Working Group "Young DPG" Arbeitsgruppe junge DPG (AGjDPG)

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Die junge DPG lädt alle Interessierten herzlich zu ihrem Programm auf der Frühjahrstagung 2013 ein. Mit einem bunten Themenmix soll den Teilnehmern ein Einblick in aktuelle Forschungsthemen gegeben und weiterführende Qualifikationen vermittelt werden. So können sich die Teilnehmer am Montagnachmittag über wissenschaftliches Publizieren im Zeitalter der neuen Medien informieren, während an den folgenden Tagen fachbezogene Themen vorgestellt werden. Den Abschluss des jDPG Programms bildet in diesem Jahr der EinsteinSlam der am Donnerstagabend im Audimax stattfinden wird. Bei diesem Wettbewerb wird vom Publikum entschieden welcher Slammer die Physik am besten in 10 Minuten vermitteln kann und die Siegertrophäe, den goldenen Albert, 2013 mit nach Hause nehmen darf.

Overview of Invited Talks and Sessions

(lecture rooms H6, H16, H37, and H44)

Invited Talks

AGjDPG 3.1	Wed	15:00–15:30	H6	**Active Mechanical Processes in Cells and Tissues** — •Frank Jülicher
AGjDPG 3.2	Wed	15:30–16:00	H6	**Cell mechanics: An experimental biophysicist's perspective** — •Jochen Guck

Sessions

AGjDPG 1.1–1.2	Mon	15:30–17:30	H44	**Publishing in the Age of the Internet (joint with BP)**
AGjDPG 2.1–2.9	Tue	9:30–13:45	H16	**Topological Defects in Magnetic Materials: from Devices to Cosmos (PhD-Student Symposium jointly with MA)**
AGjDPG 3.1–3.5	Wed	15:00–16:45	H6	**Biomechanics (joint focused session with BP)**
AGjDPG 4.1–4.7	Thu	9:30–12:30	H37	**Big Data (joint with SOE)**

AGjDPG 1: Publishing in the Age of the Internet (joint with BP)

The two talks by the editors of Physical Review Letters and New Journal of Physics, respectively, will be followed by a general discussion. Organized by Stephan Köhler (jDPG) and Ulrich Schwarz (BP).

Time: Monday 15:30–17:30 Location: H44

Topical Talk AGjDPG 1.1 Mon 15:30 H44
Publishing in Physical Review Letters — •Karsten Kruse — Theoretische Physik, Universität des Saarlandes, 66123 Saarbrücken, Germany

Physical Review Letters (PRL) is the world's foremost physics letters journal, providing rapid publication of short reports of significant fundamental research in all fields of physics. Every year we receive around 12000 manuscripts out of which about 3500 get eventually published in PRL. This talk is intended to provide young scientists a guide for publishing in PRL. I will start by explaining the editorial process and give some practical tips on how to prepare a manuscript for PRL. Finally, I will provide an overview of features that have been put into place during the last years to make PRL's content readily available to the community. These include, for example, the option of open access, support of ORCID, "Suggestions" highlighting articles of special interest, and coverage of selected articles in "Physics", a platform notably designed for young scientists.

Topical Talk AGjDPG 1.2 Mon 16:00 H44
The Opportunities of Open Access Publishing — •Eberhard Bodenschatz — MPI Dynamics and Self-Organization, Goettingen, Germany

In my talk I shall give a review of OA as it has developed over the past years. Then I shall address future opportunities. I shall give special attention to video abstracts, to 'living paper' and novel possibilities for quality control. I shall also discuss the impact factor and other developments one may consider. I shall close my talk with a request for input and suggestions from the audience.

up to 60 min of discussion

AGjDPG 2: Topological Defects in Magnetic Materials: from Devices to Cosmos (PhD-Student Symposium jointly with MA)

Organizers: Sinéad Griffin, Krzysztof Dymkowski, Yaël Birenbaum (ETH Zurich)

