Data, digital methods

and mapping social complexity

Visualizing social and semantic dynamics in the social sciences

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A. Introduction

Maps are commonly defined as the visual representation of an area. They are codified depictions highlighting relationships between elements of a given space such as objects, regions and themes. The craft of map-making has a long and rich history (Macchi & Mullender, 1980). Initially used for navigational purposes, early maps sought to represent geographical space by positioning elements on a two-dimensional surface. As representational devices, maps quickly became integrated with science and the state (Turnbull, 2000). Indeed, maps have played a major role in the ways of representing, navigating, understanding, organizing and disputing the spaces we inhabit (Lacoste, 1976).

In recent years, computers and satellites have profoundly changed cartography. Geographical Information Systems now capture, store, manipulate, analyze and manage spatial data to inform research and decision-making. Satellite systems provide geo-spatial positioning to monitor movement anywhere in the world while millions access interactive map applications through their personal computers and smart phones.

Parallel to these developments, the visual representation of non-spatial datasets using digital mapping tools has fostered growing interest in the social sciences. These representations are often labeled as maps of unchartered territories where the emergence of complex social phenomena can be studied through heterogeneous data contained in documents, structured databases or the World Wide Web. The technological and epistemological shift this entails has been described by some scholars as a move towards the *Digital Humanities*. Understandably, these developments are particularly attractive to social scientists. Though statistical tools have played a major role in the study of social existence (Desrosières, 2008), the variety of tools available to social scientists has been rather limited compared to those available to colleagues in the natural sciences. Consequently, the advent of tools to collect relational data and analyze networks has fostered "great expectations". For instance, some hope they will help bridge the methodological gap that separates the study of specific interactions from that of global structures (Venturini & Latour, 2010).

Considering the ever-expanding production and circulation of digital information it is imperative that scholars in the social sciences aquaint themselves with these new sources of data and the emerging methods that permit their analysis. An approach based on counting hits, nodes and links, though incomplete, may help clarify questions in various fields from sociology to science and technology studies and the political sciences about the increasing imbrication between web-based activity, algorithims and data in everyday life. For instance, we are already witnessing that, far from the utopic discourse that characterized early descriptions of the Web's collective dynamics and decentralized architecture, the production and sharing of content on the web have not resulted in some neo-Habermasian ideal of the public-sphere. Instead, research in the political sciences has shown that the Web is a mosaic space (Rogers, 2013), or a balkanized landscape (Sunstein, 2008) that does not fit with the unified "small world" narrative usually associated with online research (Barbier & Cointet, 2012). This seminar, as described further below, will provide participants with a conception of the web as a space of social action and present participants an emerging set of empirical tools designed to apprehend the nature of this action.

B. Scientific case

Digital mapping tools (DMTs) of various types like Gephi, the CorTexT Manager, ScienceScape and Hyphe have been developed to help social scientists tracing and analyzing the content and circulation of textual data. Such tools are beginning to be applied in the study of various social phenomena (see for instance: Parasie & Cointet, 2012 ; Diminescu, 2012), mainly by scholars active in STS and Media Studies. Though prior methods may offer some assistance (i.e. statistical regression and correspondence analysis), social scientists trying to construct explanations using relational datasets and DMTs must still cross a "methodological no man's land" (Gläser & Laudel, 2001). Indeed, basic questions related to the construction, interpretation and use of networks produced with DMTs have received little attention in the social sciences. For instance, how to choose data, parameters and algorithms to investigate specific social phenomena is seldom addressed. Similarly, literature on how to explore and make sense of maps obtained through the configuration of these elements is generally lacking, and the articulation between quantitative and qualitative results also remains an understudied area. The politics of algorithms would also benefit from further inquiry (Gillespie, forthcoming), as would the responsibility of researchers towards the actors mapped using DMTs.

The development of DMTs has been driven by multidisciplinary work at the crossroads of computational linguistics, data mining, artificial intelligence, dynamical systems and network analysis. Discussions within these communities focus on internal issues such as the extraction, parsing, disambiguation, clustering, filtering and visualization of data. Though interesting, research pursued in computer science and complex systems analysis provides an insufficient methodological basis to support the application of DMTs in the social sciences. Publications in these fields mainly revolve around modeling, development and optimization activities. They offer little insights for social scientists trying to figure out how to mobilize DMTs to answer their own research questions.

