Book of Abstracts

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Speaker: **Arató Miklós** (ELTE TTK, arato@math.elte.hu)
Author(s): Miklós Arató * (ELTE), Lajos Katona (OEP), Zsolt Abonyi-Tóth (Szent István Egyetem)
Title: Factors influencing mortality in schizophrenics – A skizofrének mortalitását befolyásoló tényezőkről
Abstract: "It is a generally recognized fact that mortality among schizophrenic patients is significantly higher than among the general population. Article [1] first examined the effects of various medicines on mortality in a large schizophrenic population. Although this research is considered fundamental, a very large amount of criticism has been levied against its methodology (see, for example, [2]). In the current study, we use the daily medication and mortality data of all diagnosed schizophrenics in Hungary. In contrast with study [1], we examine the effects of interruptions in medication, as well. The fact that it is not known what medicines are taken while hospitalized, however, represents a separate problem; therefore we calculated the likelihood of death, hospitalization and cessation of medication separately. Herein we introduce our first results and the models used.

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[2] Marc de Hert, Cristoph U. Correll, Do antipsychotic medications reduce or increase mortality in schizophrenia? A critical appraisal of the FIN-11 study, Schizophrenia Research, 117 (2010) 68-74.

* The Project is supported by the European Union and co-financed by the European Social Fund (grant agreement no. TAMOP 4.2.1/B-09/1/KMR-2010-0003)."

Speaker: **Bánkuti Gyöngyi** (Kaposvári Egyetem, bankuti.gyongyi@ke.hu)
Author(s): Dr Bánkuti Gyöngyi
Title: About the step functional regression – A lépcsősfüggvényes regresszióról
Abstract: "Methodology of COCO Component-based Object Comparison for Objectivity, or Similarity Analysis - has been developed by László Pitlik, and frequently used by his team at Szent István Universty Gödöllő – inspired me to investigate the generalization of linear regression using step functions. First I want to introduce the details and even the mathematical (linear and nonlinear programming) models of this „combinatorial" classification datamining method. Than the generalization idea of linear regression and its linear or nonlinear programming models as well. I use a simple example to show all the details of these methodologies, made by a student in 2009 in Gödöllő.

[1] Pitlik L.: Automated Generating of problem-specific Function for Forecasting and Decision Making orig.: Automatisierte Generierung problemspezifischer Prognosefunktionen zur Entscheidungsunterstützung, Wissenschaftlicher Fachverlag, Giessen, Germany ISBN 3-928563-60-2, 1993

[2] Pitlik László: Hasonlóságelemzés a gyakorlatban, KOINE Innovációs Szaklap, p. 1

[3] Vincze Tímea: Prémiumkategóriás szemes kávék összehasonlító tesztje, Gazdaságinformatika II. Egyéni feladat Szent István Egyetem, Gödöllő, 2009.

[4] Bánkuti Gy. - Pitlik L. : About the method of Component-based Object Comparison for Objectivity, International Congress of Mathematicians, 19-27, August 2010, Hyderabad, India

[5] Hazai és nemzetközi vállalkozások innovációs potenciáljának számítása hasonlóságelemzéssel Vezércikk: 2011. június (MIAU No. 154.) - Pitlik László (MIAU)"

Speaker: **Bátfai Norbert** (Debreceni Egyetem Informatikai Kar, batfai.norbert@inf.unideb.hu)
Author(s): Bátfai Norbert, Terdik György, Ispány Márton
Title: Simulations in the European football and building of FerSML Supporter Avatars – Szimuláció a futballban és a FerSML szurkolói avatárok építése
Abstract: "We are developing a simulation based decision making support expert system for coaching staffs of professional football teams. The FerSML (Footballer and Football Simulation Markup Language) platform is a pillar of this development. In the terminology of the platform FerSML, the notion of avatars simply means a collection of observed and measured soccer data which are important from the point of

view of sport science and simulation. In this lecture some proposed or investigated simulation models will be presented, with particular stress on using a ported version of the sophisticated software environment of the RoboCup 2D Soccer Simulation that is also may be suitable for fulfilling our sport-science purposes.

Speaker: **Bátkai András** (ELTE TTK Matematikai Intézet, batka@cs.elte.hu)
Author(s): András Bátkai, Petra Csomós, Bálint Farkas
Title: Operator splitting for distributed delay equations
Abstract: "We provide a general product formula for the solution of nonautonomous abstract delay equations. After having shown the convergence we obtain estimates on the order of convergence for differentiable history functions. Finally, the theoretical results are demonstrated on some typical numerical examples.

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Bátkai, A., Csomós, P., Farkas, B., Operator splitting for nonautonomous delay equations, Computers & Mathematics with Applications, 2012, doi:10.1016/j.camwa.2012.05.001

Bátkai, A., Csomós, P., Farkas, B., Nickel, G., Operator splitting for non-autonomous evolution equations, J. Funct. Anal. 260 (2011), 2163–2190. doi:10.1016/j.jfa.2010.10.008"

Speaker: **Békési József** (SZTE JGYPK, bekesi@jgypk.u-szeged.hu)
Author(s): Viktor Árgilán, János Balogh, József Békési, Balázs Dávid, Gábor Galambos, Miklós Krész, Attila Tóth
Title: Optimization possibilities for public transportation using mathematical methods – Tömegközlekedés optimalizálási lehetőségei matematikai eszközökkel
Abstract: "A közlekedési társaságok számára lényeges szempont a költségeik csökkentése, amit legkönnyebben a műveleti költségek csökkentésével valósíthatnak meg. A tömegközlekedésben ez a járművek optimalizált ütemezése segítségével valósulhat meg. Az optimalizálás nagyon komplex feladat, ezért a műveletek ütemezését három fázisra bontva tárgyaljuk, amelyek a járműütemezés, vezetőütemezés és vezetőbeosztás. A nagyméretű problémát, azaz a hosszú távú optimalizálás feladatait napi feladatokra bontjuk, majd a különböző típusú napokra egyenként megoldjuk. Az egyes járatokat azután az őket ellátó fordákba soroljuk, és ezekhez rendeljük a járművezetőket. Jelen előadásban ismertetjük a buszütemezési probléma általunk tanulmányozott megoldásának módszerét. A járművezetők ütemezési feladatának (vehicle scheduling problem, VSP) megoldására a Kliewer és társai által javasolt idő-tér hálózati modellt (time-space netwrok, TSN) alkalmaztuk. Ennek bemutatásán túl az előadásban kitérünk a gyakorlatban felmerülő speciális problémák kezelési lehetőségeire, valamint a vezetőütemezés egyes kérdéseire."

Speaker: **Benczúr A. András** (MTA SZTAKI, benczur@sztaki.hu)
Author(s): András A. Benczúr
Title: Hyperlink Analysis: when Matrix Algorithms meet Big Data
Abstract: "PageRank and HITS are ranking algorithms over ""Big Data"": the Web hyperlinks as a graph. PageRank is a random walk that has a surprisingly simple analysis for speed of convergence that also explains why PageRank expresses centrality. HITS is known to prefer dense subgraphs, a fact that has less known consequences in the spectrum of the adjacency matrix and also explains why spectral partitioning considered hard in social networks.

Behind all these fact we find surprisingly simple mathematics that were perhaps overlooked in early publications and noone published them since. The answers yield not just new insights but also practically important ""Big Data"" algorithms."

