ECONOMIC & POLITICAL NETWORK

EP

NET

Production and Distribution of Food during the Roman Empire:
Economic and Political Dynamics

Workshop

U B Universitat de Barcelona

Advancet Grant Project

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BSC Barcelona Supercomputing Center
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PhysComp²
Physics and Computation of Complex Systems

SIRIS

EPNet Workshop. Production and Distribution of Food during the Roman Empire: Economic and Political Dynamics.

Sala Gran, Facultat de Geografia i Història,

Universitat de Barcelona (Barcelona, Spain) July 2-3, 2015

July 1, 2015

19.30 **Guest reception and introduction video**. (Facultat de Geografia i Història)*

21.00 **Welcome dinner workshop guests**. (Horiginal - Restaurant)*

July 2, 2015

09.30 - 10.00 **Introduction to EPNet Workshop** (José Remesal).

Session 1: Theories on Roman economy and trade.

Coordinator: José Remesal (CEIPAC, UB).

10.00 - 10.15 Introduction to Theories on Roman economy and trade (José Remesal).

10.15 - 11.00 "The efficiency of riverine trade routes and sea-routes in the Roman Empire" (Christoph Schäfer).

11.00 - 11.15 Coffee break

11.15 - 12.00 "Maritime Infrastructure. Between Public and Private Initiative" (Pascal Arnaud).

11.15 - 12.45 "Did the Romans invent "commercial" law?" (Jean-Jacques Aubert).

12.45 - 13.00 Closing Section (José Remesal).

Session 2: Knowledge representation and semantic data management for Humanities (KR&DM4H).

Coordinador: Alessandro Mosca (SIRIS Academic).

14.30 - 14.45 Introduction to Knowledge representation and semantic data management for Humanities (Alessandro Mosca).

14.45 - 15.30 "Principles and Technologies for Ontology-Based Data Access" (Diego Calvanese).

15.30 - 15.45 Coffee break

15.45 - 15.30 "Ontology-Based Integration of data about the Roman Empire" (Martin Rezk).

15.45 - 16.00 Closing Section (Alessandro Mosca).

19.30 Honor Dinner workshop guests.

July 3, 2015

Session 3: Quantitative Methods in Archaeology.

Coordinator: Xavier Rubio (Barcelona Supercomputing Center).

09.30 - 09.45 Introduction to Quantitative Methods in Archaeology (Xavier Rubio).

9.45 - 10.30 "Inferring cultural transmission processes from frequency data" (Anne Kandler).

10.30 - 10.45 Coffee break

10.45 - 11.30 "Emergent Systems in Archaeology from Agent-Based Modelling: Example Case Studies" (Mark Altaweel).

11.30 - 12.15 "Testing hypotheses about human social and cultural evolution using statistical and agent-based models" (Thomas Currie).

12.15 - 12.30 Closing Section (Xavier Rubio).

Session 4: Network generation and interpretation of complex systems.

Coordinator: Albert Díaz-Guilera (PhysComp^2, UB).

14.00 - 14.15 Introduction to Network generation and interpretation of complex systems (Albert Díaz-Guilera).

14.15 - 15.00 "Are Data and Theory models homomorphic or complementary?" (Ray Rivers).

15.00 - 15.15 Coffee break

15.15 - 16.00 "Looking to the Past to better understand dynamics on & of complex networks" (Sergi Lozano).

16.00 - 16.45 "Black Boxes, Probabilities and Perfect Data: How (not) to provide insights into past social networks through archaeology" (Angus Mol).

16.45 - 17.00 Closing Section (Albert Díaz-Guilera).

17.00 - 18.00 **Final Discussion.**

EPNet Woorkshop Coordination:

Daniel J. Martín-Arroyo Sánchez (EPNet Project, CEIPAC).

Scientific Committee:

José Remesal (CEIPAC, UB).

Albert Díaz-Guilera (PhysComp^2, UB).

Alessandro Mosca (SIRIS Academic).

Xavier Rubio (Barcelona Supercomputing Center).

