Book of Abstracts

CYBEREMOTIONS 2013

Book of Abstracts: CYBEREMOTIONS 2013

Disclaimer

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Welcome

The overall objective of the CYBER **EMOTIONS** 2013 Conference is twofold:

- to present and discuss state of art research related to detection and modelling of emotions observed in social groups communicating by Internet,
- to present results of the 4-year EU Project CYBER **EMOTIONS** (www.cyberemotions.eu), which has produced tools and models of emotional phenomena in e-communities.

We are glad to welcome researchers dealing with computational and mathematical modelling of social processes in which the emotional component plays an important role. The topics of the Conference include:

- collective dynamics of social Web
- sentiment detection and data mining
- emotion modelling
- collective information processing
- propagation of emotional patterns in social media
- applications of sentiment analysis in business, marketing and software development

No need to get emotional about it is a response often heard when trying to calm someone down. But the fact is we **do** need to get emotional. Emotions are the backbone of family life; they enable us to react in dangerous situations; they create the group experience of a football crowd, a pop concert or a historical event. Emotions are part of what makes us human.

With information technology occupying such a central part in all our lives, it's important to ask whether there are emotions in cyberspace too? Since cyberspace is just another human space, it's bound to have an emotional context. However, it possesses special features that make social interactions between people different from those taking place in the offline world. One difference is the often much shorter lifetime of e-communities compared to their offline counterparts. Since participants of internet forums or discussion groups are also less bounded by local social norms, they may interact more quickly and express their feelings more often. The internet, for example, is well-known as a site for the expression of strong emotions, for example in "flaming". It also hosts many environments in which multiple participants engage with others.

What's to be gained by studying such phenomena? Well, firstly understanding how emotions and intuition reach information technology could help us to build better ICT systems. Humans might also benefit from ICT systems that were able to react emotionally and, ultimately, that were sensitive to emotions. More fundamentally, modelling emotions in artificial systems might also add to our understanding of humans at a psychological level. Emotions are complex processes. Behaviour, expression, physiological changes in the brain and in the body at large, motivational processes, and subjective experience are just some of the factors involved. These components are only loosely related (what researchers call 'exhibiting low coherence'). They are constrained by our biology but also constantly shaped and modulated by social and cultural contexts. And there is constant mutual interaction with processes such as attention, perception, and memory. All of this serves to make the study of emotions a challenging field of science.

CYBER **EMOTIONS** is an EU Large Scale Integrating Project within the 7th Framework Programme in FET ICT domain Theme 3: Science of complex systems for socially intelligent ICT. The project associates nearly 40 scientists from Austria (*Österreichische Studiengesellschaft für Kybernetik*), Germany (*Jacobs University* and *Technische Universität Berlin*), Great Britain (*University of Wolverhampton*), Poland (*Warsaw University of Technology* and *Gemius SA*), Slovenia (*Jožef Stefan Institute*), and Switzerland (*ETH Zürich* and *École Polytechnique Fédérale de Lausanne*).

The main objectives of CYBER **EMOTIONS** have been to understand the role of collective emotions in creating, forming and breaking up ICT mediated communities and to prepare the background for next generation of emotionally-intelligent ICT services. Project Partners have collected data on emotions in e-communities and psychophysiological data on emotions evoked by on-line discussions, developed data-driven models of cyberemotions, and created emotion-related software.

The CYBER **EMOTIONS** Project was started in January 2009 and will be completed in May 2013. The present Conference has been organized to demonstrate Project's main results. CYBER **EMOTIONS** met successes in all domains of its activity. Data collected in the Project from blogs, forums, portals, IRC channels, Twitter and MySpace are ranked among "the 70 Online Databases that Define Our Planet". Also several experimental setups provided a microscopic view on affective processes associated with reading and writing contents on the Internet. Our SentiStrength program is considered as a one of the most advanced tools in sentiment detection. Theoretical models based on active agents approach, complex networks and stochastic processes are able to describe several stylized facts for emotional dynamics in social groups communicating by Internet.

Outputs of the Project can be used for creating new affective dialog systems as interactive tools as well as semi-automated simulation of facial expression through a user's 3D avatar that can facilitate the process of the online affective communication. The Project delivered network visualization tools for effective demonstration of emotional contagion processes in social networks. And last but not least, our industrial Partner provides us with diverse opportunities of business commercialization.

More detailed information can be found in the following talks presented by Project Partners and at Project's webpage. In addition, we are very happy to have a number of invited speakers, leaders in the field, who will help to place the research of the CYBER **EMOTIONS** consortium into a wider context. We strongly encourage discussion after each contribution!

I hope that the meeting will present main CYBER **EMOTIONS** achievements and make possible exchange of results related to complementary studies. I wish you successful Conference sessions and pleasant stay at Warsaw University of Technology!

<div style="text-align: right">

Janusz Hołyst
CYBER **EMOTIONS** Coordinator
Conference Scientific Committee Chairman

</div>

Organisers

Conference Scientific Committee

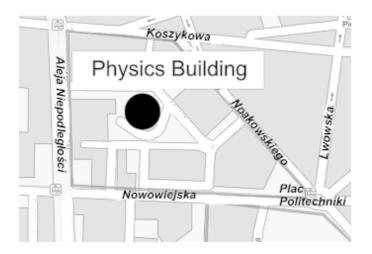- Janusz Hołyst, Chairman (Poland)
- Frank Schweitzer (Switzerland)
- Bosijka Tadic (Slovenia)
- Arvid Kappas (Germany)
- Robert Trappl (Austria)
- Ronan Boulic (Switzerland)
- Matthias Trier (The Netherlands)
- Mike Thelwall (UK)
- Anna Winnicka (Poland)

Local Organising Committee

- Janusz Hołyst
- Anna Chmiel
- Janusz Dębski
- Elżbieta Maślak
- Julian Sienkiewicz

Conference venue:

Conference registration, all lectures, poster session, lunches and conference dinner will take place at the Physics Building, Warsaw University of Technology, Koszykowa 75, **room 111**.

