

SOE 6: Poster Session

Please note: Posters can and should be on display all day. The poster boards for this session will be on 3rd floor of the HSZ in close location to HSZ03 (where sessions SOE 4 and SOE 5 are held).

Time: Monday 18:00–20:00

Location: P2

SOE 6.1 Mon 18:00 P2

Context sensitive and time resolved relevance of Wikipedia articles — ●ERIC TESSENOW¹, MIRKO KÄMPF², and JAN W. KANTELHARDT² — ¹Institute for Communications Studies, University of Leeds, UK — ²Institut für Physik, Martin-Luther-Universität Halle-Wittenberg

Since the numbers of hypertext pages and hyperlinks in the WWW have been continuously growing for more than 20 years, the problem of finding relevant content has become increasingly important. We have developed and evaluated techniques for a time-dependent characterization of the global and local relevance of WWW pages based on document length, number of links, and cross-correlations in user-access time series. We focus on content and user activity in selected groups of Wikipedia articles as a first application mainly because of data availability. Our goal is the assignment of a ranking value to a hypertext page (node), which covers static properties of the given node and its neighborhood (context) as well as dynamic properties derived from their page-view rates. We show in several examples how this goal can be achieved.

SOE 6.2 Mon 18:00 P2

Energetics of Money — ●STEPHEN I. TERNYIK — POB.201, D82043Munich

The legally requested quantity in the reserve requirement (on demand deposits) of big private banks is the single most effective wave signal of (stock) market price behavior; the whole economic business direction of the private and public banking machinery is moved by the expansion/contraction of liquidity creation/destruction, because banks are not operating in an economic vacuum, but for private and public clients to earn money. The economic wavelength (l) is quantitatively proportional to the liquidity frequency (f); the greater the monetary volume (x) in a wave, the higher its economic frequency. As in this economic system, money (m) is temporal (t) access to energy (e), the cybernetic circuit reads: money/quantizes/energy=energy/quantizes/time=time/quantizes/production (p), i.e. the increasing energy conversion (of nature into needs) quantizes physically the temporal acceleration of economic wave frequency and length. Thus the monetary research goal of sustainable global economics science is to keep $x \sim e$ as constant as possible, so f and l will behave accordingly (reciprocal transduction). Consequently, only a dynamic kind of an efficient narrow banking system can resolve the decisive economic problem between infinite mathematical alchemy and finite biophysical resources.

SOE 6.3 Mon 18:00 P2

Comparison of risk optimized portfolios to the underlying market — ●ALEXANDER ECKROT, JAN JURCZYK, and INGO MORGENSTERN — Universität Regensburg, Regensburg, DE

Optimized portfolios of stocks regarding the mean return and risk were created by means of simulated annealing. The portfolios consist of a few assets out of 111 stocks of the German market. We compare the performance of these portfolios for different optimization parameters. Furthermore the risk of the German stock index DAX will be compared to the risk of the portfolios for different market phases (stable market and crisis). For this comparison, we use two different measurements of risk: the standard deviation and the value at risk.

SOE 6.4 Mon 18:00 P2

Bringing advanced analytics to the business world — ●NIKLAS TEICHMANN and HOLGER HÜRTGEN — McKinsey + Comp. Inc. Düsseldorf

For McKinsey, as a leading strategy consulting company, new challenges arise in an increasingly data-driven world. Topics like ‘Big Data’ and ‘Cloud Computing’ are on everyone’s lips. McKinsey takes more and more advantage of advanced analytic approaches in recent projects. For a few case examples we present how analytical methods and tools can be applied in the business world, generate new insights and lead to lasting impacts for our clients.

SOE 6.5 Mon 18:00 P2

Time-dependent Optimization of the Markowitz Model with Simulated Annealing — ●JAN JURCZYK¹, JOHANNES SCHNEIDER², and INGO MORGENSTERN¹ — ¹Universität Regensburg — ²Universität Mainz

We investigate portfolio properties connected to the Markowitz Model. The introduction of observables other than average return and risk allows us to see a more detailed picture of the modern portfolio theory introduced by Markowitz. This gives us a better understanding of the efficient frontier behavior. We utilize a successful optimization algorithm based on Simulated Annealing and use a similar approach as with spin glass optimization methodology. The time-dependent resolution of the critical points within the optimization process leads to one explanation how financial bubbles can occur in the Mean-Variance Model

SOE 6.6 Mon 18:00 P2

Optimizing the combination of technical indicators for generating optimized stock portfolios — ●THORSTEN REHBERG and INGO MORGENSTERN — Universität Regensburg

We are using Threshold-Accepting for optimizing portfolios with many different indicators from the technical analysis. Therefore we create a cost-function containing 120 technical analysis indicators with different weights. To find the optimal values of these weights, we use a self-learning algorithm, which adjusts these values in such a manner that the resulting portfolios have a huge average return and also a limited risk. Applying these technique to create portfolios with stocks from the DAX, MDAX and S&P500 results in a significant better average performance.