No longer a mathematical curiosity, the number of condensed-matter systems exhibiting topological defects is ever increasing. In particular, recently-discovered topological magnetic materials provide an ideal test-bed for understanding the properties and behaviour of these defects. Among these are skyrmions; a magnetic configuration that, like a Mobius strip, contains a twist that cannot be removed. To date skyrmions have been observed in both magnetic and multiferroic systems. In the field of multiferroics, recently discovered vortices in the hexagonal-manganite family have been shown to be topologically protected, and obey the same scaling laws as expected by the formation of topological defects in the early universe. The direct imaging of such defects is enabled by their property of multiferroism - they ferroelectric order is used to visualise the polar domains and defects which then sets the resulting magnetic order. The proposal and discovery of "magnetic monopoles" in spin-ice provides an interesting analog to the magnetic monopoles first proposed by Dirac. These bundles of magnetism, acting like isolated magnetic charges, were subsequently observed in pyrochlore lattices. Not only is the observation and study of these mathematical objects illuminating, it may also have practical application in the field of quantum computation due to their 'topological' robustness. The organizers thank MaNEP for the generous financial support of the symposium.

Time: Tuesday 9:30–13:45 Location: H16

Invited Talk AGjDPG 2.1 Tue 9:30 H16
Skyrmions in magnets — •Maxim Mostovoy — Zernike Institute for Advanced Materials, University of Groningen, The Netherlands

Skyrmions form an important class of topological defects in uniformly ordered states. They emerge in a variety of different physical contexts and have rather unusual properties directly related to their non-trivial topology. First introduced by T. H. R. Skyrme in his unified theory of baryons and mesons, Skyrmions have made their way into condensed matter physics, e.g. as excitations in Quantum Hall ferromagnets and Bose-Einstein condensates. They have been recently observed in a number of helicoidal magnets with non-centrosymmetric crystal lattices, where they play the role of quantized fluxes of effective magnetic field acting on spin-polarized electrons. I will discuss phenomenological description of Skyrmions, microscopic mechanisms for their stabilization in magnetic materials and effects of the coupled dynamics of spins and charges at these topological objects.

Invited Talk AGjDPG 2.2 Tue 10:00 H16
Experimental studies of skyrmions in chiral magnets — •Christian Pfleiderer — Physik Department E21, Technische Universität München, D-85748 Garching, Germany

Present day limitations of information technology involving magnetic materials may be traced to the notion that all magnetic materials known until recently represent topologically trivial forms of long-range magnetic order. Recently the first example of a new form of magnetic order has been discovered, which is composed of topologically stable spin solitons driven by chiral spin interactions – so called skyrmions. The skyrmions known to date display several exceptional properties: a topological winding number of -1 implying great stability, very efficient coupling to the conduction electrons in metallic systems by virtue of Berry phases, very weak pinning by defects and magnetic anisotropies, all paving the way to spin torque effects at ultra-low current densities. I will review the current status of the research on skyrmions and related topological solitons in bulk compounds and thin films, focussing on similarities and analogies with conventional magnetic materials.

AGjDPG 2.3 Tue 10:30 H16
Rotating skyrmion lattices by spin torques and field or temperature gradients — •Karin Everschor-Sitte[1,2], Markus Garst[2], Benedikt Binz[2], Florian Jonietz[1], Sebastian Mühlbauer[3], Christian Pfleiderer[1], and Achim Rosch[2] — [1]Physik-Department E21, Technische Universität München — [2]Institut für Theoretische Physik, Universität zu Köln — [3]Forschungsneutronenquelle Heinz Maier Leibnitz (FRM II), Technische Universität München

Chiral magnets like MnSi form lattices of skyrmions, i.e., magnetic whirls, which react sensitively to small electric currents j above a critical current density j_c. The interplay of these currents with tiny gra-

dients of either the magnetic field or the temperature can induce a rotation of the magnetic pattern for $j > j_c$. Either a rotation by a finite angle of up to 15° or – for larger gradients – a continuous rotation with a finite angular velocity is induced. We use Landau-Lifshitz-Gilbert equations extended by extra damping terms in combination with a phenomenological treatment of pinning forces to develop a theory of the relevant rotational torques [1]. Experimental neutron scattering data on the angular distribution of skyrmion lattices suggest that continuously rotating domains are easy to obtain in the presence of remarkably small currents and temperature gradients.