Frame programme

DETAILED SCHEDULE

Time	29th January	30th January
08:30 - 08:45	REGISTRATION	REGISTRATION
08:45 - 09:00	REGISTRATION	REGISTRATION
09:00 - 09:15	CONFERENCE OPENING	David Garcia
09:15 - 09:30	Janusz Hoyst	David Garcia
09:30 - 09:45	Janusz Hoyst	Vladimir Gligorijevic
09:45 - 10:00	Arvid Kappas (INV)	Vladimir Gligorijevic
10:00 - 10:15	Arvid Kappas (INV)	Anna Chmiel
10:15 - 10:30	Arvid Kappas (INV)	Anna Chmiel
10:30 - 10:45	Bernard Rimé (INV)	COFFEE BREAK
10:45 - 11:00	Bernard Rimé (INV)	COFFEE BREAK
11:00 - 11:15	COFFEE BREAK	COFFEE BREAK
11:15 - 11:30	COFFEE BREAK	Renaud Lambiotte (INV)
11:30 - 11:45	Marina Santini (INV)	Renaud Lambiotte (INV)
11:45 - 12:00	Marina Santini (INV)	Krzysztof Kułakowski
12:00 - 12:15	Marina Santini (INV)	Krzysztof Kułakowski
12:15 - 12:30	Mike Thelwall (INV)	Paweł Sobkowicz
12:30 - 12:45	Mike Thelwall (INV)	Paweł Sobkowicz
12:45 - 13:00	Mike Thelwall (INV)	Andrzej Grabowski
13:00 - 13:15	LUNCH BREAK	Andrzej Grabowski
13:15 - 13:30	LUNCH BREAK	LUNCH BREAK
13:30 - 13:45	LUNCH BREAK	LUNCH BREAK
13:45 - 14:00	LUNCH BREAK	LUNCH BREAK
14:00 - 14:15	LUNCH BREAK	LUNCH BREAK
14:15 - 14:30	Magdalena Igras	Junghyun Ahn
14:30 - 14:45	Magdalena Igras	Junghyun Ahn
14:45 - 15:00	Wojciech Jaworski	Junghyun Ahn
15:00 - 15:15	Wojciech Jaworski	Marcin Skowron
15:15 - 15:30	Yamir Moreno (INV)	Marcin Skowron
15:30 - 15:45	Yamir Moreno (INV)	CONFERENCE CLOSING
15:45 - 16:00	Yamir Moreno (INV)	
16:00 - 16:15	Aaron Ben-Ze'ev	
16:15 - 16:30	Aaron Ben-Ze'ev	
16:30 - 16:45	Julian Sienkiewicz	
16:45 - 17:00	Julian Sienkiewicz	
17:00 - 17:15	POSTER SESSION COFFEE BREAK	
17:15 - 17:30	POSTER SESSION COFFEE BREAK	
17:30 - 17:45	POSTER SESSION COFFEE BREAK	
17:45 - 18:00	POSTER SESSION COFFEE BREAK	

SECTION SCHEDULE

Time	29th January	30th January
08:30 - 08:45	REGISTRATION	REGISTRATION
08:45 - 09:00	REGISTRATION	REGISTRATION
09:00 - 09:15	CONFERENCE OPENING	REGISTRATION
09:15 - 09:30	CYBEREMOTIONS PROJECT	OBSERVATIONS OF EMOTIONS IN ON-LINE GROUPS
09:30 - 09:45	CYBEREMOTIONS PROJECT	OBSERVATIONS OF EMOTIONS IN ON-LINE GROUPS
09:45 - 10:00	WHAT ARE EMOTIONS?	OBSERVATIONS OF EMOTIONS IN ON-LINE GROUPS
10:00 - 10:15	WHAT ARE EMOTIONS?	OBSERVATIONS OF EMOTIONS IN ON-LINE GROUPS
10:15 - 10:30	WHAT ARE EMOTIONS?	OBSERVATIONS OF EMOTIONS IN ON-LINE GROUPS
10:30 - 10:45	WHAT ARE EMOTIONS?	COFFEE BREAK
10:45 - 11:00	COFFEE BREAK	COFFEE BREAK
11:00 - 11:15	COFFEE BREAK	SOCIAL GROUPS DYNAMICS (2)
11:15 - 11:30	SENTIMENT AND EMOTION DETECTION (1)	SOCIAL GROUPS DYNAMICS (2)
11:30 - 11:45	SENTIMENT AND EMOTION DETECTION (1)	SOCIAL GROUPS DYNAMICS (2)
11:45 - 12:00	SENTIMENT AND EMOTION DETECTION (1)	SOCIAL GROUPS DYNAMICS (2)
12:00 - 12:15	SENTIMENT AND EMOTION DETECTION (1)	SOCIAL GROUPS DYNAMICS (2)
12:15 - 12:30	SENTIMENT AND EMOTION DETECTION (1)	SOCIAL GROUPS DYNAMICS (2)
12:30 - 12:45	SENTIMENT AND EMOTION DETECTION (1)	SOCIAL GROUPS DYNAMICS (2)
12:45 - 13:00	SENTIMENT AND EMOTION DETECTION (1)	SOCIAL GROUPS DYNAMICS (2)
13:00 - 13:15	LUNCH BREAK	SOCIAL GROUPS DYNAMICS (2)
13:15 - 13:30	LUNCH BREAK	LUNCH BREAK
13:30 - 13:45	LUNCH BREAK	LUNCH BREAK
13:45 - 14:00	LUNCH BREAK	LUNCH BREAK
14:00 - 14:15	LUNCH BREAK	LUNCH BREAK
14:15 - 14:30	SENTIMENT AND EMOTION DETECTION (2)	EMOTION VISUALIZATION AND EMOTIONAL HUMAN-BOT INTERACTIONS
14:30 - 14:45	SENTIMENT AND EMOTION DETECTION (2)	EMOTION VISUALIZATION AND EMOTIONAL HUMAN-BOT INTERACTIONS
14:45 - 15:00	SENTIMENT AND EMOTION DETECTION (2)	EMOTION VISUALIZATION AND EMOTIONAL HUMAN-BOT INTERACTIONS
15:00 - 15:15	SENTIMENT AND EMOTION DETECTION (2)	EMOTION VISUALIZATION AND EMOTIONAL HUMAN-BOT INTERACTIONS
15:15 - 15:30	SOCIAL GROUPS DYNAMICS (1)	EMOTION VISUALIZATION AND EMOTIONAL HUMAN-BOT INTERACTIONS
15:30 - 15:45	SOCIAL GROUPS DYNAMICS (1)	CONFERENCE CLOSING
15:45 - 16:00	SOCIAL GROUPS DYNAMICS (1)	
16:00 - 16:15	SOCIAL GROUPS DYNAMICS (1)	
16:15 - 16:30	SOCIAL GROUPS DYNAMICS (1)	
16:30 - 16:45	SOCIAL GROUPS DYNAMICS (1)	
16:45 - 17:00	SOCIAL GROUPS DYNAMICS (1)	
17:00 - 17:15	POSTER SESSION COFFEE BREAK	
17:15 - 17:30	POSTER SESSION COFFEE BREAK	
17:30 - 17:45	POSTER SESSION COFFEE BREAK	
17:45 - 18:00	POSTER SESSION COFFEE BREAK	
19:30 - 21:30	OFFICIAL DINNER	

