



# Complex Networks



FROM THEORY TO  
INTERDISCIPLINARY  
APPLICATIONS



## July 11–13 2016

Palais du Pharo  
Marseilles — France  
*Satellite meeting of Statphys26*

### ORGANIZING COMMITTEE

Alain **Barrat**, Ciro **Cattuto**,  
Eric **Fleury**, Bruno **Gonçalves**,  
Marton **Karsai**, Xavier **Leoncini**

### INVITED SPEAKERS

Luca **Aiello**, Johan **Bollen**,  
Vittoria **Colizza**, Tina **Eliassi-Rad**,  
Viktor **Jirsa**, Yamir **Moreno**,  
Daniela **Paolotti**, Jari **Saramäki**,  
Alessandro **Vespignani**

## /// Schedule at a glance

Monday, <b>July 11th</b>		Tuesday, <b>July 12th</b>		Wednesday, <b>July 13th</b>
Registration				INVITED TALK – Saramäki
9.00–9.15	Opening	INVITED TALK – Colizza		INVITED TALK – Eliassi-Rad
9.15–10.00	INVITED TALK – Vespignani	INVITED TALK – Jirsa		Coffee break & posters
10.00–10.45	INVITED TALK – Bollen	Coffee break & posters		Parallel session Networks and Epidemiology -2
10.45–11.30	Coffee break & posters	Parallel session Theory – 2		Parallel session Theory – 3
11.30–12.30	Parallel session Theory – 1	Parallel session Socio & eco networks – 3		Lunch break
12.30–14.00	Lunch break	Lunch break		INVITED TALK – Moreno Springer Lecture
14.00–14.45	INVITED TALK – Paolotti	INVITED TALK – Aiello		Break
14.45–14.50	Break	Break		Parallel session Temporal networks
14.50–15.50	TUTORIAL Provost	Parallel session Animal social networks		Parallel session Biological networks
15.50–16.30	Coffee break & posters	Coffee break & posters		Coffee break & posters
16.30–17.15	TUTORIAL Provost	Parallel session Networks and Epidemiology – 1		Parallel session Theory – 4
17.15–17.30	Parallel session Brain networks – 1	Parallel session Brain networks – 2		Parallel session Socio & eco networks – 4
17.30–17.45				
18.30	Reception at the city hall			

ROOMS:  
 ● Espace Phar\*Club & Joliette  
 ● La Major  
 ● Mucem

## /// Invited talks

— **Luca Aiello** /YAHOO, UK

Social Networks below the Surface:  
An Exploration of the Nature of Social Processes

Graphs are powerful abstractions of interactions between entities that has allowed researchers to build rigorous models to describe the evolution of complex systems, especially social networks, and the dynamics of the phenomena that these systems support, such as the process of information exchange. The explosion of data from online social media has encouraged the often uncritical adoption of the notion of social tie as the atomic interaction quantum of any social network structure. However, links are not all created equal and, similarly, the information that spreads in networks is variegated in nature. In our work we aim at reaching a better understanding of the nature of social structures and of the information that is carried along them. We look at how a social network evolves by analyzing full longitudinal traces of link creation in large-scale social platforms, showing how the process of bonding can be biased by algorithmic artifacts (such as friendship recommender systems) that influence the creation of links in a way that can change the global structural properties of the network. Moreover, by operationalizing theories from social science, we provide evidence that links might be expression of very different social processes that reflect fundamentally different structural properties of the social graph. Then, by illustrating two specific case studies (the production of quality content and the diffusion of deviant content) we will show how content type, link types, and overall network structure are all connected and have effect on each another. With our work, we hope to convey the message that a more nuanced description of social structures and processes is needed to better understand human interactions and societies, both online and offline.

— **Johan Bollen** /INDIANA UNIVERSITY, USA

Quantifying the effects of online social networks  
on subjective well-being and mental health

The introduction of social media has had contradictory effects. As a social species we require social relations for our well-being, but recent results indicate that widespread social media use leads to increased feelings of dissatisfaction and reduced happiness. The key to this paradox may lie in the unequal distribution of social relations in social networks and how these distributions affect our collective and individual subjective well-being. In this talk I will discuss the results of our investigations into how large-scale social networks can affect societal happiness levels and how we can leverage social media data to quantify the morbidity and progression of mood disorders in the population.