Speaker: **Benedek Csaba** (MTA SZTAKI, bcsaba@sztaki.hu)
Author(s): Csaba Benedek

Title: Multi-Level Visual Inspection of Printed Circuit Boards with Marked Point Processes – Nyomtatott áramkörök többszintű minőségvizsgálata Markovi pontfolyamatokkal
Abstract: "In this talk we introduce an automated Bayesian visual inspection framework for Printed Circuit Board (PCB) assemblies, which is able to simultaneously deal with *various shaped* Circuit Elements (CE) on multiple scales. We propose a novel *Hierarchical Multi Marked Point Process* (H^MMPP) model for this purpose, and demonstrate its efficiency on the task of solder paste scooping detection and scoop area estimation, which are important factors regarding the strength of the joints. A global optimization process attempts to find the optimal configuration of circuit entities, considering the observed image data, prior knowledge, and interactions between the neighboring CEs. The computational requirements are significantly reduced by a data driven stochastic entity generation scheme. The proposed method is evaluated on real PCB data sets containing 125 images with more than 10.000 splice entities.

References:

Cs. Benedek, O. Krammer, M. Janóczki and L. Jakab: „Solder Paste Scooping Detection by Multi-Level Visual Inspection of Printed Circuit Boards", *IEEE Trans. on Industrial Electronics*, in press 2012

Cs. Benedek, „Detection of Soldering Defects in Printed Circuit Boards with Hierarchical Marked Point Processes," *Pattern Recognition Letters*, vol. 32, no. 13, pp. 1535-1543, 2011"

Speaker: **Bertok Botond** (Pannon Egyetem , bertok@dcs.uni-pannon.hu)
Author(s): Botond Bertok
Title: Optimization in Supply-Chain Design and Operation by P-graphs: Success Stories – Optimalizálás P-gráfokkal ellátási lánc tervezésben és üzemeltetésben: Sikertörténetek
Abstract: The approach based on the P-graph framework appears to be the only one capable of executing process-network optimization giving rise to an algorithmically and mathematically proven solution for all steps involved, comprising superstructure generation, construction of the mathematical model, optimization, and the solution interpretation. P-graph-based algorithms and the related software are effective for enumerating feasible structural alternatives, as well as determining the optimal or n-best solutions from various aspects, e.g., cost, deadline, and reliability. The present paper shows various applications of the P-graph framework to supply-chain design and operation from conceptual design of chemical plants to vehicle routing and employee assignment. The proposed approach is to be illustrated by success stories. Besides optimization problems and solution methods the paper involves a brief summary of the IT environment required for computer-aided decision support of at multiple levels of the supply chain.

Speaker: **Bihary Zsolt** (Morgan Stanley, zsolt.bihary@ms.com)
Author(s): Zsolt Bihary
Title: Stock price dynamics driven by fear and greed
Abstract: Geometric Brownian motion is a good starting point for modeling stock price dynamics. We will generalize this model, incorporating effects of fear and greed. The proposed dynamics gives rise to asymmetric return distributions, bubbles, crashes and defaults.

Speaker: **Csajbók Zoltán Ernő** (Debreceni Egyetem Egészségügyi Kar, csajbok.zoltan@foh.unideb.hu)
Author(s): Zoltán Ernő Csajbók, Tamás Mihálydeák, József Ködmön
Title: Applying Partial Approximation of Sets to Medical Diagnosis Support
Abstract: "Due to the extreme complexity of human body, uncertainty, imprecision and incompleteness are inherent features of medical data being available to physicians about their patients. There are many classic approaches and techniques which deal with such type of data, e.g., Bayes' theorem, Dempster-Shafer theory of evidence, etc. In the early 1980's, Z. Pawlak proposed a new method called the rough set theory which has extensive applications, among others, in artificial intelligence, cognitive sciences and medicine. Our study, first, presents a generalization of the rough set theory called the partial approximation of sets. Then we construct a tool-based approximation framework based on partial approximation of sets which is applied to medical diagnosis support. Within this framework, patients having hypo-

thyroidism/hyperthyroidism can be evaluated with respect to the clinical symptoms which may indicate hypothyroidism/hyperthyroidism.

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Ladenson P, Kim M. Thyroid. In: Goldman L, Schafer AI, editors. Goldman's Cecil Medicine. 24th ed. Philadelphia, Pa: Saunders Elsevier; 2011:chap 233. "

Speaker: **Erdős Gábor** (MTA SZTAKI, gabor.erdos@sztaki.hu)
Author(s): Dr Gábor Erdős
Title: Inverz kinematikai feladat megoldása minta egyenletekkel
Abstract: Inverz kinematikai feladatnak nevezik a karos mechanizmusok modellezésének azt a problémáját, amikor a mechanizmus vezérelt koordináta keretének pozíciója és orientációja adott és meg kell határozni a hozzá tartozó vezérelt tengelyek pozícióját. Ezen inverz kinematikai feladat megoldása ekvivalens egy speciális trigonometrikus egyenletrendszer megoldásával. A feladat megoldására mind numerikus mind zárt algebrai megoldása lehetséges. Előadásomban az inverz kinematikai egyenletek szimbolikus zárt alakú megoldásával foglalkozom egy iteratív mintaegyenlet illesztési módszer segítségével.

Speaker: **Erdős Péter L.** (Rényi A. Matematikai Kutatóintézet, erdos.peter@renyi.mta.hu)
Author(s): Péter L. Erdős
Title: Genomic distance and a tree-covering problem – Genomok távolsága és egy fafedési probléma
Abstract: "In computational biology there are several well-known methods to determine the (DNA-based) evolutionary connections among different species.

When the species under scrutiny are closely related then one well-studied approach is to determine their *genomic distance* based on the relative positions of their identical (or closely related) genes in highly conserved genome segments.

There are several models to define such distances. The pioneering work here is due to Hannenhalli and Pevzner (Transforming Men Into Mice, in *Proc. 36th Ann. Symp. Found. Comput. Sci.*, (FOCS'95) (1995), 581–592). The *double cut and join* model is based on a collection of slightly stronger operations (Bergeron, Mixtacki and Stoye: A Unifying View of Genome Rearrangements, *WABI'06* (2006), 163–173). These more ""powerful"" operations provide a faster and easier computable algorithm to determine the genetic distance in this new model. This distance is not quite equal to the original one - however the two are connected through a linear parameter. Moreover the running time of the new algorithm is linear. (Bergeron, Mixtacki and Stoye: A new linear time algorithm to compute the genomic distance via the double cut and join distance, *Theor. Comput. Sci.* **410** (2009), 5300–5316).

The last step in this new algorithm depends on covers of a vertex-colored (graph-theoretical) tree with

minimal cost colored paths. There are at least three (published) problematic attempts to determine this latter parameter. At last it was done properly by Erdős, Soukup and Stoye (Balanced vertices in trees and a simpler algorithm to compute the genomic distance, *Appl. Math. Letters* **24** (1) (2011), 82–86).

In this lecture we will describe the genomic distance problem and the competing models, furthermore analyze the tree covering problem."

Speaker: **Fath Gabor** (Morgan Stanley , gabor.fath@ms.com)
Author(s): Gabor Fath
Title: Simulating diffusion equations with Monte Carlo methods
Abstract: Stochastic differential equations, and diffusion equations in particular, play an important role in modeling financial derivatives. In some cases these equations can be treated analytically, but in general the solution involves numerical methods. In the talk, I will present a Monte Carlo simulation algorithm, which allows us to get rid of one of the sources of systematic numerical errors in other standard methods, namely time discretization. The purpose of the talk is to illustrate a promising mathematical technique, and does not expect or rely on any sophisticated financial knowledge of the audience.