Programme

Tuesday, 29 January

CONFERENCE OPENING by the Dean of the Faculty of Physics, Professor Mirosław Karpierz and CyberEmotions Coordinator Professor Janusz Hołyst
Tuesday morning, 29 January, 9:00

The Cyberemotions Project
Tuesday morning, 29 January, 9:15
Room 111

9:15	Oral

Collective emotions in Cyberspace, short review of Cyberemotions Project results

Janusz A. Hołyst

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A short review of the CYBER **EMOTIONS** FP7 EU Integrated Project (www.cyberemotions.eu) will be presented. Special emphasis will be put to the achieved results: in the ICT domain as well as from a theoretical point of view. Moreover the direct applications will be discussed together with plans for the future.

The Project was split into three different layers. The first one was responsible for empirical studies, data collection and algorithmic foundations; the second was focused on the theory of complex systems, data driven simulations, predictions of emotional response and network predictability. The third layer led to ICT outputs. It will be shown how various Workpackages contributed to synergetic gains in the Project.

Several data-driven models will be presented that demonstrate collective character of emotional phenomena in online communities. It will be shown that clusters of emotional posts develop according to a simple statistical law corresponding to preferential growth. The process can lead to emergence of mono-emotional threads when the emotional cluster reaches its critical size. Representatives of minor emotions interact much stronger as compared to emotions that are majority. Negative emotions can boost user activity in online discussions. In the course of time the emotional distribution is thermalized, i.e., corresponding entropy grows up..

What are emotions?
Tuesday morning, 29 January, 9:45
Room 111
Chair: Janusz Hołyst

9:45	Invited oral

The Psychology of (Cyber)Emotions

Arvid Kappas

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Emotions are bodily and social processes that are shaped by cultural influences and biological constraints that are best understood in an evolutionary context. The scientific study of emotions goes back more than a century, but has been consistently hampered by a lack of consensus regarding how to define and how to measure emotion. Obviously, the study of collective emotional processes in Cyberspace depends to a large degree on operational definitions of what constitutes emotions and conventions regarding measurement. This presentation will outline some of the theoretical assumptions regarding what emotions are, how they come about in the individual and in social interaction, and how different affective components, such as feeling, expression, and physiological activation relate to each other.

Emotions are typically conceived of as brief changes (seconds to minutes) in bodily states, in response to external or internal events of personal significance. I will discuss how emotions differ from related concepts, such as attitudes, opinions, and moods. Some emotion theories refer particularly to certain "basic emotions" that are thought to be universal, such as happiness, or anger. In contrast, some researchers argue for a dimensional approach to emotions. Here emotional states are described according to their position in a two- or three dimensional space that includes hedonic valence, arousal, and dominance. This is the framework chosen by the CYBEREMOTIONS consortium. However, due to certain theoretical considerations and recent empirical evidence, we have also considered a bivalent framework, where co-activation of positive and negative states is possible. This has particular consequences for the measurement of emotions from text by sentiment analysis.

Lastly, I will discuss how emotions in the individual may relate to emotions in social interactions at different levels of complexity (such as dyads or triads, small groups, institutions, communities), and how emotion and emotion regulation are best considered together.

10:30	Invited oral

The social sharing of emotion

Bernard Rimé

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Emotion very generally elicits a process of social sharing of emo-

tion. Field studies and experimental research indeed showed that after an emotion, people systematically incline in communicating their experience and the related thoughts and feelings to close persons. This sharing process is modally repeated several times with various persons, and the number of such repetitions increases as a function of the intensity of the emotion. Observational studies revealed that sharing an emotional experience elicits mostly manifestations of empathy and emotional fusion with the listener. Listeners being generally emotionally affected by what they heard, they thereafter incline in sharing it with members of their own networks. The latter often evidence in their turn a similar inclination so that a serial reproduction of the sharing process develops. This leads to a collective propagation of what initially affected only a single member of the community. In this lecture, we will examine the social sharing of emotion and its consequences in a broad collective perspective.

COFFEE BREAK
Tuesday morning, 29 January, 11:15
Main hall

Sentiment and emotion detection (1)
Tuesday morning, 29 January, 11:45
Room 111
Chair: Arvid Kappas

11:45	Invited oral

How Emotional Are Users' Needs? Emotion in Query Logs

Marina Santini

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Emotional behaviour seems to be ubiquitous on the web. Predictably, social media web genres such as tweets, blog posts and blog comments show high emotional involvement. What about other genres on the web? In this talk, the focus is on the search query log genre. According to recent IR research, searchers' behaviour is not only limited to traditional informational, navigational and transactional needs. A novel hypothesis is that the seeking behaviour is driven by emotion. But can emotion be detected by analysing the queries typed by users in a search box? In this talk, I will present the results of some experiments carried out to investigate whether it is possible to identify emotion in the query log genre, and discuss how emotion could be utilized to improve the relevance of retrieved documents in searches. These experiments are part of SearchInFocus, a study centred on search.