[1] K. Everschor *et al.*, PRB **86**, 054432 (2012)

AGjDPG 2.4 Tue 10:45 H16

Giant generic topological Hall resistivity of MnSi under pressure — •Robert Ritz[1], Marco Halder[1], Christian Franz[1], Andreas Bauer[1], Michael Wagner[1], Robert Bamler[2], Achim Rosch[2], and Christian Pfleiderer[1] — [1]Physik-Department E21, Technische Universität München — [2]Institut für Theoretische Physik, Universität zu Köln

We report detailed low temperature magneto-transport and magnetization measurements in MnSi under pressures up to $\sim 12\,\mathrm{kbar}$. Tracking the role of sample quality, pressure transmitter, and field and temperature history allows us to link the emergence of a giant topological Hall resistivity $\sim 50\,\mathrm{n\Omega cm}$ to the skyrmion lattice phase at ambient pressure. We show that the remarkably large size of the topological Hall resistivity in the zero temperature limit must be generic. We discuss various mechanisms which can lead to the much smaller signal at elevated temperatures observed at ambient pressure.

15 min. break

Topical Talk AGjDPG 2.5 Tue 11:15 H16

Topological Defects and Quantum Computing — •Simon Trebst — University of Cologne

Topological defects are not only entities of fundamental theoretical beauty, they have also become highly sought-after objects in tabletop condensed matter experiments around the world. Part of their attraction comes from their possibly far-reaching relevance as the elementary building blocks in a topological quantum computer. In this talk, I will introduce the main conceptual ideas underlying these computing proposals and discuss beyond the current experimental status of identifying non-Abelian topological defects a number of possible obstacles that will need to be overcome on the way to build the first topological quantum computer.

Topical Talk AGjDPG 2.6 Tue 11:45 H16

Cosmic strings in multiferroics — •Nicola Spaldin — ETH Zurich, Switzerland

A key open question in cosmology is whether the vacuum contains topological defects such as cosmic strings, believed to have formed as a result of symmetry-lowering phase transitions in the early universe. An inexpensive, laboratory-based route to shedding light on the answer is to test the predicted scaling laws for topological defect formation (the so-called Kibble-Zurek mechanism) in condensed matter systems. Here we show that the multiferroic hexagonal manganite oxides – with their coexisting magnetic, ferroelectric and antiphase orderings – have an appropriate symmetry-lowering phase transition for testing the Kibble-Zurek scenario. We present an analysis of the Kibble-Zurek theory of topological defect formation applied to the hexagonal magnanites, show that the recently observed domain vortex cores are formally topologically protected, and that recent literature data are quantitatively consistent with our predictions from first-principles electronic structure theory. Finally, we explore experimentally for the first time to our knowledge the cross-over out of the Kibble-Zurek regime and find a surprising "anti-Kibble-Zurek" behavior.

AGjDPG 2.7 Tue 12:15 H16

Ferroelectric Vortices in Hexagonal $YMnO_3$ — •Martin Lilienblum — Department of Materials, ETH Zurich

Hexagonal rare earth manganites $RMnO_3$ (R= Sc, Y, Dy-Lu) exhibit an intriguing domain structure with kaleidoscopic intersections of always six individual domains. These ferroelectric vortices can be seen as topological defects that forms while cooling across the ferroelectric phase transition. Topological defect formation is of general interest since, for example, topological defects may have played an important role during the evolution of the early universe. Here we present an experimental study on the stability of the ferroelectric vortices in flux grown $YMnO_3$ single crystals in annealing experiments up to the phase transition temperature of around 1300 K. In a second experiment we studied the dependence of the density of ferroelectric vortices on the cooling rate. In order to ensure the visualization of the true bulk domain structure we performed an elaborate sample processing by annealing, polishing and piezoresponse force microscopy. In a third experiment we studied the progression of the ferroelectric order parameter below the phase transition by optical second harmonic generation.