Speaker: **Fazekas Zoltan** (Számítástechnikai és Automatizálási Kutatóintézet (MTA SZTAKI), zoltan.fazekas@sztaki.mta.hu)
Author(s): Alexandros Soumelidis, Zoltán Fazekas, Ferenc Schipp
Title: Surface representation using argument transformed radial Chebyshev polynomials – Felületreprezentáció módosított radiális Csebisev-polinomokkal
Abstract: "Real optical surfaces, be they manufactured (e.g., a curved mirror in a telescope), or natural (e.g., living human cornea) – are often characterized by representations based on orthogonal systems of functions (e.g., Zernike, generalized Zernike, radial Bhatia-Wolf-, radial Chebyshev polynomials) over the unit disk. In ophthalmological practice, the Zernike coefficients computed for corneal surfaces are used frequently [1]. Recently, an application-dependent modification of the radial orthogonal system constructed from the even Chebyshev-polynomials of the second kind (in radial direction) and from the trigonometric system (azimuthally) was proposed for the concise description of corneal surfaces [2]. The modification involves radial tuning of the radial Chebyshev-polynomials and results in a system of functions with functions that are orthogonal with respect to a chosen application-dependent weight-function. The surfaces detected, measured in the given application field can be represented in the new system in a concise manner. In order to compute the surface representation according to the new system, the surface needs to be sampled, or re-sampled, over a well-defined set of grid points – over the unit disk – that depends on the chosen reference surface. The surface is approximated as a weighted finite sum of the new orthogonal radial functions. Over grid points the approximation is exact, between grid points interpolation is achieved via the argument transformed continuous Chebyshev-polynomials.

In the lecture, representations of cornea-like surfaces are shown for an advantageous and for a disadvantageous choice – in the context of ophthalmological modelling and measurements – of reference surface. The reference surfaces used in the experiment are a spherical calotte (similar to an "average" human cornea) over the unit disk and a cone over the unit disk, respectively. The error functions – corresponding to approximations using polynomials of different degrees – are shown for both reference surfaces.

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Speaker: **Fenyvesi Dániel** (Óbudai Egyetem , fenyvesi.daniel@bgk.uni-obuda.hu)

Author(s): Daniel Fenyvesi
Title: Design and numerical investigation of an axial flow fan blade with sweep – Nyilazott lapátozású axiális átömlésű járókerék számítása és numerikus vizsgálata
Abstract: "A cikk nyilazott lapátalakot eredményező tervezési eljárást ismertet, amely a változó cirkuláció módszerén [1], továbbá a Lieblein-diffúzió szám [2] (DF) sugár menti tervezési előírásán alapul. A tervezési végső DF eloszlást, iteratív módszerrel, a jóság-tényező bevezetésével, és a 3D súrlódásos lapátrács áramlás numerikus (CFD) vizsgálata segítségével határozom meg. A 2D tervezésből származó metszetek 3D-felfűzése, előre nyilazott belépőélt eredményez a lapátvégen és hátranyilazottat a lapáttőnél. A kilépőél nem kap nyilazást. A tervezési módszer alapján szerkesztett nyilazott járókerék, eltér az irodalomból ismert nyilazási módszerektől [3]. A nyilazott lapátozás, a kiindulási – sugár mentén állandó húrra és DF-re tervezett - referencia lapátozáshoz [4] képest, nagyobb össznyomás különbséget produkál, lapáttő leválás kiterjedése mérsékeltebb a szívott oldalon, ugyanakkor a lapátvég felé az áramvonalak rendezettebbek, ami mérsékeltebb szekunder hatásra utal. Lapáttő és lapátvég profil szíváscsúcs kisebb, és a nyomás eloszlás egyenletesebb a lecsökkent tervezési diffúzió szám és a nyilazás következtében. A kedvezőbb lapátvég profil nyomáseloszlás miatt a lapátrés áramlás mérsékeltebb, Vena Contracta csak a referencia járókerék esetén figyelhető meg.

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Speaker: **Fridli Sándor** (ELTE, IK, fridli@inf.elte.hu)
Author(s): Sándor Fridli
Title: ECG processing by rational functions – EKG feldolgozás racionális függvényekkel
Abstract: "The aim of this talk is to present a new transformation technique in ECG processing. We give a summary on the results ([3], [4], [5], [7], [8], [9]) reached by the research group at ELTE, IK, Department of Numerical Analysis in this connection. Transformation methods (see e.g. [1]) such as Fourier-, wavelet- and other transforms turned to be very effective in ECG analysis in many respects. What we apply is a collection of systems of rational functions. This idea was inspired basically by the similarity of the shapes of simple rational functions and the P, T waves and the QRS complexes The later ones correspond to the usual medical segmentation of the signal within one heartbeat. In our model the rational system according to which the decomposition is performed may vary from heartbeat to heartbeat. Therefore in the orthogonal decomposition not only the coefficients but also the system itself is optimized. In the talk we address several questions including orthogonal, biorthogonal systems, system optimization, discretization, QRS modeling etc. For testing we have used the databank in Physionet [6] available at http://www.physionet.org/. We also note note that rational systems have been successfully used in several other areas, in particular in system- and control theories ([2], [9]).

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Speaker: **Fülöp András** (University of Debrecen Faculty of Informatics, fulibacsi@gmail.com)
Author(s): András Fülöp
Title: A Biological Driven Method for Correlation Clustering – Korreláció klaszterezés egy biológiai indíttatású módszer segítségével
Abstract: "Many applications use the benefits of partitioning data points into clusters. Correlation clustering is a clustering method which originates from document clustering. The problem was introduced Bansel, Blumand Chawla [1] and proved to be NP-complete in the same paper. Correlation clustering can be viewed as a graph partitioning problem in which each connection is labelled + (similar) or components. In correlation clustering,unlike a large portion of clustering algorithms, the number of clusters is not specified. The goal is to partition the nodes into clusters of similar nodes. There are several existing algorithms for correlation clustering ([2], [3], [4]). In this paper we introduce a method with which the correlation clustering problem can be solved. The algorithm is based on a biological optimalization method, the ant system method introduced by Dorigo, Maniezzo, and Colorni in an early report [6], and motivated by the work of Liu and Fu who utilized a similar algorithm for clustering problems [5]. In the paper we discuss our solution and results including comparisons with other existing solutions.

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Speaker: **Gerencsér Balázs** (MTA Rényi Intézet, gerencser.balazs@renyi.mta.hu)
Author(s): Balázs Gerencsér, Balázs Ráth, Gábor Tusnády
Title: Modelling of multifactorial inheritance – Multifaktoriális öröklődés modellezése
Abstract: We propose an alternative model for multifactorial inheritance. We change the way genetic information determines the appearance of a malformation and selection of the individual. Instead of using a threshold on the liability, we count mutant genes and allow them to pose independent risks. It turns out that this model is analytically tractable: convergence to a stationary distribution can be shown and

theoretical conditional probabilities can be properly calculated, which is needed for statistical testing. The model is fitted to Hungarian data on six different malformations with promising results. We present our findings on this model together with the comparison to earlier ones. We also show numerical results on an intermediate model between the new one and classical models. In this model we also count mutant genes, but malformation and selection occurs when their number exceed a certain threshold.