Similarly, though the representation of data in the form of geographical maps, statistical tables and charts or

diagrams has been addressed in the seminal works of Jacques Bertin and Edward Tufte (Bertin, 1999 ; Tufte, 1990 & Tufte, 2001), little has been written on the graphic design of relational data to study social phenomena (Healy and Moody, 2013). The growing popularity of information design (McCandless, 2009) has underlined the cognitive advantages of making information "meaningful, entertaining and beautiful". Whether and how this could/should be achieved in the social sciences provides a rich and underexplored field of inquiry.

Our workshop aims to create a space of exchange where social scientists, information designers and researchers involved in the theoretical and technical development of DMTs can discuss issues related to the dynamic mapping of networks and other web-based data. We argue that creating a collaborative space to examine DMTs can help social scientists harness the potential of existing tools and understand how results can be woven into rich and robust narratives and research agendas (Venturini, 2012). Our collaborative investigation seeks to underline the strengths and weaknesses of DMTs as well as identify the specific needs of social scientists using these tools. This should be of particular interest for researchers involved in DMT development, providing detailed feedback on the practices, critiques and needs of a user community mobilizing their software. Feedback can inform the refinement of existing tools and models or the development of new functionalities. The seminar should also be relevant for information designers interested in data visualisation approaches developed to explore, demonstrate and communicate complex phenomena. Encouraging interactions between these different communities will have mutually beneficial effects. To achieve this, our project will strive to meet three objectives:

1. Connect researchers and practicioners experimenting with DMTs in a regular seminar.
2. Provide feedback to researchers involved in the development of DMTs.
3. Support interdisciplinary community building around DMTs in the greater Paris region.

C. Organization & objectives

1. Assistance

In order encourage discussions between social scientists and practitioners experimenting with DMTs, we will organize a monthly seminar in Paris, which is open to researchers, designers and postgraduate students. Spanning from February 2014 to July 2014, the seminar's central contribution will be the collaborative construction of a framework to help social scientists to tackle the task of using visualized relational data to support or invalidate knowledge claims in their research. The construction of this framework will be derived from literature presentations and the showcasing of past or ongoing research projects led by social scientists applying DMTs.

Our 3h30 seminar will be structured around a series of themes that address different aspects of doing social science with DMTs (see syllabus below for themes). Individual sessions will consist of the presentation and discussion of 2-4 relevant scientific articles (1h), a presentation and discussion by an invited guest of past or ongoing work (1h30) and a final, shorter presentation/feedback session by a younger researcher of ongoing work (45m). The seminar is sponsored by the CorTexT Platform of IFRIS and the Medialab of Sciences Po, and will be hosted by the Ecole Nationale Supérieure de la Création Industrielle (48 rue Saint Sabin, Paris). The project is coordinated by Audrey Baneyx (médialab Sciences Po), Ian Gray (médialab Sciences Po), Axel Lagnau (IFRIS, UPEM, ESIEE) and Lionel Villard (CorTexT, UPEM, ESIEE).

The literature presentations will introduce academic and para-academic literature, provided it is relevant and stimulates discussion. Chosen texts will address the construction, interpretation and use of DMTs in the social or natural sciences. They will highlight different *ways of knowing* and *ways of working* with data visualizations, sensitizing participants to issues related to selecting data, tools and parameters, constructing interpretative pathways, developing a reflexive understanding of results and communicating these results to different audiences (peers, clients, lay public etc.).

The work presentations will revolve around past or ongoing research projects using digital mapping techniques related to the theme of the given seminar. The idea is to see how fellow researchers effectively use data visualization in their research, with a particular focus on the heuristics and tacit knowledge that assist them in their work. Emphasis will be put on the difficulties encountered when using DMTs and the strategies deployed to circumvent them. We plan to invite both senior and junior researchers and practitioners to present their work. Mixing theoretical and pragmatic aspects, presentations should focus on how texts and projects can help us refine our understanding of DMTs in scientific inquiry.

2. Feedback

Providing feedback to researchers involved in the theoretical and technical development of DMTs will be achieved through the active documentation of what goes on during the seminar. To begin with, we will film the presentations of invited lecturers and post the films on our website. In addition, two *rapporteurs* will be appointed to take notes during each session. Notes will be restructured to summarize and highlight the main themes, threads and references that came out of discussions. Similarly, the *rapporteurs* will record what is said during the discussions that follow the work presentations in order to aggregate issues encountered by researchers handling DMTs. Documents will be put online on the seminar's webpage.