12:30	Oral

Social web sentiment strength detection: methods and issues

Mike A. Thelwall

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Within the CyberEmotions project and elsewhere, sentiment analysis methods are being applied to social web data in order to gain insights into the role of sentiment in important events or normal online communication and to understand patterns of user behaviours. This talk will describe sentiment analysis methods that can be applied to social web data and make the case that traditional machine learning approaches can give sub-optimal results by identifying spurious sentiment patterns. The talk will explain how the sentiment strength detection program SentiStrength works and how it has been adapted for different social web environments, such as those where negativity or positivity are common, for topics for which key phrases with unusual sentiment meanings are common, and for ongoing communication where patterns of sentiment exchanges between participants can be harnessed to improve sentiment predictions. The talk will be primarily based on the papers below.

1. Thelwall, M. & Buckley, K. (in press). Topic-based sentiment analysis for the Social Web: The role of mood and issue-related words. *Journal of the American Society for Information Science and Technology*.

2. Thelwall, M., Buckley, K., & Paltoglou, G. (2012). Sentiment strength detection for the social Web. *Journal of the American Society for Information Science and Technology*, 63(1), 163-173.

3. Thelwall, M., Buckley, K., & Paltoglou, G. (2011). Sentiment in Twitter events. *Journal of the American Society for Information Science and Technology, 62(2),406-418*.

4. Thelwall, M., Buckley, K., Paltoglou, G., Cai, D., & Kappas, A. (2010). Sentiment strength detection in short informal text. *Journal of the American Society for Information Science and Technology*, 61(12), 2544–2558.

LUNCH BREAK
Tuesday afternoon, 29 January, 13:15
Main hall

Sentiment and emotion detection (2)
Tuesday afternoon, 29 January, 14:15
Room 111
Chair: Bernard Rimé

14:15	Oral

Dynamics of emotions in voice during real-life arguments

Magdalena Igras

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Speech, inherently including vocal sygnalization of affect, is the most natural way of communication. As the state-of-art automatic speech recognition systems become more accurate and more commonly used, the bimodal approach to the modelling emotions in speech, based on both acoustic and linguistic cues, seems to become reasonable.

The research concerns the issues of automatic detection of emotions based on vocal cues. The problem of emotions recognition in speech signal is introduced and most popular algorithms of temporal and spectral features extraction as well as classification methods are presented. The description of vocal emotions models in affective space (regarding intensity, arousal, valence) is analyzed. Furthermore, the problems determining the efficiency of voice emotion recognition are discussed.

The dynamics of emotions in authentical real-life situations was analyzed on case studies. A set of recordings selected from TV talk-shows, politicians sessions, interviews, call center conversations and recording of massive multiplayer online role playing games with voice interface were used for voice analysis. The common feature of the recordings was the gradually growing conflict between interlocutors.

Using fusion of temporal and spectral methods, the acoustic parameters of emotional speech were computed for each of the interlocutors within the conversations. The increase of arousal of the conflicts was monitored by the changes of the crucial parameters of speech. On that basis, the evolution and grading of emotional states during conversation is modelled and the visualisations will be presented.

14:45	Oral

Application of semantic spaces to sentiment analysis for words

Marcin Tatjewski, Wojciech P. Jaworski

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We propose a novel approach to mining opinion data from large scale text corpora using semantic modeling. The objective of the presented method is to determine numeric, real-valued sentiment scores for words within a text corpus. Our technique consists of two main stages: 1st is generation of a semantic space over a given corpus; 2nd is construction of a regression model over the generated semantic space using a non-binary (higher cardinality) sentiment lexicon as a source of training data. As semantic spaces we name high-dimensional matrix methods of representing semantic relations in text, such as Hyperspace Analogue to Language or Latent Semantic Analysis. For our need we applied the Correlated Occurrence Analogue to Lexical Semantics method, which proven to be especially successful in synonymy detection task. The main learning algorithm we used for constructing regression models was Support Vector Machine, which we tested with several different kernels. Linear Regression and kNN were used as benchmarks. For the purpose of our method evaluation, we tested the proposed approach on the American National Corpus and the sentiment lexicon we applied was the SentiStrength's lexicon.

Results of our computational experiments were analyzed using both standard measures and novel measures that we designed specifically for evaluating methods of this type. Obtained results prove that it is possible to extract sentiment from semantics using the proposed technique. Future perspectives for the introduced method are promising, as its complexity and dependence on resources gives several opportunities for enhancements. Particularly, consideration of other non-binary sentiment lexicons like MPQA Subjectivity Lexicon or SentiWordNet and also lexicon preprocessing steps might significantly improve the future outcome.

Our research was inspired by tools and tasks that were introduced to us by psychologists. They wanted to analyze emotional value of words in text even when sentiment was not expressed explicitly. Our method provides possibility to obtain comparable sentiment values for even common words like: man, woman, church, government, abortion, taxes etc. While similar problems were already considered in the past, semantic space modeling was rarely used for solving them, what also constrained the use of advanced machine learning tools.

Social groups dynamics (1)
Tuesday afternoon, 29 January, 15:15
Room 111
Chair: Krzysztof Kułakowski

15:15	Invited oral

Online Networks and the Diffusion of Protests.

Yamir Moreno

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Undoubtedly, online social networks have an enormous impact on opinions and cultural trends. Also, these platforms have revealed as a fundamental organizing mechanism in country-wide social movements. Recent events in the Middle East and North Africa (the wave of protests in the Arab world), across Europe (in the form of anti-cuts demonstrations or riots) and United States (the OWS movement) have generated much discussion on how digital media is connected to the diffusion of protests. In this talk, we investigate the mechanisms driving the emergence, development and stabilization of unrest movements in Spain and the USA by analyzing data from Twitter. Messages related to the protests are analyzed at both static and dynamic levels. We show that the online trace of the protests provides a unique opportunity to tackle central issues like recruitment patterns, information cascades and their spatiotemporal dynamics. Our findings shed light on the connection between online networks and social movements, and offer an empirical test to elu-

sive sociological questions about collective action.

16:00   Oral

The impact of cyberspace upon current society

Aaron Ben-Ze'ev

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Many of the activities that occur in current society are done in cyberspace, which is increasingly playing an ever more central role in shaping this society. Three of the major aspects of cyberspace that have become evident in this society are: (a) egalitarianism, (b) flexibility of boundaries, and (c) greater romantic freedom. These aspects contribute to making current society very exciting.