— **Vittoria Colizza** /INSERM, FRANCE

## Vulnerability to infections: applications for risk assessment in infection prevention and control

Our understanding of communicable diseases prevention and control is rooted in the theory of host population transmission dynamics. The network of host-to-host contacts along which transmission can occur drives the epidemiology of communicable diseases, determining how quickly they spread and who gets infected. A large body of epidemiological, mathematical and computational studies have provided a number of insights into the understanding of the process and the identification of efficient control strategies. The explosion of time resolved contact data has however opened the stage to new challenges. What are the structural and temporal aspects, and possibly their non-trivial interplay, that are critical for disease spread? To answer this question, I will introduce the infection propagator approach, a theoretical framework for the assessment of the degree of vulnerability of a host population to disease epidemics, once we account for the time variation of its contact pattern. By reinterpreting the tensor formalism of multi-layer networks, this approach allows the analytical computation of the epidemic threshold for an arbitrary time-varying network of host contacts, i.e. the critical pathogen transmissibility above which large-scale propagation occurs. I will apply this framework to a set of empirical time-varying contact networks and show how it can be used to test different intervention strategies for infection prevention and control in realistic settings.

— **Tina Eliassi-Rad** /NORTHEASTERN UNIVERSITY, USA

## Sifting through Measures on Networks: From a Theoretical Framework to an Empirical Guide

In this talk, I will discuss two problems on network data. (1) Measuring tie-strength: Given a set of people and a set of events attended by them, how should we measure connectedness or tie strength between each pair of persons? The underlying assumption is that attendance at mutual events produces an implicit social network between people. I will describe an axiomatic solution to this problem. (2) Measuring similarity between networks: Given two networks (without known node-correspondences), how should we measure similarity between them? This problem occurs frequently in many real-world applications such as transfer learning, re-identification, and change detection. I will present an empirical guide on how to select a network-similarity method.

— **Viktor Jirsa** /AIX-MARSEILLE UNIVERSITY, FRANCE

## The Virtual Brain: biologically realistic network modeling merging structure and dynamics

Over the past decade we have demonstrated that the fusion of subject-specific structural information of the human brain with mathematical dynamic models allows building biologically realistic brain network models, which have a predictive value,

beyond the explanatory power of each approach independently. The network nodes hold neural population models, which are derived using mean field techniques from statistical physics expressing ensemble activity via collective variables. This approach has been successfully applied to the modeling of the resting state dynamics of individual human brains, as well as clinical situations including stroke and epilepsy research. In epilepsy, we reconstruct personalized connectivity matrices of human epileptic patients using Diffusion Tensor weighted Imaging (DTI). Subsets of brain regions generating seizures in patients with refractory partial epilepsy are referred to as the epileptogenic zone (EZ). During a seizure, paroxysmal activity is not restricted to the EZ, but may recruit other brain regions and propagate activity through large brain networks, which comprise brain regions that are not necessarily epileptogenic. The identification of the EZ is crucial for candidates for neurosurgery and requires unambiguous criteria that evaluate the degree of epileptogenicity of brain regions. Stability analyses of propagating waves provide a set of indices quantifying the degree of epileptogenicity and predict conditions, under which seizures propagate to nonepileptogenic brain regions, explaining the responses to intracerebral electric stimulation in epileptogenic and nonepileptogenic areas. We demonstrate the predictive value of our seizure propagation model by validating it against empirical patient data. In conjunction, our results provide guidance in the presurgical evaluation of epileptogenicity based on electrographic signatures in intracerebral electroencephalograms.

— **Yamir Moreno** /UNIVERSITY OF ZARAGOZA, SPAIN

## Contagion Processes on Multilayer Networks

This talk will deal with two of the most representative and studied dynamical processes on networks: disease contagion and information spreading. We will first summarize some basic and fundamental results concerning disease and information spreading in single-layered networks. Then, we will increasingly add complexity to the models, in the form of more sophisticated analyses on so called multilayer networks, which are made up by more than one layer and represent more accurately several real-world systems where disease spreading or information contagion/diffusion is most relevant.