Speaker: **Gerencsér László** (MTA SZTAKI, gerencser@sztaki.hu)
Author(s): Máté Mánfay, Cecilia Prosdocimi, Balázs Gerencsér, László Gerencsér
Title: Levy Systems in Finance and Actuarial Mathematics – Lévy Rendszerek a Pénzügyi és a Biztosítás Matematikában
Abstract: We propose a new class of processes for modeling financial data. The novelty of our approach is that the standard assumption of independent returns is relaxed, thus allowing to model the effect of feedback or friction in financial markets. The formal model is a linear stochastic system driven by a Levy process. Widely used Levy processes are the stable, VG or the CGMY process. We present a novel method for the identification of such systems, which is a combination of standard techniques in systems identification with a specific statistical technique widely used in the context in finance, called the empirical characteristic function (ECF) method. Risk processes associated with data generated by Levy systems will be also briefly discussed.

Speaker: **Gulyás András** (Budapesti Műszaki Egyetem, gulyas@tmit.bme.hu)
Author(s): "For analytical tractability a strong and generic theoretical foundation for compact communication policies is substantial on which compelling scalability questions can be answered. Instead of concentrating on particular communication policies one by one and building piecemeal theoretical frameworks, we can rather chose an abstract way to describe communication policies allowing us to infer generic properties. In particular, we can use the notion of routing algebras. A theory established by J. Sobrinho about ten years ago, routing algebras proved exceptionally useful in answering one of the most pressing open questions in network theory, the Stable Path Problem. "
Title: Algebraic Compact Routing – Útonalválasztás skálázhatóságának vizsgálata algebrai módszerekkel
Gulyás András
Abstract:

Speaker: **Gyarmati Katalin** (Debreceni Egyetem , gykati@cs.elte.hu)
Author(s): Gyarmati Katalin
Title: Pszeudovéletlen sorozatok és rácsok
Abstract: "Pseudorandom sequences and lattices have many important applications, for example the famous encrypting algorithm, the one-time pad uses them. In 1997 Christian Mauduit and Andras Sarkozy initiated a new constructive theory of pseudorandomness. They introduced new pseudorandom measures and (partly with further coauthers) tested several constructions. In this talk I will talk about connections of different pseudorandom measures, large families of constructions with strong pseudorandom properties and pseudorandom properties of subsequences."

Speaker: **Győry Máté** (UBS, mate.gyory@gmail.com)
Author(s): Győry, Máté
Title: Mathematical models in the banking industry: from the risk neutral measure to the Hungarian sovereign CDS spread – Matematikai modellek a bankszektorban: a kockázatsemleges mértéktől a magyar CDS-felárig
Abstract: "The aim of our lecture is to give a short survey on mathematical modelling in the investment banking sector, with a special focus on the fixed income trading. We illustrate on a few examples for what and how to apply mathematics (especially probability theory, stochastic processes, partial differential equations) to solve economical problems. We give an outlook on the most frequent misunderstandings

arising from applying mathematical tools, on the problems of the credit crunch and the current sovereign debt crisis, and their impacts on mathematical modelling."

Speaker: **Hanak Gabor** (KPMG, hanak@chello.hu)
Author(s): Hanák Gábor
Title: A biztosítók európai prudenciális szabályozásának egyes kérdései
Abstract: "This presentation highlights some of the major theoretical and at the same time practical dilemmas of the evolving new European prudential regulation. The importance of the issue is highlighted by the fact that billions of euros depend on the answers to be given to the open questions. Insurers in Europe will have to report a special, so called Solvency II, balance sheet based on market consistent valuation of assets and liabilities. The own funds (in other reporting nomenclatures: equity or capital) is considered as a random variable and the basic requirement against insurers' solvency in Europe will be to hold own funds in excess of the value at risk of the basic own funds (sometimes described loosely as the net asset value, i.e. by which the value of assets exceed the value of liabilities) on a one year time horizon. One of the basic elements of the special Solvency II balance sheet will be the discount rate used to calculate the present value of cash flows stemming from insurance liabilities. The choice of the discount rate is subject to a hot debate in Europe and various opinions try to influence the final decision of the regulator in Europe."

Speaker: **Horváth Zoltán** (Széchenyi István University, horvathz@sze.hu)
Author(s): Zoltán Horváth
Title: Simulation and optimization methods and applications
Abstract: In this lecture we introduce our methodology and results on computational simulation of industrial fluid flow problems and the optimization of objectives associated with them.

Speaker: **Huszti Andrea** (Debreceni Egyetem, huszti.andrea@inf.unideb.hu)
Author(s): Huszti Andrea
Title: Security requirements of cryptographic protocols – Kriptográfiai protokollokkal kapcsolatos biztonsági elvárások vizsgálata
Abstract: Nowadays more and more people use computer to manage their everyday life. There are several electronic systems that require people to fill out a simple or sometimes rather complex questioner and later all the answers are evaluated. These assessment systems bring up serious security issues. Security requirements for different assessment systems are sometimes similar. Important requirement in e-assessment schemes that only eligible individuals are allowed to participate. Systems should possess anonymity and eligibility at the same time. We consider other security requirements, like individual and global verifiability, secrecy, unreusability and uncoercibility.

Speaker: **Illés Tibor** (Budapesti Műszaki és Gazdaságtudományi Egyetem, illes@math.bme.hu)
Author(s): Tibor Illés, Kristóf Körmendi
Title: Multi robot systems: Mathematical results and solution methods – Multi-robot rendszerek: matematikai eredmények és megoldási módszerek
Abstract: "Multi robot systems (MRS) – when we have single depot for the 'robots' – can be modelled as integer linear optimization problems, since they belong to the class of optimization problems known as capacitated arc routing problems.

In practice engineers assume that in MRS the robots are placed in different depots and they make their tours in the graph starting from their depots and arriving back to their own depots. Very similar problems from theoretical and algorithmic point of view have been studied in operations research, graph theory and complexity theory as well. Classical examples include: waste collection, snow removal, mail delivery, school bus routing, etc. Most of these problems – on general graphs, even if those are planar graphs – are known to be NP-hard problems. (There is no practitioner who will be happy with this news, but this is not the end of the story.)

Since these problems are generally NP-hard problems, still several interesting questions remain open, like (i) How to solve practical instances of the examples listed above (including MRS) in a better and more efficient way then those experts could, who do not know enough from operations research? (ii) Can we identify such subclasses of the problem – depending on the structure of the graph – that are solvable in polynomial time? (iii) What kind of approximation algorithms can be introduced for these problems? (iv) How to formulate the multi robot multi depot case? What are the similarities and differences between the single depot and multi depot problems from modelling and algorithmic point of view?

In this talk we deal with many of these questions and discuss some results; however the numbers of good open questions still outnumber those for which we have appropriate answers. (Those who want to do research in this area could be happy, lots of easier or harder questions wait to be answered.)

Good news for practitioners: we have generalized and implemented a known algorithm (path scanning method) for the multi robot, multi depot case. It is working, producing feasible solutions in finite number of iterations. Although we are not completely satisfied neither with the speed of the algorithm nor the quality of the feasible solutions produced by it, but we have not seen (yet) in the literature any other method reported to solve general cases of MRS problem in finite number of iterations."

