their community.
HOW DO THEY COMMENT ON 4000 INTENTIONAL FALSE CLAIMS?

Polarized users on false information.

Percentage of likes and comments on intentional false memes posted by a satirical page from polarized users of the two categories.

We notice the presence of debates among the two groups on the comments, while conspiracist confirm their attitude on liking.
Debunkers: users or pages posting information aiming at correcting false claims circulating on the web. Are Debunkers effective on persuading conspiracists?
Social Determinants of Content Selection in the age of misinformation

SURVIVAL PROBABILITY: the probability to interact with a post of a given category after a specified time $T$

Polarized users of conspiracy-like information and debunking posts

EXPOSED

NOT EXPOSED