— **Daniela Paolotti** /ISI FOUNDATION, ITALY

## Digital traces and participation for forecasting the flu

The ability to rapidly recognize and respond to both global and local health threats remains a critical public health priority. The ever-growing digital world represents an unprecedented opportunity to harvest for tools to face emerging and re-emerging public health issues. This digital means of disease and, more in general, health and behavior-related information detection has been made possible by the growing influence of Internet technology, which has significantly changed the landscape of public health surveillance, epidemic intelligence gathering and forecasting of epidemic spreading. Informal digital channels such as social networking sites, blogs, chat rooms, Web searches, local news media, crowdsourcing platforms have been credited with providing information that are not easily accessible by more traditional channels,

such as census or traditional surveillance. In particular, we have explored how digital traces left by humans on the web (e.g. geo-located Twitter or Flickr data used to extract mobility patterns on a Europe-wide scale) and voluntarily provided self reports on health related matters (e.g. self reported Influenza-like illness symptoms to detect in real time and with high geographical resolution the seeds for seasonal influenza outbreaks) can become a crucial tool in informing dynamical models for epidemic spreading on a national and global scale.

— **Jari Saramäki** /AALTO UNIVERSITY, FINLAND

Social networks, time, and individual differences

In the traditional “bare-bones” network approach, nodes are nodes and links are links, and that is all there is. For social networks, this means that individuals are distinguishable only on the basis of their network characteristics (degree, centrality, etc). However, we all know that people are different and behave in different ways. These differences can be approached with more fine-grained behavioural data, in particular with the help of data on time-stamped interactions that allow constructing dynamic and temporal social networks. In this talk, I will focus on exploring individual differences with the help of temporal data on electronic interactions (calls, emails, etc). I will first talk about longer timescales and the similarities and differences in how we maintain our personal networks. Then, I will focus on shorter timescales of circadian patterns, and show how various data sets reveal chronotypes of individuals (morning/evening-active persons) and chronotype compositions of populations.

— **Alessandro Vespignani** /NORTHEASTERN UNIVERSITY, USA

From the physics of reaction-diffusion processes  
in complex networks to infectious disease forecast

Mathematical and computational methods have gained importance in the public-health domain, especially in epidemic modeling, by providing quantitative analysis in support of the policy-making processes. At the same time, the epidemic modeling metaphor has been introduced to describe a wide array of different phenomena. The spread of information, cultural norms, and social behavior can be all conceptually modeled as a contagion process. Although the basic mechanisms of each phenomenon are different, their effective mathematical description often defines similar constitutive equations and dynamical behaviors framed in the general theory of reaction-diffusion processes. In this lecture I will review the theoretical framework developed in recent years to understand the dynamic of reaction-diffusion processes in expanded schemes that explicitly include the many realistic features that characterize human mobility behavior, and complex interactions patterns. I will also discuss how this framework is at the core of data-driven computational approaches that, through the integration of large-scale data sets and the explicit simulation of entire populations down to the scale of single individuals, are successfully used in the analysis and forecast of real epidemics.

— **Foster Provost** /NEW YORK UNIVERSITY

Predictive Modeling with Social Networks

Over the past decade there has been a surge of interest in methods for analyzing complex social networks: from communication networks, to friendship networks, to professional and organizational networks. For predictive modeling, the dependencies among linked entities in the networks present an opportunity to improve inference about properties of individuals, as birds of a feather do indeed flock together. For example, when estimating whom to target with a product offer, who is likely to leave the organization, who has committed financial malfeasance, and many more aspects of individuals, it often is quite helpful to consider the status of people's friends along these dimensions, and even more interestingly, our predictions about the status of people's friends.

This tutorial will explore the unique opportunities and challenges for predictive modeling with social network data. We will begin with a description of the problem setting, including examples of various applications of social network mining (e.g., targeted marketing, on-line advertising, churn prediction, financial malfeasance, fraud detection). We will then present a number of characteristics of social network data that differentiate them from the traditional settings for inference and learning, and outline the resulting opportunities for significantly improved inference and learning. We will discuss specific techniques for capitalizing on each of the opportunities in statistical models, and outline both methodological issues and potential modeling pathologies that are unique to network data.

The focus in this tutorial will be to cover the basics, to discuss real applications and results where possible, and to provide a framework for understanding the more advanced concepts. We also will provide supplemental material on more advanced concepts, including links to the literature.