Speaker: **Ispány Márton** (Debreceni Egyetem, ispany.marton@inf.unideb.hu)
Author(s): Márton Ispány
Title: Approximation of non–negative integer–valued matrices with application to Hungarian mortality data – Nem-negatív egész értékű mátrixok approximációja és alkamazása a magyar mortalitási adatokra
Abstract: "Singular valued decomposition (SVD) is a commonly applied technique for dimensionality reduction. SVD implicitely minimizes an unweighted sum of squares which may be inappropriate in several practical applications. This paper gives generalizations of SVD to other loss functions, e.g., weighted Frobenius distance and logistic loss, that are better suited to the data. We describe algorithms for minimizing these loss functions, and give an application to Hungarian mortality data."

Speaker: **Jánosi M. Imre** (ELTE, Természettudományi Kar, janosi@lecso.elte.hu)
Author(s): Imre M. Jánosi
Title: The limits of wind power: does it really blow somwhere? – A szélenergia termelés korlátai: tényleg valahol mindig fúj?
Abstract: It is well known that a single wind turbine produces a very intermittent output, especially over land. There is a widespread opinion among people supporting renewable energy sources that wind always blows somewhere. Consequently, when wind power is integrated over a sufficiently large geographic area, a smooth output can be generated with high reliability. We check this expectation using decade long reanalysis wind time series covering the continental Europe. Somewhat surprisingly, our results demonstrate that Europe is too small especially compared to a typical size of midlatitude anticyclones. During Summer periods, it happens regularly that the output of a hypothetical wind turbine network drops to a very low level, thus it seems that wind alone can never replace the traditional background energy producing power network.

Speaker: **Jüttner Alpár** (ELTE TTK, alpar@cs.elte.hu)
Author(s): "Bajzik Lajos, Bernáth Attila, Bérczi Kristóf, Jordán Tibor, Jüttner Alpár, Király Tamás, Kaszanitzky Viktória, Kovács Erika, Svigruha Gergely, Végh László"
Title: Algorithms for GMPLS/OTN Network Dimensioning – Algoritmusok GMPLS/OTN hálózatok méretezésére
Abstract: "The *OTN (Optical Transport Network)* standard, defined by ITU-T Recommendation G.709 and G.872, contains a flexible digital hierarchyof *ODU (Optical Data Unit)* signals. The ODU hierarchy provides sub-wavelength grooming in OTN networks, which is necessary for efficient utilization of the high bit rates of optical channels. When dimensioning the links of a transport network consisting of ODU switches, the packing of lower order ODU signals into higher order ODU signals needs to be taken into account. These networks are expected to be controlled by *GMPLS (Generalized MPLS)*, which puts

specific constraints on the dimensioning. We assume that there is no explicit label control and that the *GMPLS control plane is using first-fit strategy for making reservations on a link*. With these assumptions the link dimensioning problem is defined as deciding how many higher order ODU component links are required on an OTN GMPLS bundled link for first-fit packing of a given set of lower order ODU demands, in any order of arrival. The paper provides strict bounds for ODU hierarchy-specific item and bin sizes. Then, it introduces an extended variant of the dimensioning problem, when lower order ODU connections which are not controlled by GMPLS are also present."

Speaker: **Karsai János** (Szegedi Tudományegyetem, karsai.janos@med.u-szeged.hu)
Author(s): János Karsai, Ágnes Méri
Title: On Some Cellular Automata Models in Ecology and Epidemiology – Populációdinamikai és epidemiológiai jelenségek sejtautomata modelljeiről
Abstract: Simulation is often the only effective tool to study several phenomena in ecology and epidemiology. Hence, computing and visualization tools became unavoidable. In our talk, we present some of our recent experimental results for stochastic cellular automata models of ecological and epidemiological phenomena with Wolfram Mathematica. After a short introduction to cellular automata, we briefly study the spatio-temporal development of some single-species territory-based models. Then we consider the competition of several species fighting for territory. In particular, we investigate the parasite-host interactions and C.A. versions of the S.I.R. model in epidemiology. Simulations can give us a lot of information on special properties such as aggregation, diffusion, properties of the boundary of patches; and in general, the role of neighbors in the development.

Speaker: **Katz Sándor** (ELTE Fizikai Intézet, katz@bodri.elte.hu)
Author(s): Katz, Sándor
Title: Application of Graphics Cards in Physics – Grafikus kártyák alkalmazása a fizikában
Abstract: The use of modern graphics cards (GPU's) makes it possible to build high performance computer clusters at a reasonable cost. I will discuss the main features of GPU's and the parallelization requirements for scientific applications. With a high bandwidth network it is also possible to use multiple GPU's to parallelize a large scale problem. I will discuss how to implement an iterative linear solver for a sparse system and present performance data for the GPU cluster at the Eötvös University.

Speaker: **Kerényi Ádám** (Magyar Tudományos Akadémia Szegedi Biológiai Kutatóközpont, kerenyi.adam@brc.mta.hu)
Author(s): Sándor Pongor, Ádám Kerényi
Title: Modelling Bacterial Communication and Cooperation – Bakteriális kommunikáció és kooperáció modellezése
Abstract: Multispecies microbial consortia are a major form of life that includes examples of medical significance such as the gut flora, opportunistic pathogens living in hospital environments, bacterial-fungal consortia present in dental cavities etc. The stability of such consortia is poorly understood and is generally discussed in terms of species-specific mechanisms. On the other hand, there is a growing body of evidence that there are general stability criteria for polymicrobial consortia. Experimental and theoretical studies indicate that some species are capable of stable, long-term collaboration while non-cooperating cheat mutants can cause a local collapse of the community. These simple mechanisms provide a protection against unwanted mutations and environmental challenges so they may serve as guidelines for developing defense strategies against mixed microbial infections.

Speaker: **Kis Tamás** (MTA SZTAKI, tamas.kis@sztaki.hu)
Author(s): "Drótos Márton, Kis Tamás"
Title: Solution of large scale scheduling problems by MIP techniques – Nagyméretű ütemezési problémák megoldása egészértékű programozási technikákkal

Abstract: "In the talk, the usefulness of Mixed Integer Programming in solving large scale, complex scheduling problems is demonstrated through a few examples.

The first one is that of resource leveling in a dedicated machine environment, where in addition to machines, there are additional resources whose usage have to be leveled according to a linear or quadratic criterion. We will show that our exact method can provide better results than some reasonable heuristics in the same computation time (meaning that the exact method is stopped even without finding the optimal solution, or proving optimality of the best solution found so far).

The second scheduling problem is that of scheduling jobs with alternative routings. The problem is solved in two phases, the first being routing selection, and the second is job shop scheduling with machine alternatives. The computational results show that it is essential to solve the first phase as good as we can in the permitted computational time. We will also briefly discuss a variant of the combined route selection and scheduling problem which is even harder to solve."

Speaker: **Klement Péter** ((AUDI Hungaria Motor Kft., Győr), peter.klement@audi.hu)
Author(s): Péter Klement
Title: A járműfejlesztés kihívásai az Audi Hungaria Motor Kft-nél
Abstract: "Egy tavalyi döntés értelmében az Audi kiválasztott szakértői területeket épít ki Győrben a járműfejlesztés területén. Ezek a numerikus járműszimuláció, az aggregátok intenzív tesztelése és a fejlesztéstámogatás bizonyos feladatkörei lesznek, számos matematikai kihívással."