Note.
All meals provided by the University of Barcelona:
July 1, 2015. Welcome dinner workshop guests.
July 2 - 3, 2015. Coffee break and catering workshop.
July 2 - 3, 2015. Dinner workshop guests.

Your accommodation is at. **Residència d'Investigadors** C/ Hospital, 64 08001 Barcelona Phone: 934 438 610 Fax: 934 428 202 E-mail: investigadors@resa.es http://www.resa.es/Residencias/Investigadors Available from July 1 to July 3 (3 nights).	**Workshop place** **UB Facultat de Geografia i Història** Carrer de Montalegre, 6 08001 Barcelona Phone: 934 037 557 (EPNet – CEIPAC) ***Guest reception and introduction video** **UB Facultat de Geografia i Història** seminari de filosofia 4ª planta ***Welcome dinner workshop guests** **Horiginal restaurant** Ferlandina,29 (opposite MACBA) Barcelona 08001

Workshop abstracts.

Session 1: Theories on Roman economy and trade.
Coordinator: José Remesal (CEIPAC, UB).

- Christoph Schäfer
http://www.uni-trier.de/index.php?id=51892

The efficiency of riverine trade routes and sea-routes in the Roman Empire
In antiquity as today, mass-produced bulk goods such as grain, wine, and oil were preferably transported by sea or river, because this method of transportation was (and is) by far more cost-efficient than land transport. But the reach and coverage of trade is determined primarily by the cost and effort required by the trader. There were, however, differences between sea-routes and maritime shipping on the one hand, and riverine transport on the other. According to Richard Duncan-Jones, riverine transport was more expensive than sea transport by a factor of 1:4,9. It is the purpose of this paper to review this proposition. To do so, new and different sources will be considered, as will technological and nautical aspects of water-borne transport, all within the theoretical framework of transaction cost theory.

- Pascal Arnaud
http://iuf.amue.fr/author/parnaud/

- Jean-Jacques Aubert
http://www2.unine.ch/histoire/page-34050.html

Did the Romans invent "commercial" law?
This paper will review the various ways Roman law, i.e. Roman magistrates, judges, and jurists, responded to the concerns of traders, in terms of legal basis, procedure, and remedies. The main thesis is that edictal law, devised by aediles, praetors, and provincial governors, was in tune -- and increasingly so -- with the expectations of the trading community and provided, possibly in response to the latter's request, the most important legal instruments upon which classical jurists (in the works excerpted and compiled in the Digest) and later imperial legislators (in the laws collected in the codes) built a more encompassing set of solutions to legal issues arising in the context of various economic activities.

Session 2: Knowledge representation and semantic data management for Humanities (KR&DM4H).
Coordinador: Alessandro Mosca (SIRIS Academic).

- Diego Calvanese
http://www.inf.unibz.it/~calvanese/

Principles and Technologies for Ontology-Based Data Access
Ontologies allow one to describe complex domains at a high level of abstraction, providing end-users with an integrated coherent view over data sources that maintain the information of interest. In addition, ontologies provide mechanisms for performing automated inference over data taking into account domain knowledge, thus supporting a variety of data management tasks. Ontology-based Data Access (OBDA) is a recent paradigm concerned with providing access to data sources

through a mediating ontology, which has gained increased attention both from the knowledge representation and from the database communities. OBDA poses significant challenges in the context of accessing large volumes of data with a complex structure and high dinamicity. It thus requires not only carefully tailored languages for expressing the ontology and the mapping to the data, but also suitably optimized algorithms for efficiently processing queries over the ontology by accessing the underlying data sources. In this talk, which is directed at a non-technical scholarly audience, we discuss the main principles behind OBDA relying on lightweight ontology languages, and we highlight the benefits of implementing OBDA for usability in data access, for data integration, and for checking and maintaining data consistency.