**Prerequisites:**

*The tutorial assumes a basic knowledge of statistical inference, predictive modeling, and machine learning.*

# //// Detailed program

## Monday, July 11th

8.00–9.00 Registration

9.00–9.15 Opening

9.15–10.45 Plenary session. Chair: **Alain Barrat**

9.15–10.00 **Alessandro Vespignani**. *From the physics of reaction-diffusion processes in complex networks to infectious disease forecast*

10.00–10.45 **Johan Bollen**. *Quantifying the effects of online social networks on subjective well-being and mental health*

10.45–11.30 Coffee break and poster session

### 11.30–12.30 Parallel Sessions

**LA MAJOR: Theory – 1. Chair: Giovanni Petri**

11.30–11.45 Pablo Jensen, Matteo Morini, Márton Karsai, Tommaso Venturini, Alessandro Vespignani, Mathieu Jacomy, Jean-Philippe Cointet, Pierre Mercklé and Eric Fleury. *Detecting global bridges in networks*

11.45–12.00 Emanuele Cozzo, Guilherme Ferraz de Arruda, Francisco Rodrigues and Yamir Moreno. *Structural transition in multiplex networks triggered by layer degradation*

12.00–12.15 Juan Fernandez-Gracia, Caroline C. Buckee and Jukka-Pekka Onnela. *Flexible network embedding*

12.15–12.30 Roland Bouffanais and David Mateo. *Influence of interaction network topology on the dynamical response of swarming systems*

**MUCEM: Socio & eco networks – 1. Chair: Luca Aiello**

11.30–11.45 Janos Kertesz, Janos Török, Yohsuke Murase, Hang-Hyun Jo and Kimmo Kaski. *What do Big Data tell? Sampling the social network by communication channels*

11.45–12.00 Gerardo Iñiguez, Márton Karsai, Riivo Kikas, Zhongyuan Ruan, Kimmo Kaski and János Kertész. *Global contagion with local cascades: Modelling the slow adoption of technology online*

12.00–12.15 Dina Mistry, Qian Zhang, Nicola Perra and Andrea Baronchelli. *Committed activists and the reshaping of status-quo social consensus*

12.15–12.30 Yannick Léo, Eric Fleury, José Ignacio Alvarez-Hamelin, Carlos Sarraute and Márton Karsai. *Socioeconomic correlations in communication networks*

12.30–14.00 Lunch break and posters

14.00–14.45 Plenary session. Chair: **Alessandro Vespignani**

**Daniela Paolotti**. *Digital traces and participation for forecasting the flu*

### 14.50–15.50 Parallel Sessions

**LA MAJOR: Tutorial. Chair: Ciro Cattuto**

**Foster Provost**. *Predictive Modeling with Social Networks*

**MUCEM: Socio & eco networks – 2. Chair: Pablo Jensen**

14.50–15.05 Manuel Sebastian Mariani, Matus Medo and Yi-Cheng Zhang. *Early identification of high-quality papers*

15.05–15.20 Maxime Lenormand, Thomas Louail, Juan Murillo Arias and José J. Ramasco. *Crowdsourcing the Robin Hood effect in the city*

15.20–15.35 Manuel Jiménez Martín, Javier Rodríguez Larguna and Elka Korutcheva. *Assessing structural balance drive in the evolution of international relationships*

15.35–15.50 Claire Lagesse. *Read Cities through their Lines. How to highlight time in road networks spatiality*

### 15.50–16.30 Coffee break and poster session

### 16.30–17.30 Parallel Sessions

**LA MAJOR: Tutorial. Chair: Ciro Cattuto**

**Foster Provost**. *Predictive Modeling with Social Networks*

**MUCEM: Brain – 1. Chair: Marcel Carrère**

16.30–16.45 David Angulo-Garcia, Joshua D. Berke and Alessandro Torcini. *Cell Assembly Dynamics of Sparsely-connected Inhibitory Networks*

16.45–17.00 Francesca Melozzi, Christophe Bernard and Viktor Jirsa. *The Virtual Mouse Brain*

17.00–17.15 Spase Petkoski, Jean-Jacques Temprado and Viktor Jirsa. *The spatial distribution of time delays determines the synchronization of coupled oscillators*

17.15–17.30 Maria Luisa Saggio, Petra Ritter and Viktor K. Jirsa. *Analytical Operations Relate Structural and Functional Connectivity in the Brain*