Speaker: **Kiss-Tóth Christan, Jósvai János** (Széchenyi István Egyetem, ktchris.hu, josvai@sze.hu)
Author(s): Tamás Hajba, Zoltán Horváth, János Jósvai, Christian Kiss-Tóth, Pál Pusztai
Title: Methods and codes for production line scheduling – Gyártósor-ütemezési módszerek és kódok
Abstract: This talk contains the introduction of an interface of a market leader DES-based industrial software for simulation of production lines and an overview of several state-of-the-art mathematical and computational optimization techniques with their codes for optimization of production line models. Several algorithms and their codes were tested, such as iterative greedy methods, tabu search approaches and mixed integer formulations. Some of them are working on multicore processors and computer clusters. We also investigated algorithms to get guaranteed lower bounds for the problems to be able to stop the iterations when optimum is reached. To measure the performance more reliably to industrial situations, a modified set of benchmark problems is also introduced. We conclude that our codes are suitable for a fast decision support tool and for industrial problem.

Speaker: **Kocsis A. Tihamér** (Széchenyi István Egyetem, katihi@sze.hu)
Author(s): Zoltán Horváth, Tihamér A. Kocsis, Adrián Németh
Title: On the positivity of numerical methods for CFD – A számítógépes áramlástan numerikus módszereinek pozitivitásáról
Abstract: Simulation of fluid flow problems often require numerical solutions of partial differential equations. In these problems many physical variables are positive, such as densities, pressures and concentrations. However, numerical discretizations of the equations describing the flows often generate negative values leading to physically meaningless solutions and causing the algorithm to break down. In this talk we present the most important classical results and their extensions about positivity preserving numerical methods, such as Runge-Kutta and additive Runge-Kutta methods to avoid the occurrence of negative values and oscillating behaviour. We also present our general approach to find larger simulation time steps by considering the positive invariance of arbitrary sets.

Speaker: **Kőrösi Attila** (Budapesti Műszaki és Gazdaságtudományi Egyetem, korosi@tmit.bme.hu)
Author(s): András Gulyás, Attila Kőrösi, Gábor Rétvári, József Bíró, Dávid Szabó
Title: On Network Formation Games in Hyperbolic Space – Hálózatok kialakulásának modellezése hiperbolikus terekben: egy játékelméleti megközelítés

Abstract: Complex networks have been analyzed from different perspectives so far. *Network models* try to mimic their *topological* properties (diameter, degree distribution, clustering) as precisely as possible. *Navigation models* try to capture the essence of their excellent *navigability* by distributed search algorithms. *Network formation games* try to explain how they *emerge* among realistic conditions i.e. from the interaction of selfish elements. Recovering all of these features from a single model would be a compelling thing for the deeper understanding and controlling of such networks. In this presentation we attempt to define a unified model that can incorporate topology, navigability and emergence *at the same time*.

Speaker: **Kovács András** (MTA SZTAKI, akovacs@sztaki.hu)
Author(s): András Kovács, Gábor Erdős, Zsolt János Viharos, László Monostori
Title: Failure detection and maintenance scheduling for wind farms – Szélparkok hibadetektálása és karbantartás ütemezése
Abstract: As the share of wind energy increases on the global energy market, the efficient operation of wind farms gains an ever growing significance. Effective methods for failure detection and maintenance scheduling are crucial for the availability of turbines, as well as for the operational costs. This talk introduces a software system that monitors wind turbine conditions and performs the detailed scheduling of maintenance operations at a set of wind farms maintained by common personnel. The models and algorithms used for solving the scheduling problem are presented in detail.

Speaker: **Kovacs Edith Alice** (Általános Vállalkozási Főiskola, kovacs.edith@avf.hu)
Author(s): Edith Kovács, Tamás Szántai
Title: Discovering the dependence structure between the exchange rates
Abstract: "The aim of the paper is to introduce a method which on the basis of a sample data, for example multidimensional time series, exhibits the conditional independences between the random variables involved. This task is achieved using the information content of the low dimensional marginals obtained from the discrete probability distribution of the sample data. The efficiency of our method is presented by revealing some of the conditional independences of 9 US-exchange rates. First for each marginal exchange rate series, an appropriate ARMA(P,Q)- GARCH(p,q) model was determined in [1]. It turned out that ARMA(1,1)-GARCH(1,1) models are sufficient to remove the time dependence in each of the individual US-exchange rates. The resulting standardized residuals of these models were transformed using the "Empirical Cumulative Distribution Function". Then the multivariate data set have been transformed using the concept of sample derivated copula [2]. Based on the information content of the lower order marginals we determined the best fitting t-cherry junction tree probability distribution [3]. This made possible to reveal some of the conditional independences. This method can also be applied for finding the truncated copula vine structure.

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Speaker: **Kovács Levente** (Hungarian Banking Association , titkarsag@bankszovetseg.hu)
Author(s): Kovács Levente
Title: A kereskedelmi bankok aktuális kihívásai
Abstract: "The Hungarian government's unconventional crisis management measures put a significant part of the burdens on the Hungarian banking sector. Out of the research topics that may be of interest for theoretical and practical specialists, the presentation will address three current issues.
The special bank tax imposed in Hungary is ten times that applied on average in the European Union, therefore, the response of market players was easy to assess. The proposed financial transaction levy,

planned to be imposed on day-to-day interbank payments, is a completely new type of tax. The presentation will highlight the expected impacts of this proposed tax.
Due to the weakening of the Hungarian currency and temporary job losses, households with foreign currency-denominated mortgage loans have found themselves in a desperate situation. The presentation will review the impacts and consequences of the measures adopted by the government to help borrowers in distress.
Even today, analyses on current account balances refer to the findings of research conducted in the United States in the 1950s. The formula arrived at that time is meaningless at today's interest and commission rates. The presenter's analyses in recent years on corporate accounts have revealed current account balances different from that model. The explanation for the different curve lies in payments becoming faster and cheaper and in the just-in-time management of current account balances."

Speaker: **Kovács Péter** (Eötvös Loránd Tudományegyetem, kovimesterr@gmail.com)
Author(s): Levente Lócsi, Péter Kovács
Title: ECG Signal processing: rational algorithms – EKG jelfeldolgozás: racionális algoritmusok
Abstract: "This poster outlines our proposed approach for the representation of ECG signals (ElectroCardioGrams) using rational function systems. The methods for the analytical representation, parameter optimization are discussed, and biorthogonal systems are introduced. Also proper discretization techniques are developed and demonstrated.

Our model provides methods for good compression and denoising, the parameters of the used system contain some direct diagnostic information.

References:

[1] Fridli, S.; Lócsi, L.; Schipp, F. Rational function systems in ECG Processing, Proc. 13th Int. Conf. Computer Aided Systems Theory (EUROCAST 2011), Springer Lecture Notes in Computer Science 6927 (2011), 88–95.

[2] Fridli, S.; Schipp, F. Biorthogonal systems to rational functions, Ann. Univ. Sci Budapest, Sect. Comput. 35 (2011), 95–105.

[3] Lócsi, L.; Approximating poles of complex rational functions, Acta Univ. Sapientiae, Math, 1, 2 (2009), 169–182."