SOE 6.7 Mon 18:00 P2

Modeling long-range dependent inverse cubic distributions by nonlinear stochastic differential equations — ●BRONISLOVAS KAULAKYS, MIGLIUS ALABURDA, and JULIUS RUSECKAS — Institute of Theoretical Physics and Astronomy, Vilnius University, A. Gostauto 12, LT-01108 Vilnius, Lithuania

One of stylized facts emerging from statistical analysis of financial markets is the inverse cubic law for the cumulative distribution of number of events of trades, volatility and of the logarithmic price change. Here we model the long-range dependent inverse cubic cumulative distributions by square multiplicative stochastic differential equations [1] and taking into account a transition from Stratonovich to Ito convention in noisy systems [2] according to Wong-Zakai theorem [3], with decrease of the driving noise correlation time when the market proceeds from turbulent to calm behavior.

[1] B. Kaulakys and M. Alaburda, J. Stat. Mech. P02051 (2009); J. Ruseckas and B. Kaulakys, Phys. Rev. E **81**, 031105 (2010).

[2] G. Pesce et al, Nature Commun. **4**, 3733 (2013).

[3] E. Wong and M. Zakai, Ann. Math. Stat. **36**, 1560 (1965).

SOE 6.8 Mon 18:00 P2

Stochastic Evolution of New York Stock Market Distributions — ●PAULO ROCHA¹, JOAO P. DA CRUZ^{2,3}, FRANK RAISCHEL⁴, and PEDRO G. LIND⁵ — ¹Mathematical Department of Faculdade de Ciências of University of Lisbon, Campo Grande 1749-016 Lisboa — ²Closer Consultoria Lda, Avenida Engenheiro Duarte Pacheco, Torre 2, 14-C, 1070-102 Lisboa, Portugal — ³Departamento de Física, Faculdade de Ciências da Universidade de Lisboa, 1649-003 Lisboa, Portugal — ⁴Instituto Dom Luiz, CGUL, 1749-016 University of Lisbon, Lisbon, Portugal — ⁵ForWind and Institute of Physics, Carl-von-Ossietzky University of Oldenburg, DE-26111 Oldenburg, Germany

Using data from the New York stock market, extracted from the Yahoo platform (<http://finance.yahoo.com>) every 10 minutes since January 2011, we test four different bi-parametric models to fit the correspondent volume-price distributions at each 10-minute lag: the Gamma distribution, the inverse Gamma distribution, the Weibull distribution and the lognormal distribution. In each case, the value of the pair of parameters is recorded, composing a bivariate time-series, which is then analyzed as a stochastic process. Assuming that the evolution of

the two parameters is governed by a two-dimensional coupled Langevin equation, we derive the corresponding drift vector and diffusion matrix, which can then provide physical insight for understanding the mechanisms underlying the evolution of the stock market.

SOE 6.9 Mon 18:00 P2

Dynamics of popstar record sales on phonographic market - stochastic model — ●ANDRZEJ JARYNOWSKI^{1,2}, ANDRZEJ BUDA³, and JAROSLAW KWAPIEN³ — ¹Department of Sociology, Stockholm University, Sweden — ²Smoluchowski Institute of Physics, Jagiellonian University, Cracow, Poland — ³Institute of Nuclear Physics PAN, Cracow, Poland

We investigate weekly record sales of the world's most popular 30 artists (2003-2013). Time series of sales have non-trivial kind of memory (anticorrelations, strong seasonality and constant autocorrelation decay within 120 weeks). Amount of artists record sales are usually the highest in the first week after premiere of their brand new records and then decrease to fluctuate around zero till next album release. We model such a behavior by discrete mean-reverting geometric jump diffusion (MRGJD) and Markov regime switching mechanism (MRS) between the base and the promotion regimes. We can built up the evidence through such a toy model that quantifies linear and nonlinear dynamical components (with stationary and nonstationary parameters set), and measure local divergence of the system with collective behavior phenomena. We find special kind of disagreement between model and data for Christmas time due to unusual shopping behavior. Analogies to earthquakes, product life-cycles, and energy markets will also be discussed.