15 min. break

Topical Talk AGjDPG 2.8 Tue 12:45 H16

Topological physics: from quantum Hall Skyrmions to optical Chern lattices — •Roderich Moessner — Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany

Topological physics as we understand it today started 30 years ago with the experimental discovery of the quantum Hall effects. Here, we discuss the physics of Skyrmions, spin textures in quantum Hall states exhibiting both conventional and topological forms of order in a delicately intertwined way: they combine, in a physically transparent way, fundamental concepts such as topological stability and Berry phase physics. We provide a detailed analysis of Skyrmion lattices for multicomponent quantum Hall systems, such as (bi)layer graphene or multi-valley semiconductors in a magnetic field. We also point out how these results can be used to inspire a robust design strategy for optical topological band structures for use in cold atomic systems.

Topical Talk AGjDPG 2.9 Tue 13:15 H16

Magnetricity and Magnetic Monopoles in Spin ice — •Steve Bramwell — University College London

The analogy between spin configurations in spin ice materials like Ho2Ti2O7 and proton configurations in water ice, H2O, has been appreciated for many years (see Ref. [1] for a review). However it is only in the last few years that this equivalence has been extended into the realm of electrodynamics [2,3]. In this talk I shall describe our recent experimental work that identifies emergent magnetic charges ("monopoles"), transient magnetic currents ("magnetricity") and the universal properties expected of an ideal magnetic Coulomb gas (magnetic electrolyte - "magnetolyte"). These universal properties include the Onsager-Wien effect, "corresponding states" behaviour, Debye-Huckel screening and Bjerrum pairing [4-6]. I will describe experimental results for both traditional spin ice materials (Ho2Ti2O7, Dy2Ti2O7) and a recently discovered system (Dy2Ge2O7).

References:

[1] Bramwell and Gingras, Science, 294 1495 2001 [2] Castelnovo, Moessner & Sondhi, Nature 451 42 (2008) [3] Ryzhkin, JETP 101 481 (2005); [4] Bramwell et al. Nature 461 956 (2009) [5] Fennell et al., & Bramwell Science 326 415 (2009) [6] Giblin, Bramwell et al., Nature Physics 7 252 (2011) [7] Zhou, Bramwell et al., Nat Comm. 478, 1483 (2011)

AGjDPG 3: Biomechanics (joint focused session with BP)

This sessions discusses recent advances in our understanding of the mechanics of cellular systems with the concepts and methods from physics, both from the theoretical and from the experimental points of view. (Organizers Jochen Schneider for jDPG and Ulrich Schwarz for BP)

Time: Wednesday 15:00–16:45 Location: H6

Invited Talk AGjDPG 3.1 Wed 15:00 H6

Active Mechanical Processes in Cells and Tissues — •Frank

Jülicher — Max Planck Institute for the Physics of Complex Systems, Nöthnitzerstrasse 38, 01187 Dresden

Living cells are extraordinarily dynamic and have the ability to generate movements and forces. This is particularly striking in the case of swimming microorganisms or the process of cell division. A key example for force generating processes in cells is the operation of molecular motors that interact with filaments of the cytoskeleton. In the cell, cytoskeletal networks form gel-like materials with unconventional active material properties that are the consequence of force generating processes. Active cellular processes have also interesting effects on larger scales. Tissues are collections of many cells which can also be considered as active media. Active processes in tissues result e.g. from cellular dynamics, cellular force generation and cell division. These processes introduce mechanical stresses and permit active rearrangements and flows in tissues. In recent years it has become increasingly clear that cells and tissues can also respond to mechanical conditions. Furthermore, there is evidence that mechanical feedbacks may be important in pattern formation processes by which complex organisms form in a developmental process from a single fertilized egg cell. Theoretical approaches are important to characterize the principles which govern the behaviors of active biomaterials and the formation of patterns. Furthermore, theoretical descriptions of cell dynamics and multicellular systems provide a key tool to understand complex dynamics observed in quantitative experiments in vitro and in vivo.