Egalitarianism. Cyberspace eradicates many social constraints, particularly differences in status. Theoretically, in the new current society everyone can have equal access and everyone is treated equally, regardless of personal characteristics. Current society is a huge commune—a kind of mentally nude commune. People feel increasingly less inhibited about stripping off their mental masks and unloading their secret desires. This does not mean that personality differences disappear completely; however, their impact is considerably reduced.

Flexibility of boundaries. Cyberspace involves many experiences of crossing boundaries. Openness, which is an important aspect of cyberspace implies boundary deregulation. Since the activities in cyberspace cut across territorial borders, the feasibility and legitimacy of laws based on geographic boundaries is undermined. One significant boundary that can collapse in current society is the line between our private and public lives.

Greater romantic freedom. Lovers in the current society enjoy greater freedom and greater alternatives than ever before in history. This freedom makes their lives more complex. The abundance of alternatives and the perpetual possibility of finding something "better" undermine commitment. The greater number of alternatives in current society might help many people in finding their true love, but will frustrate many others who would be better off compromising on their existing relationship, even if it does not fulfill their dreams. Current society is likely to experience an increase the number of international, intercultural, and interreligious marriages, ultimately modifying global social norms—in the main, making them more flexible.

Future society

The test of future current society will be whether they can complement ordinary romantic activities, just as the telephone complements ordinary social activities, or whether they will merely replace these activities with less valuable ones, as the television frequently has done.

16:30   Oral

Online discussions modelled by an evolving Ising-like dynamics

Julian M. Sienkiewicz, Janusz A. Hołyst

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We present and exactly solve a one-dimensional model for emotional online discussions basing on the Ising-like asymmetrical and evolving dynamics.We restrict ourselves only to interactions with last message's emotions and study the dependence of the chain's average motion $<e>$ on external field h (community tendency toward a selected valence) and temperature T (uncertainty of the emotion). This leads us to an observation of three distinct phases - the first, where discussion evolution is determined by its beginning only, the second, in which the mostly observed emotion is coping the external influence, a finally, the third one, where the outcome is subject to fluctuations. The phases are separable with respect to the parameter that copies participant's uncertainty about their emotional behaviour.

POSTER SESSION & COFFEE BREAK
Tuesday afternoon, 29 January, 17:00
Main hall

17:00   Poster   1

Fluctuation-dissipation relations in physiological data collected during emotional stimulation

Jan Chołoniewski[1], Anna Chmiel[1,2], Janusz A. Hołyst[1,2]

1. *Warsaw University of Technology, Faculty of Physics, Koszykowa 75, Warszawa 00-662, Poland* **2.** *Warsaw University of Technology, Centre of Excellence for Complex Systems Research, Koszykowa 75, Warszawa 00-662, Poland*

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We present results of our search for fluctuation-dissipation relations in physiological data (i.e. phasic skin conductance, facial EMG). Data comes from experiments that were performed in the frame of Cyberemotions project and concerns people's emotions observed during experiencing emotional stimuli (i.a. IAPS images). For the sake of this study, we also tried out several approaches for quantifying response function and fluctuations in physiological signals. Because of signals' nonlinearity and non-stationarity part of fluctuations analysis was based on time-frequency methods and signals decomposition (such as Empirical Mode Decomposition, Discrete Wavelet Transform).

17:00	Poster	2

Noise enhances information transfer in hierarchical networks

Agnieszka Czaplicka[1], Janusz A. Hołyst[1], Peter M A Sloot[2,3,4]

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We study the influence of noise on information transmission in a form of packages shipped between nodes of hierarchical networks. Numerical simulations are performed for artificial tree networks, scale-free Ravasz-Barabási networks as well for a real network formed by email addresses of former Enron employees. Two types of noise are considered. One is related to packet dynamics and is responsible for a random part of packets paths. The second one originates from random changes in initial network topology. We find that the information transfer can be enhanced by the noise. The system possesses optimal performance when both kinds of noise are tuned to specific values, this corresponds to the Stochastic Resonance phenomenon. There is a non-trivial synergy present for both noisy components. We found also that hierarchical networks built of nodes of various degrees are more efficient in information transfer than trees with a fixed branching factor.

17:00	Poster	3

Viral spread with or without emotions in online community

Andrzej Jarynowski[1,2], Jarosław Jankowski[3], Anita Zbieg[4,5]

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We propose an approach to modeling the behavior of online community exposed on external impulses. The results presented based on online multilayer system observation. We run experiments, where we introduced viral to system and agents were able to propagate it. There were two modes of experiment: with or without award. Dynamic of spreading both of virals were described by epidemiological model and diffusion. We found that speed of propagation is much faster than natural disease and can be understand more like planned, terrorist attack. On the other hand such a process has something in common with super-diffusion. Results from experiment were compared with real propagation process – spontaneous organization against ACTA. During general-national protest against new antypir-acy laws – ACTA, members of chosen community could send such a anty-ACTA viral. In this scenario, we are able to capture behavior of society, when real emotion play a role, and compare results with artificiality conditioned experiments. Moreover, we could measure effect of emotions in viral propagation.

17:00	Poster	4

Modeling of scientific paradigms spreading

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Recently a simple model was introduced [Phys. Rev. Lett. 106 058701 (2011)], which attempts to describe the process of emergence, expansion and decline of scientific ideas. It is an agent-based model, which takes into account the agents' memory. Possible interactions between the agents are defined by the interaction network. We try to develop an analytical description of the dynamics, in the case of two competing ideas, considering different topologies of the interaction networks (including homogeneous networks, such as the chain graph, as well as heterogeneous networks, e.g. Barabási-Albert graphs). We examine the pace of an innovative idea expansion, as well as the time after which a new idea replaces the old one. Our analytical results agree with the results of the simulations.

17:00	Poster	5

Cyberemotions in the Laboratory

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Building models of how emotions spread over the Internet requires certain assumptions what actually happens within the nodes that compose a network: Individuals. Does reading an emotional post of another person who is not known to the reader create emotions? Are the emotions experienced by sender vs. receiver the same, or can they be complementary? One of the assumptions of appraisal theory is that the elicitation of emotions is dependent on personal relevance – does that mean that propagation of emotions online requires shared personal relevance?