### 18.30 Reception at the City Hall



## Tuesday, July 12th

9.15–10.45 Plenary session. Chair: **Yamir Moreno**

9.15–10.00 **Vittoria Colizza** *Vulnerability to infections: applications for risk assessment in infection prevention and control*

10.00–10.45 **Viktor Jirsa**. *The Virtual Brain: biologically realistic network modeling merging structure and dynamics*

10.45–11.30 Coffee break and poster session

### 11.30–12.30 Parallel Sessions

**LA MAJOR: Theory – 2. Chair: Christian Vestergaard**

11.30–11.45 Jose J. Ramasco. *Percolation-based precursors of transitions in spatially extended systems*

11.45–12.00 Filippo Radicchi and Claudio Castellano. *Beyond the locally tree-like approximation for percolation on real networks*

12.00–12.15 Owen Courtney and Ginestra Bianconi. *Generalised Network Structures: The configuration model of simplicial complexes*

12.15–12.30 Giona Casiraghi. *A Broad Class of Ensembles for Real World Networks*

**MUCEM: Socio & eco networks – 3. Chair: Laetitia Gauvin**

11.30–11.45 Moses C. Kiti, Michele Tizzoni, Timothy M. Kinyanjui, Dorothy C. Koech, Patrick K. Munywoki, Milosch Meriac, Luca Cappa, André Panisson, Alain Barrat, Ciro Cattuto and D. James Nokes. *Quantifying social contacts in a household setting of rural Kenya using wearable proximity sensors*

11.45–12.00 Vahan Nanumyan. *Inferring Weighted Signed Relations from Repeated Interactions*

12.00–12.15 Michele Starnini, Mattia Frasca and Andrea Baronchelli. *Group segregation and the emergence of metapopulation structures*

12.15–12.30 Mathieu Génois, Christian Lyngby Vestergaard and Alain Barrat. *Using co-presence as a proxy for contact networks relevant for spreading processes*

### 12.30–14.00 Lunch break and posters

14.00–14.45 Plenary session. Chair: **Ciro Cattuto**

**Luca Aiello**. *Social Networks below the Surface: An Exploration of the Nature of Social Processes*

### 14.50–15.50 Parallel Sessions

**LA MAJOR: Animal Social Networks. Chair: Michele Tizzoni**

14.50–15.05 Nicolas Claidiere, Julie Gullstrand, Aurélien Latouche and Joel Fagot. *Using automatized cognitive testing to analyse the social network of baboons*

15.05–15.20 Matthew Silk, Lucy Steward, Darren Croft, Dave Hodgson, Mike Boots, Dez Delahay and Robbie McDonald. *Dynamic networks and disease across different timescales in a wild animal*

15.20–15.35 Ivan Puga-Gonzalez and Cedric Sueur. *Social Networks in an individual-based model of primate social behaviour*

15.35–15.50 Marijke Rauch, H. Hildenbrandt and C.K. Hemelrijk. *Network analysis of a modelled flock of starlings*

**MUCEM: Multiplex networks. Chair: Manlio De Domenico**

14.50–15.05 Toni Vallès-Català, Francesco A. Massucci, Marta Sales-Pardo and Roger Guimera. *Multilayer stochastic block models reveal the multilayer structure of complex networks*

15.05–15.20 Federico Battiston, Vincenzo Nicosia and Vito Latora. *Rich cores in multiplex networks*

15.20–15.35 Nicole Beckage, Markus Brede and Massimo Stella. *Mental Lexicon Growth Modeling Reveals the Multiplexity of the English Language*

15.35–15.50 Jacopo Iacovacci, Federico Battiston, Vincenzo Nicosia, Vito Latora and Ginestra Bianconi. *Emergence of Multiplex Communities*

### 15.50–16.30 Coffee break and poster session

### 16.30–17.45 Parallel Sessions

**LA MAJOR: Networks and Epidemiology – 1. Chair: Daniela Paolotti**

16.30–16.45 Philipp Hoevel, Florian Fiebig, Hartmut H. K. Lentz and Vitaly Belik. *Controlling contagious processes on temporal networks via adaptive rewiring*

16.45–17.00 Chiara Poletto, Eugenio Valdano and Vittoria Colizza. *Analytical computation of the epidemic threshold on temporal networks: impact of immunity and latency periods*