Documenting these processes is essential. It feeds into future discussions and the construction of a final online report/handbook. The report will provide a field manual for researchers grappling with DMTs. It will also strive to identify the practices, critiques and needs voiced by researchers during presentation and discussions. These offer precious indications of user preoccupations and can inform the refinement or development of relevant functionalities and tools. Consequently, the outcome of the seminar is also of interest for researchers involved in DMT development at the CortTexT platform, the Médialab and elsewhere.

3. Community building

Supporting exchanges between social scientists, designers and DMT developers in the greater Paris region is the third goal of our project. Practitioners and researchers located in the Institut Francilien Recherche Innovation Société (IFRIS), Sciences Po and the Ecole Nationale Supérieure de la Création Industrielle have all shown interest in the creation of a space to meet, learn from and discuss with colleagues interested in DMTs. Researchers coordinating and participating in the seminar will strive to support collaborative projects such as publication projects or prototype development. Thus, the seminar will promote the advancement of a shared multidisciplinary research culture related to digital mapping tools. The organization of a final two-day barcamp will be the crowning event to discuss findings, reflect on what has been achieved (publications, field manual, functionalities) and plan the next steps.

D. Program

27.02.14 // Introduction [1] // 14:00-17:30

The inaugural session will introduce the recent technological and epistemological transition entailed by the advent of digital mapping tools (DMTs) in the social sciences. Richard Rogers, Director of the Digital Methods Initiative at University of Amsterdam will present how DMTs can be mobilized to explore social complexity and present a broad vision of the development of the tools now used in the cartography of information--both in research and and the private sector. Organizational aspects of the seminar will also be addressed, such as allocating literature presentations and inquiring about participants that would like to present their work during the seminar.

06.03.14 // Mapping science & technology through structured data [2] // 14:00-17:30

Scientometrics has pioneered the use of structured data to analyse the social and cognitive dynamics of science and technology. This has enabled the development of tools and methodological insights that are relevant for researchers using DMTs to study other social phenomena. Constructing maps of scientific knowledge production requires several steps, namely data extraction, entity selection (i.e. co-word, co-author, and co-citation analysis), normalisation, filtering, and finally visualisation (Börner, 2010). This analytical framework has recently been applied to patenting activity (Leydesforff, 2011 ; Rafols, 2012 ; Schoen, 2012). It has also been extended to the plotting of heterogeneous networks. The session will discuss the process of mapping scientific or technological data and show how the choice of thresholds, algorithms, layouts and scale affects interpretation.

27.03.14 // Digitized archives and distant reading [3] // 14:30-18:00

The growing digitization of our textual and literary heritage has convinced many academics and observers of higher education that we are currently experiencing a renaissance in the Humanities (Pannapacker, 2009). National funding agencies, such as the National Endowment for the Humanities (NEH) in the U.S., are allocating increasing resources to develop data mining, data storage and language processing techniques to support this movement. Some scholars argue that this mass of data is profoundly changing the methodological toolbox of a field whose scholarship is traditionally based on close reading and interpretation of texts (Moretti, 2013). Digitization has rendered novels, plays, poems and historical texts open to forms of statistical analysis and visualization methods previously unavailable to these objects. As a result, this "digital turn" is creating a vivid debate within the Humanities about the effects that the use of algorithms might have on the interpretation, understanding and teaching of literature and history. There is a palpable tension on university campuses of how to respond as outside disciplines, such as evolutionary dynamics, systems and artificial intelligence, gain new ports of entry into the traditional territory of the Humanities (Michel, 2010 ; Diski, 2011). This session will explore the paths forward in this debate.

10.04.14 // Natively digital data mapping [4] // 14:30-18:00

Thirty years ago, the democratization of IT radically changed the way we access, generate and manage information. The Internet has amplified and accelerated this phenomenon, producing ever increasing amounts of "natively digital data" (Rogers, 2013). This has fostered numerous studies of online culture, where researchers have turned to user-populated platforms such as Twitter to detect the presence and associative practices of novel communities, or to sites such as Wikipedia where recent studies compare the controversality of topics on different language sections of the online encyclopedia (Yasseri, 2012). Beyond these specific studies of web-based-media use, there are broader questions about what exactly are we studying when we analyze hyperlinks, online forums, websites, etc.? Furthermore, what are we doing when we access information through ranking systems provided by search engine algorithms (e.g. PageRank) that constantly evolve to take into account a user's prior searches? The session aims to develop a reflexive understanding of using natively digital data as a resource for research.