In our laboratory we have created several experimental situations that provide a microscopic view on some of the affective processes that are associated with reading and writing contents on the Internet either in asynchronous contexts, such as forums, or synchronous contexts, such as chats. We have assessed subjective experience, facial responses, and physiological activation associated with the autonomic nervous system. Our findings support the notion that emotions can travel from person to person and seem to be moderated by psychological constructs, such as relevance or social relationships, but they do not depend on them.

17:00	Poster	6

Temporal characteristics of human dynamics in virtual world

Olesya Mryglod[1], Michael Szell[2], Yurij Holovatch[1], Stefan Thurner[3,4]

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The modern computational social science incorporates the new approaches for studying of society [1]. Using the so-called digital footprints (recorded data about human actions: e-mail activity, mobile calls, purchases with credit cards etc.), it is possible to quantitatively analyse the individual and collective behavior patterns in order to get some new knowledge about the general `rules' which govern the society. Playing online games offer an example of well-documented collective human activities [2]. Here, we analyse the temporal characteristics of players behaviour in the free massive multiplayer online browser game. Having the data for more than 17,000 players, we build and analyse the distributions of interevent times between their consecutive actions on the amalgamated collective and individual levels. Some features of these distributions reflect the well-known real-life phenomena, such as circadian and weekly cycles or bursts of activity which follows the important events in the world. The peculiarities of different kinds of actions cause the differences between the corresponding interevent times distributions. The distinctions between dynamics of highly active players and whose with just small number of actions are shown as well. [1] Lazer D. et al., Computational Social Science, SCIENCE, 2009, vol. 323, 721-723. [2] Szell M., Thurner S., Measuring social dynamics in a massive multiplayer online game, Social Networks, 2012, vol. 32, 313-329.

17:00	Poster	7

Emotional clusters observed in Internet communities

Tomasz Ryczkowski[1], Anna Chmiel[1,2], Janusz A. Hołyst[1,2]

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We present an analysis of Internet users' behaviour based on the study of a set of four million comments from two services: BBC Forum and DIGG. Each of the comments was processed using sentiment analysis classifiers to determine its emotional valence (positive, negative or neutral). We propose two new versions of emotional clusters which are an extension of the definition introduced in the paper [1] to quantify the collective character of expressed emotions. The new clusters take into account the existence of noisy comments with mistakenly classified emotional valenciese.

The presence of noise changes distributions of cluster lenghts. Additionally, we suggest a simple analytical model describing emergence of noisy clusters.

[1] A. Chmiel, J. Sienkiewicz, M.Thelwall, G.Paltoglou, K. Buckley, A. Kappas, J. A. Hołyst Collective emotions online and their influence on community life, PLoS ONE 0022207 (2011)

17:00	Poster	8

Correlational analysis between Web search queries and currency market conditions

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This study considers correlation between collective emotion and currency exchange rates. Recently, search queries are easily obtained from Web search companies such as Yahoo, Google, and so forth. The relationship between word frequencies and currency exchange rates (volatility) has been studied. However, the study on the number of quotations and transactions is few at this moment. In this study, we use high-resolution interbank market data and investigate correlation between the number of quotations (transactions) and specific word frequencies obtained from Google Trends.

17:00	Poster	9

Sentiment and activity analysis of Manchester United football forum

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We present an analysis of dynamics of discussions on web forums related to football. The data are users' text comments from various forums threads. We collected them and classified as positive (1), negative (-1) and objective (0). After averaging in time windows we received two kinds of time series describing average emotional value and number of comments in a time interval (intensity of discussion). The data set was extracted from an unofficial Manchester United forum, where club's fans can discuss topics dealing with sport, football and their favourite Premier League club. We concentrated on one part of forum called Matchday Forum, where Match Threads exist. Every thread is devoted to another MU match. We studied how a goal during the match affects the forum dynamics. A large increase of intensity of discussion is observed after goals scored or lost and a decrease average emotional value - after lost goals. We show that relaxations relative changes of these observables can be described by power law functions.

17:00	Poster	10

Big emotions in microblogging

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The presented poster shows an application of opinion mining algorithms to identify emotional climate accompanying social events. Researchers have analyzed positive and negative sentiment in comments on Polish Twitter from year the 2012. The aim of the analysis is to identify positive and negative "buzz" related to the most important events in Poland during mentioned period. Intensity of positive and negative sentiment has been analyzed in time and in relation to users. Researchers try to answer the questions: what were the happiest and saddest moments during past year in Poland, what were the moods on weekdays and weekends, what is the relation between seasons of the year and sentiment in tweets and what is the general attitude toward reality of Twitter users.

BREAK
Tuesday evening, 29 January, 18:00

DINNER
Tuesday evening, 29 January, 19:30

Wednesday, 30 January

REGISTRATION
Wednesday morning, 30 January, 8:30
Lobby

Observations of emotions in on-line groups
Wednesday morning, 30 January, 9:00
Room 111
Chair: Yamir Moreno

9:00	Oral

A modelling framework for collective emotions in online communities

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Collective emotions in online communities can be triggered by external events, but also can emerge from the interaction of many individuals. These collective emotional states can appear faster and have different properties than in offline interaction. The emotional expression left by millions of Internet users allows us to quantitatively study emotions at a large scale, but the dynamical explanation for the way they emerge and evolve requires additional work. We present our modeling framework for collective emotions in online communities. This framework allows us to design and analyze agent-based-models that reproduce collective emotions in different online communities. These models provide a link between macroscopic emotional behavior, and the dynamics of psychological states under microscopic user-to-user interaction. We empirically test the assumptions of this framework in experimental setups, measuring individual emotion dynamics through physiological signals, and self-assessment of emotions. We illustrate two applications of our framework to two very different online communities. Our first model focuses on emotions in product reviews communities, reproducing the empirical distribution of emotions towards products in Amazon.com. The second model reproduces the emergence of collective emotional persistence and long-range interactions in real-time IRC chatrooms. We summarize by discussing further applications of our approach to model emotions in Open Source Software projects.