Invited Talk AGjDPG 3.2 Wed 15:30 H6

Cell mechanics: An experimental biophysicist's perspective — •Jochen Guck — Biotechnology Center, Technische Universität Dresden, Germany

The mechanical properties of cells are increasingly being investigated and it is well worth taking a closer look why. From a physics point of view, they prescribe the response to external forces and define the limits of a cell's interaction with its three-dimensional physical environment. Largely determined by the cytoskeleton, an internal polymer network regulated by intricate biochemical processes, cell mechanics also has an important biological component. The cytoskeleton is central to many biological functions, evolves during the normal differentiation of cells, and is characteristically altered in many diseases, including cancer. In this presentation I will review this link between physical description and biological function, describe some of the methods to measure cell mechanics and try to communicate the fascination of this topic from a personal point of view.

AGjDPG 3.3 Wed 16:00 H6

Flagellar synchronization independent of hydrodynamic interactions — •Benjamin Friedrich and Frank Jülicher — Max-Planck-Institute for the Physics of Complex Systems, Dresden, Germany

Inspired by the coordinated beating of the flagellar pair of the green algae *Chlamydomonas*, we study theoretically a simple, mirror-symmetric swimmer, which propels itself at low Reynolds number by a revolving motion of a pair of spheres [1]. We show that perfect synchronization between these two driven spheres can result from the motion of the swimmer, which feeds back on the two spheres by local hydrodynamic friction forces. Hydrodynamic interactions, though crucial for net propulsion, contribute little to synchronization for this free moving swimmer. The swimmer design for optimal synchronization reflects a trade-off between the swimmer's ability to move and the premise of broken symmetries required for synchronization. This simple swimmer exemplifies a novel paradigm for hydrodynamic synchronization that could explain flagellar synchronization in *Chlamydomonas*.

[1] B.M. Friedrich, F. Jülicher: Phys. Rev. Lett. **109**, 138102(2012).

AGjDPG 3.4 Wed 16:15 H6

The muscle's force-velocity relation derived from a basic principle — •Michael Günther[1,2,3], Daniel Haeufle[1,2], and Syn Schmitt[1,2] — [1]Universität Stuttgart, Institut für Sport- und Bewegungswissenschaft, Germany — [2]Stuttgart Research Centre for Simulation Technology (SimTech), Germany — [3]Friedrich-Schiller-Universität, Institut für Sportwissenschaft, Germany

In 1938, A.V. Hill extracted from heat and force measurements on frog muscles that the muscle's concentric force-velocity relation is a hyperbola. In 1957, A.F. Huxley published a model that could approximate the Hill relation from assuming eight microscopic parameters describing partly cross-bridge geometry and partly transition rates for cross-bridge attachment and detachment. Other Huxley-type models, using an increasing number of parameters, have been developed since then. In this presentation, we outline a very reduced set of assumptions that is sufficient to derive the Hill relation from the force equilibrium within a simple macroscopic arrangement of mechanical elements and very few further assumptions about the properties of these elements, all based on physiology. With just three elements, incorporating one force-dependent damper, just four mechanical parameters are needed to find a hyperbolic force-velocity relation. A most recent version of our model including a second damping element can even well explain the heat rate-velocity relation, assuming six parameters. From our model, it can be concluded that it might be erroneous to presume that using the isotonic condition guarantees a direct experimental determination of the properties of the active muscle part.

AGjDPG 3.5 Wed 16:30 H6

Dynamics of regenerating tissues under mechanical stress — •Claus Fütterer[1,2], Julia Fischer[1], Kao-Nung Lin[1], and Michael Krahe[1] — [1]Fakultät für Physik und Geowissenschaften, Institut für Experimentelle Physik I, Universität Leipzig, 04103 Leipzig, Germany — [2]ranslationszentrum für Regenerative Medizin (TRM), Universität Leipzig

Hydra vulgaris tissue fragments regenerate and provide an ideal system to study the relation of single cell mechanics to tissue mechanics. We studied tissue toroids with about 1500 cells and studied the overall force fluctuations as well as single cell behaviour. We also applied continuous stress as well as stress pulses to the tissue and investigated the active and passive relaxation and contraction dynamics. We relate the mechanical measurements to the alpha and beta actin structures which form well organized supra-cellular structures responsible for the orchestration of the regeneration process.