Speaker: **Kunszenti-Kovács Dávid** (ELTE TTK Matematikai Intézet, daku@fa.uni-tuebingen.de)
Author(s): Fatih Bayazit, Bernd Klöss, Dávid Kunszenti-Kovács
Title: Operator semigroup methods for evolution equations on networks – Operátor félcsoport módszerek és evolúciós egyenletek hálózatokon
Abstract: "Many biological processes are modelled by some process on a network. The aim of the talk is to show through some applications how operator semigroup theory can be applied to obtain results on asymptotics and control of different types of evolution equations on networks."

Speaker: **Lagzi István** (BME , istvanlagzi@gmail.com)
Author(s): István Lagzi, Shibi Thomas, Ferenc Molnár, Ferenc Izsák, Zoltán Rácz
Title: Modelling reaction-diffusion systems – Reakció-diffúzió rendszerek modellezése
Abstract: "Numerical solution of reaction-diffusion equations in two or three dimensions is one of the most challenging applied mathematical problems. Since these simulations are very time consuming, any ideas and strategies aiming at the reduction of computational time are important topics of research. We will show and discuss several reaction-diffusion systems, and we will present a powerful parallel computing framework for solving reaction-diffusion equations numerically using the Graphics Processing Units (GPUs) with CUDA. Moreover, we will present and discuss a case study for simulating phase separation in the wake of a moving diffusion front.

[1] F. Molnár, F. Izsák, R. Mészáros and I. Lagzi, Simulation of reaction-diffusion processes in three dimensions using CUDA, Chemometr. Intell. Lab., 108, 76-85, 2011

[2] P. A. Zegeling, I. Lagzi and F. Izsák, Transition of Liesegang precipitation systems: simulations with an adaptive grid PDE method, Commun. Comput. Phys., 10, 867-881, 2011

[3] A. Volford, I. Lagzi, F. Molnár jr., Z. Rácz, Coarsening of precipitation patterns in a moving reaction-diffusion front, Phys. Rev. E, 80, 055102(R), 2009"

Speaker: **Lázár Viktória** (Biológiai Kutatóközpont Magyar Tudományos Akadémia, vlazar@brc.hu)
Author(s): Viktória Lázár, Róbert Busa-Fekete, Gergely Fekete , Gajinder Pal Singh, Balázs Kégl, Csaba Pál, Balázs Papp
Title: Exploring antibiotic interactions in Escherichia coli – Antibiotikum interakciók feltérképezése Escherichia coli baktériumban
Abstract: The rapid evolution of bacterial drug resistance has motivated the use of drug combinations to combat resistance and maintain clinical efficiency. Thus, there is an increasing need to develop reliable systematic methods to map synergistic and antagonistic interactions between pairs of antibiotics (i.e. when two compounds enhances or diminishes, respectively, each other's effect). Large-scale antibiotic interaction maps would be useful for i) exploring the mechanisms behind drug interactions, and ii) for the development of new combination therapies. To quantify interaction experimentally, we systematically measured the effects of pairs of antibiotics on the growth rate of E. coli using a robotic liquid handling system. Next, to construct a complete high resolution antibiotic interaction network we developed a high-throughput automated screening and a robust statistical analysis methodology for identifying antibiotic interactions. Finally, using a data-mining approach, we explored how chemical and biological features of antibiotics explain their interaction patterns.

Speaker: **Leitold Adrien** (University of Pannonia, leitolda@almos.uni-pannon.hu)
Author(s): Adrien Leitold, Miklós Gerzson, Katalin M. Hangos
Title: Modeling of Technological Systems for Diagnostic Purposes using Colored Petri Nets – Színezett Petri hálók használata technológiai rendszerek diagnosztikai célú modellezésére
Abstract: "The aim of our research is to develop a model based fault diagnosis method for technological systems described by discrete event system models. During the diagnostic process we determine the state of system and the occurrence of the faults based on the model of the system and on the observed technological data in the form of event sequences. We use Petri nets that can be applied for the modeling of discrete event system efficiently. This type of models is typical in the field of automotive, manufacturing and chemical industries. A novel method for the development of Petri net models describing both normal (faultless) operation and different faulty modes of the technological system is proposed in our work. Starting from the low level or colored Petri net model of the system we enlarge this model in a novel way in order to both the event logging and the fault simulation can be efficiently and automatically performed. Using the arc expression and guard functions of the colored Petri model we can avoid the unnecessary growing of the size and complexity of the developed model with the number and kind of the faults considered. The proposed method is illustrated on simple technological examples. The example models were developed in the colored Petri Net simulator CPNTools.

M. P. Fanti, C. Seatzu: Fault diagnosis and identification of discrete event systems using Petri nets, 9th International Workshop on Discrete Event Systems, WODES 2008, 2008, pp. 432–435.

K. Jensen, L. M: Kristensen, L. Wells: Coloured Petri Nets and CPN Tools for Modelling and Validation of Concurrent Systems, Int. J. of Software Tools for Technology Transfer, 9. (2007) 3-4, pp. 213-254"

Speaker: **Lévai Balázs László** (Szegedi Tudományegyetem, Levai.Balazs.Laszlo@gmail.com)
Author(s): Balázs László Lévai, Balázs Bánhelyi, Tibor Csendes, Endre Palatinus
Title: The automated design of LED street lights with optimization methods and parallel computing – Párhuzamosítással gyorsított optimalizációs eljárás LED technológiájú, közvilágítási lámpatestek automatikus tervezéséhez
Abstract: An interesting side effect of industrial civilization - becoming an emphatic problem of our

modern age - is Light pollution, also known as photopollution or luminous pollution. This phenomenon is the unwanted or unneeded lighting of outdoor areas by artificial light. It obscures the stars in the night sky making impossible the observation of certain astronomical objects. Moreover, light pollution raises questions about energy conservation which is becoming more and more important as the world's energy consumption grows. Nowadays, the application of LED technology is available for street-lighting purposes. LEDs have low energy consumption and low maintenance costs. They are three to four times more energy efficient than incandescent bulbs and last up to five times longer than compact fluorescents. Their light can easily be focused in a wide range of patterns by applying proper optical lenses. Unlike traditional incandescent street lights, the luminaries of LED street lights consists of multiple LED packages clustered in a housing, instead of a single bulb. In certain cases, even 200 LED packages - each one having unique angle and power characteristics - could be needed to light an area depending on its size and shape. Due to the large number of feasible LED combinations, designing a LED street light manually is almost impossible. In our studies, we present an optimization technique for this problem. During the design as part of the optimization method, we have to calculate the illuminance and the objective function value of the numerous LED package configuration variants to decide whether they fit the requirements or not. In a normal scenario, we have to repeat this process even a thousand times which can take hours to execute. We introduce a possible parallelization of our computation which significantly reduces the execution time.

Speaker: **Lócsi Levente** (Eötvös Loránd Tudományegyetem, locsi@inf.elte.hu)
Author(s): Levente Lócsi, Péter Kovács
Title: ECG Processing: Rational Algorithms – EKG feldolgozás: racionális algoritmusok
Abstract: "This poster outlines our proposed approach for the representation of ECG signals (ElectroCardioGrams) using rational function systems. The methods for the analytical representation, parameter optimization are discussed, and biorthogonal systems are introduced. Also proper discretization techniques are developed and demonstrated.

Our model provides methods for good compression and denoising, the parameters of the used system contain some direct diagnostic information.