9:30	Oral

Patterns of Online Chats with Emotional Bots: Data Analysis and Agent-Based Simulations

Vladimir Gligorijević[1], Milovan Šuvakov[2], Marcin Skowron[3], Bosiljka Tadić[1]

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We analyse the data of online chats in the presence of bots, which are collected from IRC channels and from several experimental situations as well as from the agent-based simulations. The network mapping reveals the structure of social grouping of the users that can be related with the contents and emotion carried by the exchanged messages between the users and the users with the bots. Furthermore, considering the time series of messages by individual users we observe a typical patterns of communications with the emotional bots. With the help of the agent-based modeling we explore the mechanisms of emotion spreading among users and potential of the emotional bots to influence the course of the dynamics.

10:00	Oral

Transition due to preferential cluster growth of collective emotions in online communities

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We consider a preferential cluster growth in a stochastic model describing the dynamics of a binary Markov chain with an additional long-range memory. The model is driven by data describing emotional patterns observed in online community discussions with binary states corresponding to emotional valencies. Numerical simulations and approximate analytical calculations show that the pattern

of frequencies depends on a preference exponent related to the memory strength in our model. For low values of this exponent in the majority of simulated discussion threads both emotions are observed with similar frequencies. When the exponent increases an ordered phase emerges in the majority of threads, i.e. only one emotion is represented from a certain moment. Similar changes are observed with increase of a single-step Markov memory value. The transition becomes discontinuous in the thermodynamical limit when discussions are infinitely long and even an infinitely small preference exponent leads to ordered behavior in each discussion thread. Numerical simulations are in a good agreement with approximated analytical formula. The model resembles a dynamical phase transition observed in other Markov models with a long memory where persistent dynamics follows from a transition to a superdiffusion phase. The ordered patterns predicted by our model have been found in Blog06 dataset although their number is limited by fluctuations and sentiment classification errors.

COFFEE BREAK
Wednesday morning, 30 January, 10:30
Main hall

Social groups dynamics (2)
Wednesday morning, 30 January, 11:00
Room 111
Chair: Peter Richmond

11:00	Invited oral

Psychological Aspects of Social Communities

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Social Network Analysis has often focused on the structure of the network without taking into account the characteristics of the individual involved. In this work, we aim at identifying how individual differences in psychological traits affect the community structure of social networks. Instead of choosing to study only either structural or psychological properties of an individul, our aim is to exhibit in which way the psychological attributes of interacting individuals impacts the social network topology. Using psychological data from the myPersonality application and social data from Facebook, we confront the personality traits of the subjects to metrics obtained after applying community detection algorithms to the social neighborhood of the subjects. Amongst others, we observe that introverts tend to have less communities and hide into large communities, whereas extroverts tend to act as bridges between more communities, which are on average smaller and of varying cohesion.

11:45	Oral

The Simmel effect and babies names

Małgorzata Krawczyk, Antoni Dydejczyk, <u>Krzysztof Kułakowski</u>

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Simulations of the Simmel effect are performed for agents in a scale-free social network . The social hierarchy of an agent is determined by the degree of her node. Particular features, once selected by a highly connected agent, became common in lower class but soon fall out of fashion and extinct. Numerical results reflect the dynamics of frequency of American babies names in 1880-2011.

12:15	Oral

A new model of individual opinion dynamics based on information and emotions

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We present a new model of individual opinion changes dependent on the emotional state of interacting agents and their information about the issue in question [1]. The model is a simple, yet nontrivial and flexible representation of individual attitude dynamics that can be used for agent based simulations in a variety of social environments. The model is a discrete version of the cusp catastrophe model of opinion dynamics in which information is treated as the normal factor while emotional arousal (agitation level determining agent receptiveness and rationality) is treated as the splitting factor. Both variables determine the resulting agent opinion, which itself can be in favor of the studied position, against it, or neutral. The communication between the agents is via messages, so that the model is potentially applicable in a wide range of situations. The simplest version of the model uses fully deterministic microscopic dynamics, with predetermined transition table between the different agent states. Even such model shows a lot of similarity with real social situations, as well as phenomena interesting from the modeling point of view, for example the presence of metastable states. A more advanced version includes probabilistic approach to generation of agitated states when people of different opinions interact and a gradual decay of emotional arousal when there are no activities that stir the emotions. As an example of the model application, we study the dynamics of a set of agents in a simple, fully connected communication topology. Such choice allows to focus on the effects of the individual opinion dynamics, and to look for stable final distributions of agents with different emotions, information and opinions. Even for such simplified system, the model shows complex behavior, including phase transitions due to symmetry breaking by external propaganda. The model indicates that in certain communication environments (e.g. internet based communities) the emotional arousal resulting from exposure to contrarian views may effectively block opinion changes. This would induce the observed stability of opinions - despite the fact that the traditionally recognized mechanisms, such

as selective exposure and focus on intra-group interactions are absent or negligible. Many discussion environments are actually based on the contacts between conflicted groups, yet there are no signs that discussions lead to opinion changes [2,3]. The model provides a psychologically plausible and mathematically treatable approach to this phenomenon. [1] Sobkowicz, P. Discrete Model of Opinion Changes Using Knowledge and Emotions as Control Variables PLoS ONE, 2012, 7, e44489 [2] Sobkowicz, P. & Sobkowicz, A. Properties of social network in an Internet political discussion forum Advances in Complex Systems, 2012, 15, 1250062 [3] Sobkowicz, P. & Sobkowicz, A. Two-Year Study of Emotion and Communication Patterns in a Highly Polarized Political Discussion Forum Social Science Computer Review, 2012, Online first, DOI: 10.1177/0894439312436512

12:45	Oral

Human behavior in online social networks

Andrzej Grabowski

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The aim of this work is to present a data set describing human behavior in four different social networks and to introduce a simple model of the evolution of individuals (taking into account eg. lifespan) in online social networks. The first one is a large social network of an Internet community (Skyrock), which consists of 10^7 individuals. The Skyrock project started in 2002 at www.skyrock.com. Since then, it has grown into a social phenomenon well known mainly among French-speaking Internet users. Each user of Skyrock can write a blog with an unlimited number of posts, which others can comment on.