- Martin Rezk
http://www.inf.unibz.it/~mrezk/

Ontology-Based Integration of data about the Roman Empire.
In this talk we will introduce an ontology-based data integration framework that allows to virtually integrate different datasets by means of a conceptual layer (an ontology).
The ontology provides to the user a clear point of access and a unified and unambiguous conceptual view of the underlying data, to which it is declaratively mapped.
In particular, we use the Ontology-Based Integration (OBDI) paradigm to integrate data about the Roman Empire and hence make it easily accessible to scholars.
We will illustrate this by relying on the system Ontop developed at the Free University of Bozen-Bolzano, which is deployed in industrial projects.
In particular, we will concentrate on the following crucial questions:
– How to map available data sources to an ontology.
– How to query the underlying data sources using the terms in the ontology.
– How to check consistency of the data sources w.r.t. the ontology.

Session 3: Quantitative Methods in Archaeology.
Coordinator: Xavier Rubio (Barcelona Supercomputing Center).

- Anne Kandler
http://www.cecd.ucl.ac.uk/people/?go1=67

Inferring cultural transmission processes from frequency data
Cultural change can be quantified by temporal frequency changes of different cultural artefacts. Based on those (observable) frequency patterns researchers often aim to infer the nature of the underlying cultural transmission processes and therefore to identify the (unobservable) causes of cultural change. Especially in archaeological and anthropological applications this inverse problem gains particular importance as occurrence or usage frequencies are commonly the only available information about past cultural traits or traditions and the forces affecting them. Matters are further complicated by the fact that observed changes often describe the dynamics in samples of the population of artefacts whereas transmission processes act on the whole population. In this talk we start analysing the described inference problem. We develop a generative inference framework which firstly establishes a causal relationship between underlying transmission processes and temporal changes in frequency of cultural artefacts and secondly infers which cultural transmission

processes are consistent with observed frequency changes. In this way we aim to deduce underlying transmission modes directly from available data without any optimality or equilibrium assumption. Importantly this framework allows us to explore the theoretical limitations of inference procedures based on population-level data and to start answering the question of how much information about the underlying transmission processes can be inferred from frequency patterns. Our approach might help narrow down the range of possible processes that could have produced observed frequency patterns, and thus still be instructive in the face of uncertainty. Rather than identifying a single transmission process that explains the data, we focus on excluding processes that cannot have produced theobserved changes in frequencies. We apply the developed framework to a dataset describing the LBK culture.

- Mark Altaweel
http://www.ucl.ac.uk/archaeology/people/staff/altaweel

Emergent Systems in Archaeology from Agent-Based Modelling: Example Case Studies
This talk provides several examples of complex system modelling where past agriculture, land use decisions making, transport, social interaction, and settlement choices are studied using agent-based modelling (ABM). Results are discussed with regard to their benefits and how they can assist in developing archaeological theory and insights. Based on these collective examples, general lessons and future directions are drawn regarding best approaches, technological utility, application of ABM to archaeological problems, and overall theory development.

- Thomas Currie
http://www.ucl.ac.uk/~ucsatec/

Testing hypotheses about human social and cultural evolution using statistical and agent-based models
In this talk I will focus on the use of statistical and agent-based models in testing hypotheses about human cultural evolution. Formal modelling approaches such as these are an important part of any mature science and serve a number of useful purposes. They force us to translate verbal models or abstract theoretical principles into more concrete terms. This enables us to test the logic of proposed mechanisms (i.e. does the idea "make sense"?), and helps makes the assumptions behind an idea more explicit. Agent-based simulations allow us to model the interactions between our "agents", and see if complex phenomena emerge from relatively simple rules. Such models therefore allow us to evaluate whether our theory provides a possible explanation of what happens in the real world. Models can also yield sharply defined, quantitative predictions that can be tested against data from the archaeological or historical records. In statistical models we assess whether the patterns of change of certain variables, or the relationship between different variables match those predicted by a theory. In agent-based models we can assess how well the output from our simulations matches with real data. In other words we can test whether a particular model offers a plausible explanation. Importantly, we should seek to test alternative hypotheses and models, and see which of the competing ideas provides the best explanation of what we observe. I will illustrate these approaches using 1) empirical studies of migration and cultural evolution in island Southeast Asia and the Pacific, 2) simulations of the effect of borrowing of cultural traits on our ability to use

phylogenetic methods to make inferences about the past, and 3) a global-scale model of the evolution of large-scale states and empires over a three thousand year period. Such approaches are somewhat different from the traditional method of inquiry that historians and archaeologists employ. However, scholars in the humanities and the sciences can all benefit by working together in order to develop better theories and models, and to ensure that they are tested with the best available information.