24.04.14 // Transformative interactions: web effects on social dynamics [5] // 14:30-18:00

This seminar will address a critical question in the application of digital methods for social science research. The web is not merely a new resource that, through the treatment of large collections of data, lets us valsify or verify long-held assumptions about the relationships between institutional culture, individual behavior and other key concepts in the social sciences. The web itself is changing the way institutions function (such as how news is produced [Bozkowski, 2009] or science gets published [Evans, 2008]), as well as how individuals interact (social networking sites offer a new forms of the presentation of self [Goffman, 1959 ; Menaker, 2013], and commentary on blogs and news sites have spawned new norms in communication). What we propose to address in this seminar is not a methodological question, but an epistemological question. How does the internet itself shape social phenomenon and require new theorizing about our objects of study? We will look at examples in the production of science and the news, and the treatment of data from Facebook and blog communities.

15.05.14 // Visualizing complexity [6] // 14:30-18:00

Early data visualizations in science ordered information in tree-like representations to address issues of classification and genealogy. The Encyclopédie's *Système figuré des connaissances humaines* and Darwin's *Tree of life* are classical examples of this first period of data visualization. The recent shift towards issues of organized complexity in scientific inquiry (Weaver, 1948) has changed the practice of visualization, marking a transition from trees to networks. Despite a rich stream of research, network visualization still lacks a basic grammar of standardized graphic presentation as that advocated by Willard Brinton (Brinton, 1939) and Jacques Bertin (Bertin, 1999). The session will address visualizing complexity from a graphical perspective, stressing the importance of information design and visual standards for improved perception and understanding of complex phenomena.

05.06.14 // Spatializing data [7] // 14:00-17:30

In addition to the problem of how to graphically treat and visualize data (dealt with in the previous session), are a series of underlying questions about the metaphors, metonyms and metrics we deploy to translate the digital into the spatial (Levy, 2012). When we invoke digital "mapping" tools, or talk about "spatializing" our networks through tools such as Gephi, we are making loose references to practices and techniques of the field of cartography. The session will unpack the relationship between web cartography and traditional cartography by taking a long historical view of the evolution of the field and the uses (navigational, aesthetic, conquest) of its objects (Farinelli, 2009). We will also think through the epistemological commitments entailed in describing the activity of digital analysis and representation as "mapping" (November et al., 2010). What do we gain and lose by adhering to this term?

19.06.14 // Activism, journalism, decision-making: DMTs in practice [8] // 14:30-18:00

The advent of the "open data" movement has given new leverage to the press and civic activists to expose corruption and abuses of power by public actors (Schmidlin, 2012 ; Greenwald, 2013). What can these practices tell us about the influence of data on democracy and the role of civil society in mobilizing data to speak "truth to power"? Is the internet delivering on its promise of providing a pragmatic space for public debate? How do we classify the rise in groups generating software tools, platforms and hacks that undermine or transplant traditional powers of the state (Wikileaks and Anonymous)? On the flip side, there is also a question of how institutional powers are making use of data, particularly Big Data, to increase their influence. How does access to ever increasing amounts of information about individual behavior changing the way political campaigns see voters and how marketing firms target consumers (Issenberg, 2013)? How do social scientists position their own map making activities within this mixed terrain? And What can the social sciences learn from the methods of these institutions while keeping the requisite distance to analyze their impact on our concepts of citizenship, participation, privacy and persuasion?

Rather than closing the seminar with a conference, the final session will be a two-day participatory workshop-event where data, tools and methods are collectively explored with seminar participants. This final session will also be open to the public. The workshop takes its inspiration from BarCamp events. Though loosely defined, these events are based on two fundamental principles: no one is a spectator (everyone participates through their different forms of expertise; i.e. technical or analytical skills) and results are produced and shared at the end of the event. A BarCamp usually kicks off with a presentation of participants (name, affiliation, interests) and then relies on the self-organizing capacity of participants to form groups and pursue a given project. In this case, our interest lies in how participants will use various sources of data and DMTs to improve our knowledge of a given social phenomenon. Participants can choose to work with data sets that will be provided by organizers or build their own datasets. They are free in their choice of tools, though the organizer's will provide extensive technical support for Gephi and the CorTexT Manager. Throughout the two-day event, participants can schedule "special sessions" on the sessions grid to address specific points. The sharing of information is encouraged through mailing lists, shared notepads (i.e. EtherPad) and the seminar's website in an effort to minimize "off-the-record" information exchange that characterizes invite-only events. Indeed, participant's productions will be accessible online. This practise-oriented event will also provide informal feedback on the seminar and help plan future steps.

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