The second system under investigation is LastFM – a music community server or, to be more precise, its part known as the Audioscrobbler project which was launched in 2002. Like in the other systems discussed here, there is one server connected to the Internet, on which user accounts are registered. There are about 1×10^6 users of this system. Its special plug-in, an important part of the system, is installed into a music player application (e.g., winamp) It sends information about every song played by users to the Audioscrobbler server. Data thus gathered are used to find users with similar music tastes: people with similar tastes in music and who listen to the same songs are presented and recommended to users who can see this information on their personalized website via a web browser. People with similar taste in music can meet one another and make friends (mutual consent is required) and/or gather in groups (according to music genre, favorite performers, etc.). The users' activity can be calculated eg. by the number of songs played over time.

The third system described in this paper is a booklovers' system Shelfari. Shelfari is a website server similar to LastFm. Users can create accounts obtaining in this way their personalized website where they can create virtual shelves with books which they enjoy. The system recommends users to one another according to similar tastes and books read, it shows other people's opinions about various books, and makes it possible to create or join groups.

The fourth system under investigation is XFire. It is a gamers' community program similar to Internet chat systems integrated with almost all popular computer games. People who are playing a game do not need to quit it to chat with people who are doing something else at that moment because XFire makes it possible to talk inside games via a special chat window. People who like to play computer games use this application to maintain contact with other players even when they are not playing any game or are playing two games at the same time. XFire gives each user their own web space with their statistics (i.e., overall time played, list of friends). Information about overall playing time can be considered an indicator of human activity.

Online communities offer a great opportunity to investigate human dynamics, because so much information about individuals is registered in databases. To analyze to what extent people are interested in using a web-service over time, we studied the creation date and the last login date registered in a database. The lifespan of an individual T_L is defined as the number of days from the time the individual was added to the database (i.e., a user account was created) to the date of the last logging in, i.e., to the last activity of the user in the system. It should be noted that such definition of a lifespan makes it possible to eliminate the influence of users who drop out of the system.

We have shown that users' behavior in different social systems does not differ much: the distributions of parameters describing users' activity x in the system have the form

of the power law. The value of an exponent depends on the type of activity. Similar behavior is observed in the activity of individual agents in online auctions (the distribution of the total number of bids placed by the same agent follows the form of the power law), in the activity of 24×10^7 users of the Microsoft Messenger instantmessaging system (the number of logins per user follows the form of the power law) and in the number of posts per blog (the data set of 45×10^3 blogs was analyzed). We have investigated the relationship between x and time. In none of the systems did the power-law relationship have values of exponents greater than one. This indicates that in most cases users lose interest in their activity in online systems over time and become less and less active. The power-law form of distributions and time development of users in the systems under investigation and other results indicate that such a scaling law is common in human dynamics and should be taken into account in models of the evolution of social systems and of human activity. Moreover, it was recently found that the heavy-tailed distribution of the intercontact times between susceptible and infected individuals has a significant influence on the spreading of computer viruses. We suggest that our results concerning human behavior can have a significant influence on the dynamic phenomena in complex networks (e.g., rumor propagation or opinion formation).

LUNCH BREAK
Wednesday afternoon, 30 January, 13:15
Main hall

Emotion visualisation and emotional human-bot interactions
Wednesday afternoon, 30 January, 14:15
Room 111
Chair: Mike Thelwall

14:15	Oral

Facial asymmetry and affective communication in 3D Online Virtual Society

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The affective communication in cyber-world is widely spread through the internet mostly in textual form. From the user's point of view this text-based information may hinder smooth communication arising difficulties to understand exact meaning or subtle change of mood and situation. In this context, the authors believe that a semi-automated simulation of facial expression through a user's 3D avatar can facilitate the process of the online affective communication. More specifically, we exploit the aspect of facial asymmetry, which can efficiently convey the mixed feelings of the user.

In order to achieve this goal, we first designed and developed a prototype online virtual society, where the users can meet, chat and transfer emotions through their own 3D avatar. This environment is accessible by a common web browser, where the virtual world and network connections were built on top of the Unity game engine. During the conversation the facial expression are simulated automatically by the Valence-Arousal-Dominance values generated from the text message or manual input.

For the asymmetry, the left and right hand sides of the face are controlled independently. Based on the psychological findings, the left side of face takes charge of direct and intuitive emotional feeling. On the other hand, the right side of face is more controlled and restricted due to the social conventions. Extracting this complex information is somehow a big challenge. However, as the first step, we concentrated our approach in two different ways: (1) ambivalent face editing for mixed feeling; and (2) asymmetric face control by a left/right bias parameter. We also created a set of words which are related to the asymmetric expressions for direct use in case of appearance in the sentence.

In the future, we plan to evaluate the meaningful asymmetric parameters that help users to easily understand the context of emotional conversation. The plausibility of the asymmetric facial animation will be also explored by an evaluation conducted in the proposed online virtual society.

14:45	Oral

Affective Dialogue Systems and Beyond - Interacting with Collective Emotions in E-communities

Marcin Skowron, Stefan Rank

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Interaction mediated through the Internet is changing the ways in which people connect, communicate, and share information and emotions. At the same time, this enables studies of these processes hitherto impossible by acquiring large, content-rich, highly interconnected data-sets that enable both quantitative and qualitative analysis on an unprecedented scale. The ongoing evolution of Internet services and of the ways in which we use them in daily life influences not only our interaction patterns but also our susceptibility to the communicated content, including our emotional responses.

In this paper, we cover how interactive affective systems can be used to study the genesis and the influence of collective emotions in online communication, progressing from one-on-one scenarios to ones that entail modelling of more complex, multi-agent communication processes. The presented approach is supplementary to automatic sentiment classification and data-mining of users' posts in online social media. The introduction of affective dialog systems as interactive tools enables to extend the scope of analysis both qualitatively, i.e., by engaging users in follow-up dialogs, and quantitatively, i.e., by reaching the usually silent majority: users who normally refrain from voicing their opinion in asynchronous online channels. In this paper we also give an overview of useful methods for affect detection and user modelling in the context of affective dialog management. Further, we present experimental settings for our interactive affective systems and corresponding results. We conclude by discussing the relation between the acquired insights and a general framework for modelling the role of collective emotions in ICT-mediated communication channels.

Conference closing by Janusz Hołyst
Wednesday afternoon, 30 January, 15:45

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