Session 4: Network generation and interpretation of complex systems.
Coordinator: Albert Díaz-Guilera (PhysComp[2], UB).

- Ray Rivers
http://www.imperial.ac.uk/people/r.rivers

Are Data and Theory models homomorphic or complementary?
Quantitative modelling of historical society roughly falls into two categories; data modelling and theory modelling. Basically, theory models function at an ideational level, encoding in a formal way what we might term 'agency', whereas data models are validated by their ability to describe the data. Networks provide an ideal tool to frame these approaches, with data modelling enabling us to identify significant patterns of influence and exchange and providing support for coherent social narratives. Data arises at many scales from the mico-artefact to the meso-community to the macro-'empire'. Data modelling typically works upward from the smallest scales whereas Theory modelling often begins at the largest distance and times scales and works downwards. With relatively few parameters, at best it describes generic/universal behaviour at a coarse-grained level.

The question is how possible is it to reconcile the top-down coarse-graining with the bottom-up detail, the top-down 'universal' behaviour with the bottom-up site-specific social narratives? Are they complementary or, insofar as they overlap, is theory modelling coarse-grained data modelling i.e. they are homomorphic? Of course, they may be neither, which may be more interesting in that it shows how specific local social forces are anything but generic! I shall explore this with examples from a wide variety of data sets (not yet finalised).

- Sergi Lozano
https://iphes.academia.edu/SergiLozano

Looking to the Past to better understand dynamics on & of complex networks
Archaeology (and Studies of the Human Past in general) has a unique
capability to provide empirical evidences for long-term patterning of
social processes (Shennan, 2002). This is also applicable to social and technological networks.
Indeed despite their particular challenges (e.g. missing or uncertain links, definition of temporal windows..), case studies from the Past can be highly useful to better understand the basic mechanisms underlying dynamics on and of such networks. How to unleash this potential? Theory-driven approaches and generalization beyond concrete(empirically-grounded) models can help (Barton, 2013). However there is still a lot to do in this direction, and cross-disciplinary

collaboration is strictly required. I
will try to reflect on this issue and link it to some of our current on-going work.

- Dr. Angus Mol

http://archaeology.leiden.edu/organisation/staff/molaaa.html

Black Boxes, Probabilities and Perfect Data: How (not) to provide insights into past social networks through archaeology.

Even if the two are often conflated, reconstructed archaeological network models are not direct representations of social networks. Compared to types of relational data used in formal network approaches, archaeological sources of information are perceived to be atypical: they are fragmentary, multi-levelled as well as geographically and temporally constrained. The result is that many in- and outside the discipline are skeptical if it is possible to understand archaeological networks as social networks.

There have been a number of reactions to these perceived incompatibilities between archaeological data and (social) network models. First is the "black box" criticism, in which archaeologists consider a network model to be in essence a construct resulting from a series of obscured decisions and algorithms put in place by the modeler, making any social inferences drawn from the model self-referential. Secondly, there is a move towards "probabilistic determinism" in which archaeologists do not model social networks, but instead seek to understand network data as a set of possibilities and probabilities that can be used to contextualize intangible social networks. This is often predicated on a networked use of GIS-models. Thirdly, there is the "quest for the perfect network", in which researchers seek to uncover past social networks through data-sets that are as robust and detailed as possible, often using "big data" or archaeometrically verified provenance studies.

Taken by themselves, these reactions are all potentially destructive for the broader application of network approaches in archaeology. However, taken together they provide guiding principles for incipient archaeological network studies. This paper will provide case-studies from indigenous Caribbean archaeology to show the different challenges involved and how to potentially resolve them with positive results.

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