17.00–17.15 Massimo Stella, Cecilia Andreazzi, Sanja Selakovic, Alireza Goudarzi and Alberto Antonioni. *Parasite spreading in spatial ecological multiplex networks*

17.15–17.30 Rossana Mastrandrea and Alain Barrat. *How to estimate epidemic risk from incomplete contact diaries data?*

17.30–17.45 Eugenio Valdano, Chiara Poletto, Christian Vestergaard, Mathieu Génois, Alain Barrat and Vittoria Colizza. *Assessing the impact of spatial and temporal resolution on spreading potential through data-driven analytical and numerical approaches*

**MUCEM: Brain – 2. Chair: Viktor Jirsa**

16.30–16.45 Tim Kunze, Alexander Hunold, Jens Haueisen, Viktor Jirsa and Andreas Spiegler. *Modeling transcranial direct-current stimulation (tDCS) in a large-scale human brain network model*

16.45–17.00 Sarah Morgan, Sophie Achard and Petra Vertes. *Mapping the motif Pareto space of fMRI brain networks*

17.00–17.15 Giovanni Petri, Francesco Vaccarino and Demian Battaglia. *Homological features of brain functional connectomes show dynamical compensation of age-related structural brain connectomes changes*

17.15–17.30 Mireille Bonnard, Sophie Chen, Jérôme Gaychet, Marcel Carrère, Michael Woodman and Viktor Jirsa. *Resting state brain dynamics and its transients explored with combined TMS-EEG*

17.30–17.45 Manlio De Domenico. *Mapping multiplex hubs in human functional brain network*

## Wednesday, July 13th

9.15–10.45 Plenary session. Chair: **Johan Bollen**

9.15–10.00 **Jari Saramäki**. *Social networks, time, and individual differences*

10.00–10.45 **Tina Eliassi-Rad**. *Sifting through Measures on Networks: From a Theoretical Framework to an Empirical Guide*

10.45–11.30 Coffee break and poster session

11.30–12.30 Parallel Sessions

**LA MAJOR: Networks and Epidemiology – 2.** Chair: **Mathieu Génois**

11.30–11.45 Davide Colombi, David Emmanuel Rivalyn Nakouné Yandoko, Chiara Poletto, Hervé Bourhy and Vittoria Colizza. *On the mechanisms for persistence of the rabies virus (RABV): effects of movement network and incubation period heterogeneity*

11.45–12.00 Kanchan Mopari, Alessio Cardillo, Paolo De Los Rios, Alex Arenas and Jesus Gomez-Gardenes. *To vaccinate or not to vaccinate? A coevolutionary dilemma*

12.00–12.15 Julie Fournet and Alain Barrat. *Epidemic risk from friendship network data: an equivalence with a non-uniform sampling of contact networks*

12.15–12.30 Alexandre Darbon, Chiara Poletto, Sara Andraghetti, Eugenio Valdano, Michele Tizzoni and Vittoria Colizza. *Competing spreading processes on temporal networks*

**MUCEM: Theory – 3.** Chair: **Xavier Leoncini**

11.30–11.45 Geza Odor, Ronald Dickman, Silvio Da Costa Ferreira and Wesley Cota. *Burstiness, localization and Griffiths effects in network models*

11.45–12.00 Sarah de Nigris, Anthony Hastir and Renaud Lambiotte. *Burstiness and fractional diffusion on complex networks*

12.00–12.15 Antoine Moinet, Michele Starnini and Romualdo Pastor Satorras. *Aging effects in percolation processes of Non Poissonian temporal networks*

12.15–12.30 Antonia Godoy, Roger Guimera, Marta Sales-Pardo and Christopher Moore. *Accurate and scalable social recommendation using mixed membership stochastic block models*

12.30–14.00 Lunch break and posters

14.00–14.45 **Springer Complexity Lecture**. Chair: **Alain Barrat**

**Yamir Moreno**. *Contagion Processes on Multilayer Networks*

14.50–15.50 Parallel Sessions

**LA MAJOR: Temporal networks.** Chair: **Jari Saramäki**

14.50–15.05 Victor Ramiro, Emmanuel Lochin and Patrick Senac. *Characterization and Applications of Temporal Random Walks on Opportunistic Networks*