AGjDPG 4: Big Data (joint with SOE)

The availability of large-scale data invades all areas of econophysics, sociodynamics, as well as bioinformatics and poses methodical challenges for data analysis, visualization and modeling. This session provides an overview how methods adapted from statistical physics and network analysis deepen the understanding of the interaction of humans through language and social media, their emergent collective behaviour the assessment of risks and the detection of crises. (Session compiled by Kerstin Kämpf, TU Darmstadt and Jens Christian Claussen, U Lübeck.)

Time: Thursday 9:30–12:30 Location: H37

Topical Talk AGjDPG 4.1 Thu 9:30 H37

Physics and the Information Society: Turning Big Data into Big Insight — •René Pfitzner — ETH Zurich, Chair of Systems Design, Switzerland

As of today 2.3 Billion people are online, spend 1 Billion hours on the web, write 400 Mio. tweets and produce a total of 65 terabytes of Facebook content – every day.
Inspired by these impressive numbers, in this talk I will illustrate two main points about "Big Data" research. First, based on examples I will show how the availability of large amounts of "online" data facilitates research to gain insights into "offline" phenomena like disease spreading. Second, I will show that in complex information systems, composed of interacting social and technical components, non-trivial questions about information propagation, the emergence of memes or measuring the relevance of content occur.
I will point to methodologies that have been developed, and continue to

be developed, to cope with these research challenges and opportunities - often inspired by theories well known from the Physics literature.

Invited Talk AGjDPG 4.2 Thu 10:00 H37

Network analysis literacy — •Katharina Anna Zweig — TU Kaiserslautern, Computer Science Department, Graph theory and complex network analysis, Gottlieb-Daimler-Str. 48, 67663 Kaiserslautern, Germany

Big data often comes in a form that relates objects or subjects to each other. Examples for this kind of data describe interactions between proteins or people, plane connections between cities, or references from articles to other articles. Relational data is best analyzed by network analytic measures which have been proven useful in very different disciplines; high hopes have been put in them to finally understand the complex systems surrounding us. While network analysis is often very successful, in this talk I will show that not all relational data should actually be represented as a network and that not all measures are likely to give reasonable results in all contexts. I will discuss the "trilemma of social network analysis" which puts an emphasis on matching the data and its network representation, the method to use, and the question to be answered.

Invited Talk AGjDPG 4.3 Thu 10:30 H37

From Noise to Signal. Stories about big data. — •Sune Lehmann[1], Yong-Yeol Ahn[2], Alan Mislove[3], Jukka-Pekka Onnela[4], and Niels James Rosenquist[5] — [1]Technical University of Denmark, Kgs Lyngby, Denmark — [2]Indiana University, Bloomington Indiana — [3]Northeastern University, Boston, MA, USA — [4]Harvard School of Public Health, Boston, MA, USA — [5]Mass General Hospital, Boston, MA

This talk tells the story of how we used over 300 million tweets (Sep 2006 - Aug 2009) to map the collective mood of the United States. The mood of each tweet was inferred using a simple word-list (ANEW), and the results are represented as density-preserving cartograms. A cartogram is a map in which the mapping variable (in this case, the number of tweets) is substituted for the true land area. Thus, the geometry of the actual map is altered so that the shape of each region is maintained as much as possible, but the area is scaled in order to be proportional to the number of tweets that originate in that region. For the final part of the talk, we will discuss the importance of visualization in analysis of Big Data as well as new developments in the area of Big Data.