SOE 6.10 Mon 18:00 P2

N-individual Hawk-Dove games in finite and infinite populations — BINGHUI FAN¹, XINSHENG LIU^{1,3}, ●JENS CHRISTIAN CLAUSSEN^{2,3}, and WANLIN GUO¹ — ¹Nanjing University, China — ²Computational Systems Biology Lab, Research II, Jacobs University Bremen, Germany — ³INB, Universität zu Lübeck, Germany

The Hawk-Dove game has been used to analyze conflicts for resources such as food and habitats. But, in the real world, many contests are activities in which many individuals engage. In this paper, we present an N-individual generalization of the well-known Hawk-Dove game by considering the possible existence of a threshold of the frequency of Hawks in the interacting group above which the Doves get nothing and the Hawks fight for the total resource. When the frequency of Hawks is less than the threshold, the Doves can share a portion of the resource and the hawks fight for the remaining portion. Besides, as the frequency of Hawks increases, the portion of the resource that the Doves can gain decreases sharply according to a nonlinear function. Then we discuss evolutionary dynamics of the N-individual Hawk-Dove games with variation of reasonable range of some significant parameters in both infinite and finite populations. Specially, as for infinite populations, the system will always end up either in full Hawk or in a stable equilibrium where Hawks and Doves coexist. In finite populations, which may exhibit different dynamics, we discuss fixation probabilities and fixation times by analytic and numerical methods. We find that the conditional fixation time exhibits a maximum with respect to the group size or the value-to-cost ratio.

SOE 6.11 Mon 18:00 P2

Spatial constraints and auspicious buying in a self-organized cartel formation model — ●PHILIPP C. BÖTTCHER, TIAGO P. PEIXOTO, and STEFAN BORNHOLDT — Institut für Theoretische Physik, Universität Bremen, Hochschulring 18, D-28359 Bremen, Germany

The decision of the German cartel office to require gas stations to record and release their gas prices to the public sparked considerable interest in the media. We investigated a simple trust game to qualitatively predict the effects of this decision.

In our model, a population of agents is forced to play against each other: Buyers buy from a fixed number of sellers that are chosen dynamically, and sellers can compare their payoff and adapt accordingly. The results for simulations on a globally mixed population [1] showed the existence of a phase transition, observed at a specific value for the strategy update rate, where the spontaneous formation of an effective cartel occurs. This suggested that a cartel can be formed without collusion and may simply be the result of individual payoff maximization. However, the model lacked important ingredients, such as the fact that both buyers and sellers are often constrained to specific geographical locations. To model this effect, we investigated the dynamics of the model on a 2D-lattice and introduced a distance of interaction.

Finally, to model the effect of the global knowledge introduced by a general price list, we added a fraction of buyers who were fully aware of their neighborhood and were therefore able choose the best seller to buy from, instead of comparing with randomly chosen neighbors.

[1] T. Peixoto and S. Bornholdt, Phys. Rev. Lett. 108, 218702 (2012)

SOE 6.12 Mon 18:00 P2

Edge-to-edge relations from failure-induced flow redistribution to identify relations between structure and dynamics in complex networks — MICHAEL T. SCHAUB¹, ●JÖRG LEHMANN², SOPHIA N. YALIRAKI¹, and MAURICIO BARAHONA¹ — ¹Imperial College London, U.K. — ²ABB Switzerland Ltd, Corporate Research, Baden-Dättwil, Switzerland

The structural analysis of complex networks commonly focuses on nodes and corresponding node communities. However, in many dynamical processes on complex networks, e.g., those related to the flow of energy or information, edges play a more prominent role than nodes. In these situations, an analysis based on edge-to-edge relations is more appropriate. Here, we put forward a corresponding approach, which is based on the flow redistribution induced by edge failures [1]. Our method takes into account not only the local coupling between edges but also potential long-range interactions between them. Furthermore, it leads naturally to the concept of an edge embeddedness, which reflects the importance of an edge in weighted cuts of the network. We exemplify the significance of our approach with analyses of the Iberian power grid, traffic flows in road networks and the C. elegans neuronal network.

[1] M. T. Schaub et al., arXiv:1303.6241

SOE 6.13 Mon 18:00 P2

Co-authorship patterns on the scale of network motifs — ●DAVID FABIAN KLOSIK¹, MARC-THORSTEN HÜTT², and STEFAN BORNHOLDT¹ — ¹Institut für Theoretische Physik, Universität Bremen, Hochschulring 18, 28359 Bremen, Germany — ²School of Engineering and Science, Jacobs University Bremen, Campusring 1, 28759 Bremen, Germany

Ever since the seminal philosophical work of Thomas S. Kuhn it is widely accepted that the institutional process of knowledge production, i.e. science, cannot be fully described in purely logical, content-related terms, but has a significant social aspect to it. The recently growing accessibility to aggregated citation information in form of electronic datasets might allow for a quantitative assessment of the social influences. Following the work of Krumov et al. [1] we evaluate network motifs in a co-authorship network constructed from a dataset provided by the American Physical Society, in order to investigate whether there is a correlation between collaboration patterns on the motif scale and the impact of the corresponding papers. We find that care has to be taken when applying motif-based measures to co-authorship networks.