15.05–15.20 Christian Lyngby Vestergaard, Mathieu Génois, Eugenio Valdano and Taro Takaguchi. *Randomization techniques for the analysis of dynamical processes on temporal networks*

15.20–15.35 Anna Sapienza, Laetitia Gauvin and Ciro Cattuto. *Joint Factorization for Analysing Multi-dimensional Data*

15.35–15.50 Ronan Hamon, Pierre Borgnat, Patrick Flandrin and Céline Robardet. *Networks as signals: Extraction of dynamical network structures*

**MUCEM: Biological networks.** Chair: **Chiara Poletto**

14.50–15.05 Sergio Arregui, Fernando Cid, Joaquín Sanz and Yamir Moreno. *Context-specific protein-protein interactions in Mycobacterium Tuberculosis*

15.05–15.20 Soumen Roy. *Novel interdisciplinary applications of network science: From image processing and diagnostics to protein design*

15.20–15.35 Paolo Moretti. *The role of hierarchy in the resilience of biological networks*

15.35–15.50 Somdatta Sinha. *Protein Contact Networks: Structure, Function and Evolution*

15.50–16.30 Coffee break and poster session

16.30–17.15 Parallel Sessions

**LA MAJOR: Theory – 4.** Chair: **Eric Fleury**

16.30–16.45 Ruairidh Clark, Giuliano Punzo, Kristaps Baumanis and Malcolm Macdonald. *Leader Selection for Consensus Speed Optimisation in Weighted k-NNR Networks*

16.45–17.00 Oliver Mülken. *Complex Quantum Networks: From Universal Breakdown to Optimal Transport*

17.00–17.15 Aurélien Decelle and Cyril Furtlehner. *Generalized Belief-Propagation applied to inverse problems, sampling and optimization on complex network*

**MUCEM: Socio & eco networks – 4.** Chair: **Marton Karsai**

16.30–16.45 Matthieu Cristelli. *The Heterogeneous Pathways of Development of Nations*

16.45–17.00 Fabio Saracco, Riccardo Di Clemente, Andrea Gabrielli and Tiziano Squartini. *Detecting the bipartite World Trade Web evolution across 2007: a motifs-based analysis*

17.00–17.15 Andrea Zaccaria, Matthieu Cristelli, Andrea Tacchella and Luciano Pietronero. *How the Network of Products Drives the Economic Development of Countries*