AGjDPG 4.4 Thu 11:00 H37

Geopolitical risk-index derived from 60 million news articles predicts war — •Thomas Chadefaux — Chair of sociology, modeling and simulation, ETH Zurich, Clausiusstrasse 50, 8092 Zurich, Switzerland

There have been more than 200 wars since the start of the 20th century, leading to about 35 million battle deaths. However, efforts at forecasting conflicts have so far performed poorly for lack of fine-grained and comprehensive measures of geopolitical tensions. Here, we developed a weekly risk-index by analyzing a comprehensive dataset of historical newspaper articles for 166 countries over the past century, which we then tested on a data of all conflicts within and between countries recorded since 1900. Using only information available at the time, we could predict the onset of a war within the next year with up to 85% confidence; we also forecasted over 70% of large-scale wars, while issuing false alarms in only 16% of observations. Predictions were improved up to one year prior to interstate wars, and six months prior to civil wars, giving policy-makers significant additional warning time.

AGjDPG 4.5 Thu 11:15 H37

Big data; fame and money, box office prediction based on Wikipedia activity data — Márton Mestyán[1], •Taha Yasseri[1,2,3], and János Kertész[1,3,4] — [1]Institute of Physics, Budapest University of Technology and Economics, Budapest, Hungary — [2]Oxford Internet Institute, University of Oxford — [3]Department of Biomedical Engineering and Computational Science, Aalto University, Aalto, Finland — [4]Center for Network Science, Central European University, Budapest, Hungary

Use of socially generated Big Data to predict the collective reaction of individuals in societies to a certain event or product has become of great interest in recent years. In this work [1], we investigate the possibility of making precise predictions for the financial success of movies, by monitoring activity and the traffic on Wikipedia articles on the movies. We consider a sample of 312 movies released in the USA market in 2010, and show that, by using a minimalistic linear regression model, one could easily outperform the existing prediction methods. Our model, free of any content analysis, reaches a coefficient of determination of 0.92, one month prior to the movie release.

[1] Márton Mestyán, Taha Yasseri, and János Kertész, Early Prediction of Movie Box Office Success based on Wikipedia Activity Big Data, preprint available at: arXiv:1211.0970.

Topical Talk AGjDPG 4.6 Thu 11:30 H37

Information Retrieval, Applied Statistics and Mathematics on BigData — •Romeo Kienzler — IBM Innovation Center Zurich, Switzerland

Although the majority of algorithms used for BigData Analytics have been developed decades ago, their application on BigData currently experiences a renaissance. In this talk a selection of algorithms and their application will be discussed in the context of BigData. A set of selected Use Cases in the field of Social Network Analysis, Bioinformatics, Financial Fraud Detection and Information Retrival will be discussed. Besides theoretical viewpoints this talk covers also runtime environments for BigData application and explains concepts of data parallelism, partition skew, aggregated storage to CPU bandwidth and fault tolerance on commodity hardware. Besides the omnipresent MapReduce/Hadoop example, which seems to be the de facto standard, we will also discuss massive parallel data warehousing and stream computing. Finally, a technical outlook tries to separate theory from reality, future from presence and hype from vision.

Invited Talk AGjDPG 4.7 Thu 12:00 H37

Web-Based Cognitive Science: Harnessing the Power of the Internet to Study Human Cognition — •Christopher Y. Olivola — University of Warwick, UK

The Internet provides a unique and powerful tool for the social sciences, allowing researchers to collect data and carry out experiments at scales that were previously unfeasible. So far, web-based social science has mainly focused on aggregate behaviors and large-scale phenomena. In contrast, the enormous potential of the Internet has been much less utilized by behavioral scientists studying individual behaviors and their underlying cognitive processes. In this presentation, I will discuss several examples of how web-based research methods can both aid the study of cognition and directly clarify its contents. In particular, I will highlight 4 distinct ways in which cognitive scientists can utilize the Internet: (1) running web-based experiments with large samples of human participants (at low cost); (2) using online games to collect data from intrinsically motivated participants (for free); (3) studying *naturally* occurring online individual behaviors; (4) measuring the contents of memory and the dynamics of attention over time. I will conclude by discussing how students and researchers with a quantitative background (e.g., physicists) can utilize the web to advance our understanding of human cognition.