[1] L. Krumov, C. Fretter, M. Müller-Hannemann, K. Weihe, and M.-T. Hütt, Motifs in co-authorship networks and their relation to the impact of scientific publications, EPJ B (84), 535 (2011)

SOE 6.14 Mon 18:00 P2

Boolean networks with veto functions — ●HALEH EBADI¹ and KONSTANTIN KLEMM² — ¹Bioinformatics, Institute for Computer Science, Leipzig University, Haertelstrasse 16-18, 04107 Leipzig, Germany — ²Department of Theoretical Chemistry, University of Vienna, Waehringerstrasse 17, 1090 Wien, Austria

Boolean networks are discrete dynamical systems for modeling regulation and signaling in living cells. We investigate a particular class of Boolean functions with inhibiting inputs exerting a veto (forced zero) on the output. We give analytical expressions for the sensitivity of these functions and provide evidence for their role in natural systems. In an intracellular signal transduction network [Helikar et al., PNAS (2008)], the functions with veto are over-represented by a factor exceeding the over-representation of threshold functions and canalizing functions in the same system. In Boolean networks for control of the yeast cell cycle [Fangting Li et al., PNAS (2004), Davidich et al., PLoS One (2009)], none or minimal changes to the wiring diagrams are necessary to formulate their dynamics in terms of the veto functions introduced here.

SOE 6.15 Mon 18:00 P2

Controlling the collective behavior in the agent-based herding model — ●ALEKSEJUS KONONOVICIUS and VYGINTAS GONTIS — Institute of Theoretical Physics and Astronomy, Vilnius University,

Vilnius, Lithuania

The characteristic feature of the complex socio-economic systems is a tight coupling of the constituent parts. We can see them as generalized agents, which are tightly coupled with other agents via the herding interactions. Previous empirical research, from a point of view of the behavioral biology and sociology (see recent papers by Jens Krauze), has shown that one can use the tight coupling to control the collective behavior of large groups of individuals. In this contribution we approach the same problem from an agent-based modelling point of view. Namely, we study the dynamics of the agent-based herding model in which certain agents are controlled externally.

SOE 6.16 Mon 18:00 P2

Agent Based Model to describe Socio-Technical Regime Changes — •FLORIAN SENGER — Fraunhofer Institut für System- und Innovationsforschung, Breslauer Str. 48, 76139 Karlsruhe

In the work presented here we combined methods from physics of social systems with methods from evolutionary economics to develop an agent-based model that is supposed to mimic the dynamics of regime changes in socio-technical systems.

We therefore modeled the demand side as consumer agents according to a distribution of endowments and needs, connected to each other in a social network, influencing each other in a voter-model-like manner and choosing the technology and company they think suite their needs best. For the supply side we modeled explicit company agents consisting of genes in an evolutionary sense, producing a technology in a quality depending on their particular fitness, taking influence on particular areas of the consumer network via marketing and changing the alleles of their genes by a process of imitating and stochastic innovating, getting feedback on their fitness by the degree of success with the consumers.

We show here the results so far with different realisations of the model, especially different network topologies and give an outlook on how the model will be applied to real case studies.

SOE 6.17 Mon 18:00 P2

Measuring the predictability in social media — •JOSÉ M. MIOTTO and EDUARDO G. ALTMANN — Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

We derive a formula to quantify the predictability of binary events in different systems. We apply it to the problem of predicting whether the attention devoted to social-media items will pass a given threshold (e.g., whether a scientific paper will become more than 1,000 views within 2 months). Results obtained using different prediction factors in four different databases show that increasing the threshold increases the predictability, a surprising results which is interpreted using simple statistical and stochastic models.

SOE 6.18 Mon 18:00 P2

Multi-level multi-channel modeling of human relationship — •JÁNOS TÖRÖK¹, KIMMO KASKI², and JÁNOS KERTÉSZ^{1,3} —

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We present a model of society. Human relations are strengthened by communication and eroded by time. Communication is, in general, related to some social activity (work, friendship, hobby) or social context. Therefore we postulate that individuals having different social needs participate in a number of social contexts (family, workplace etc.) - which may also evolve in time - and communicate with other members of the contexts using different communication channels (face to face, phone, email, etc.) for different purposes and with different impact on their relationship. We show that using realistic input data from surveys and statistical data one can reproduce important features of real society like Dunbar's numbers and their meaning.