1. Alberto Aleta, Andreia Hisi, Chiara Poletto, Sandro Meloni, Vittoria Colizza and Yamir Moreno. *Persistence of rapidly mutating pathogens on a metapopulation network*
2. Joël Amedon, Joël Fagot, Nicolas Claidière. *Dynamic social network and cognitive performance: a preliminary study in Baboons (Papio papio)*
3. Satish Badepalli and Murat Yuksel. *Universal Power Exponent in Network Models of Thin Film Growth*
4. Federico Botta and Charo I. Del Genio. *Modularity density as a quality function for community detection: a detailed analysis*
5. Andrea Brovelli, Jean-Michel Badier, Francesca Bonini, Fabrice Bartolomei, Olivier Coulon, Guillaume Auzias. *Dynamic reconfiguration of cortico-cortical and cortico-subcortical functional connectivity mediating visuomotor behaviours*
6. Giulia Cencetti. *Control theory of instabilities on complex networks*
7. Nicolás Deschle, Bastian Pietras and Andreas Daffertshofer. *Estimation of relaxation times in coupled finite size oscillatory networks*
8. Francesca Di Patti. *Topology driven pattern on directed networks: a multiple-scale approach*
9. Jan Fousek and Eva Výtvarová. *Temporal networks of dynamical synchronization in neuroimaging data*
10. Frédéric Guinand and Yoann Pigné. *Reachability in Maritime Transportation Networks*
11. Caroline Haimerl, Susanne Reichinnek, Vincent Villette, Rosa Cossart and Arnaud Malvache. *Self-referenced spatio-temporal coding in the hippocampus through speed-modulated theta oscillation*
12. Juan Hernandez and Christian Gonzalez. *Growing model for the supply network in a tourism destination*
13. Laura Hernandez, Stéphanie Saba and Annick Vignes. *Ecological study of Auction and Decentralized Markets. Looking for the social aspect of economic exchanges*
14. Szabolcs Horvát. *Comparing rodent and primate cortical connectomes based on a universal cortical organization principle*
15. Flavio Iannelli, Andreas Koher and Igor Sokolov. *Hidden Pattern Geometries for Epidemics Spreading on Complex Networks*
16. Pablo Jensen, Sébastien Grauwin, Kris Lund and Heisawn Jeong. *Learning about Educational Sciences through network analysis*
17. Guy Kelman, Eran Manes, Marco Lamieri and David Bree. *Missing Data as Part of the Social Behavior in Networks*
18. Yongjun Liao, Wei Du, Márton Karsai and Eric Fleury. *Prepaid or Postpaid? That is the question*
19. Francesca Lipari, Alberto Antonioni and Massimo Stella. *"Keeping up with the Joneses": Investigating peer and sorting effects within an adaptive network model*
20. Xiao Liu, Hai Zhao, Ying Feng, Xuan He, Jin-fa Wang and Rus Hoelzel. *Pine-caterpillar networks in Changbai Mountain based on the space and time influence domain*
21. Daniela Lopez, Patricio Camus, Nelson Valdivia and Sergio Estay. *Dynamics of the degree distribution in ecological networks*
22. David Martínez and Eduardo Mojica. *Entropy Measures in Evolving Networks*
23. Andrea Martini, Alessio Cardillo and Paolo De Los Rios. *Automatic identification of relevant concepts in scientific publications*
24. Cornelia Metzger. *The Needle Sharing Network of Injecting Drug Users and Transmission of Hepatitis C*
25. Gabriel Michau, Patrice Abry, Pierre Borgnat, Nelly Pustelnik, Alfredo Nantes and Edward Chung. *Estimation of Link-Dependent Origin-Destination Matrix for Traffic on Road Networks*
26. Mizuki Oka, Koya Sato, Yasuhiro Hashimoto and Takashi Ikegami. *Emergence of Individuality on Social Tagging Dynamics*
27. Simona Olmi, Alessandro Torcini, Stefano Boccaletti and Adrian Navas. *Dynamics of coupled rotators with unimodal and bimodal frequency distribution*
28. Laurent Perrinet. *Compensation of oculomotor delays in the visual system's network*
29. Daniela Perrotta, Qian Zhang, Corrado Gioannini, Daniela Paolotti, Nicola Perra, Marco Quaggiotto, Michele Tizzoni and Alessandro Vespignani. *Social data mining and seasonal influenza forecasts: the FluOutlook platform*
30. Diane Peurichard. *Modelling of cross-linked fiber networks*
31. Mélodie Sammarro, Anthime Schrefheere, Patrick Biggs, Jonathan Marshall, Jennifer Tate, Murray Cox, Nigel French, Stephen Marsland and Matthieu Vignes. *Challenges and leads for modelling complex molecular biological systems*
32. Rita Sleimen-Malkoun, Dionysios Perdakis, Viktor Müller, Jean-Jacques Temprado and Viktor Jirsa. *How aging shifts brain dynamics from global to local information processing: a study of multiscale variability of EEG Signals*
33. Timo Smieszek, Gianrocco Lazzari and Marcel Salathé. *Assessing the Dynamics and Control of Droplet- and Aerosol-Transmitted Influenza Using an Indoor Positioning System*
34. Sebastian Sosa. *How Social Network Analysis allows a multilevel approach to study animal societies*
35. Andreas Spiegler, Enrique Hansen, Christophe Bernard, Anthony R. McIntosh and Viktor Jirsa. *Stimulation-induced activity in a large-scale human brain network model resolves in the resting state networks*
36. Duc Thi Luu and Thomas Lux. *Randomizing the bipartite Bank-Sector credit networks: The case of Spain*
37. Enrico Ubaldi, Alessandro Vezzani, Marton Karsai, Nicola Perra and Raffaella Burioni. *The interplay between burstiness and social capital allocation in social networks*
38. Ruud van der Weel and Audrey Van der Meer. *An EEG study of differences between three high speeds of simulated forward motion from optic flow in adult participants*
39. Xiaozhu Zhang, Sarah Hallerberg, Dirk Witthaut and Marc Timme. *Impact of Perturbation in Oscillatory Networks*



Sponsored by

---