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Speaker: **Lovas Attila** (Budapesti Műszaki és Gazdaságtudományi Egyetem, lovas@math.bme.hu)
Author(s): Attila Lovas, Péter Sótonyi Dr., Brigitta Szilágyi Dr., Anna Udvardy Dr., Imre Gallatz, Zoltán Pathó
Title: Study of reaction to physical stress – Fizikai stresszre adott válasz tanulmányozása
Abstract: "A research project was started at the Faculty of Physical Education and Sport Sciences of Semmelweis University which aimed to find out whether the reaction to physical stress is different between healthy but untrained adults and professional athletes. In addition, we sought to determine what kind of connection there is between the blood concentration of the HSP70 protein, the noradrenaline level and the stress on the individual. There were 22 participants in this experiment: 12 professional athletes (judo) and a control group of 10. There was an equal number of males and females in both groups. The stress reaction was triggered by spiroergometric testing. It was done on recumbent bicycles and before the testing (K), at the end of the testing (T) and at the 30th, 60th, 120th and 180th minute of the restitution after the testing blood was taken from the veins of the participants. In the blood sample the

concentration of noadrenaline and HSP70 was determined by the ELISA Immunoassay procedure. Then our task is the statistical analysis of the data, the exploration of the hidden relationships between the measured quantities and the mathematical modelling of the temporal behaviour of the individual stress markers.

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Speaker: **Márkus László** (ELTE TTK, markus@cs.elte.hu)
Author(s): László Márkus, András Zempléni, Miklós Arató, Vilmos Prokaj
Title: Earthquake Risk Exposure Analysis of an Insurance Portfolio
Abstract: The paper reports on the findings and the applied methodology of an earthquake risk analysis carried out by our research group upon request from a leading insurance company in Hungary. An extensive simulation study of earthquakes - in co-operation with the Geophysical Institute - has been performed in order to gain information on the possible causes, locations and intensity of the damages. It was then matched up with the actual position of the portfolio. Taking into account the quality of the insured properties and their contents, scenarios for loss occurrence were generated. This resulted in a proper assessment of the risk caused by possible earthquakes and ultimately the calculation of the necessary reserves to cover the exposure.

Speaker: **Martinek László** (Eötvös Loránd Tudományegyetem, martinek@cs.elte.hu)
Author(s): Miklós Arató, László Martinek
Title: Estimation of Claim Numbers in Automobile Insurance – Kárszámok becslése gépjármű-biztosításokban
Abstract: The use of bonus-malus systems in compulsory liability automobile insurance is a worldwide applied method for premium pricing. If certain assumptions hold, like the conditional Poisson distribution of the policyholders claim number, then an interesting task is to evaluate the so called claims frequency of the individuals. Here we introduce 3 techniques, two is based on the bonus-malus class, and the third based on claims history. The article is devoted to choose the method, which fits to the frequency parameters the best for certain input parameters. For measuring the goodness-of-fit we will use scores, similar to better known divergence measures. The detailed method is also suitable to compare bonus-malus systems in the sense that how much information they contain about drivers.

Speaker: **Menig Cornelius** (AUDI AG, Ingolstadt, Cornelius.Menig@audi.de)
Author(s): Cornelius Menig
Title: Optimization in traffic and vehicle engineering
Abstract: "Mobility in cities is characterized by many crossing traffic streams. Despite substantial improvements in traffic engineering during the last century, traffic participants still have to stop often at red lights. Communication between traffic lights and vehicles shows a lot of potential for improving this situation. On the one hand the driver can be informed based on the time until the next phase transition about the optimal speed to pass the stop line at green light. On the other hand vehicle data could be used to optimize the traffic light control. Here for the first time both approaches are combined to reduce stops, travel times and fuel consumption significantly. Alternative drive systems like fuel cells and plug-in hybrids lead two new vehicle architectures. Here some examples for the resulting optimization problems are given."

Speaker: **Mihálykó Csaba** (Pannon Egyetem, mihalyko@almos.uni-pannon.hu)
Author(s): Csaba Mihálykó, Éva Orbán-Mihálykó
Title: Investigation of the Gerber-Shiu function in dual risk model – A Gerber-Shiu függvény vizsgálata duális kockázati modell esetén
Abstract: "In this presentation a dual risk (negative risk sums) model is considered with general inter-claim time distribution and general claim size distribution. The model can be applied in life annuity or pension insurance and process enginering as well. The surplus of the insurance company is the balance of the initial surplus, stochastic incomes and deterministic expenses. The main question is the probability and time of ruin (i.e. negative surplus). For their unified handling, the Gerber-Shiu function connected to the ruin time is defined. By the help of the usual renewal technique an integral equation is set up for it. It has been proved that the equation has a unique solution in the set of bounded functions. In the case when the probability density function of the interclaim times satisfies a linear differential equation with constant coefficients, we transform the integral equation into an integro-differential equation and we present its explicit solution.

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Dong, Y., Wang, G. 2006. Ruin probability for renewal risk model with negative risk sums. Journal of Industrial and Management Optimization. (2) 229-236.

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"

Speaker: **Miklós István** (MTA Rényi Intézet, miklos.istvan.74@gmail.com)
Author(s): István, Miklós
Title: Markov chain Monte Carlo methods in bioinformatics
Abstract: "Markov chain Monte Carlo (MCMC) methods are used to generate samples from complicated distributions in high dimensional, typically non-Euclidian space. It is particularly widespread in Bayesian statistics, where the aim is to generate samples from a Bayesian distribution for estimating parameters of interest. Examples fro such Bayesian distributions are the Bayesian distribution of evolutionary trees under the coalescent prior or Bayesian distribution of multiple alignments using flat priors.

Usually it is very hard to give lower and upper bounds for the mixing time of Markov chain Monte Carlo methods, namely, how many MCMC steps are necessary to get close to the desired distribution. However, in some cases it is possible. We show a few example for these.

Miklós, I., Tannier, E. (2012) Approximating the number of Double Cut-and-Join scenarios, Theoretical Computer Science accepted.

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Speaker: **Molnar-Saska Gabor** (Morgan Stanley, gabor.molnar-saska@ms.com)
Author(s): Gabor Molnar-Saska, Balazs Kovacs
Title: Monte Carlo simulation for pricing American type options
Abstract: Monte Carlo simulation is used extensively in financial mathematics since analytic solution for complex pricing problems does not exist. Typical examples are the American type options, where the payout function of the products depends not only on the final value, rather the whole trajectory of the underlying products. In this presentation I will show some basic American type option problems in finance. Then I show how we can avoid generating bushy Monte Carlo paths based on a linear regression

following the Longstaff-Schwartz methodology. Finally I will present some possible extensions of this approach. Mora Peter Morgan Stanley peter.mora@ms.com Limits of short rate models Peter Mora, Zsolt Pandi Short rate models might not be able to calibrate to discount factors and swaptions' prices observed on the market simultaneously. In this lecture we present some examples for which the calibration fails and investigate the reason behind this.

Speaker: **Nakata Yukihiko** (University of Szeged, yunayuna.na@gmail.com)
Author(s): Yukihiko Nakata, Gergely Röst
Title: Global analysis for spread of an infectious disease via human transportation – Egy fertőző betegség utazás során való terjedésének globális vizsgálata
Abstract: "We investigate the global dynamics of epidemic models describing disease transmission dynamics between multiple regions. We generalize the model developed in [1] to consider different characters of each region such as population size and transportation rate. We analyze the global dynamics in terms of the basic reproduction number. We illustrate the stability regions of equilibria in a parameter plane and discuss how human transportation between regions influences the spread of the disease. For complex networks, interesting spatial endemic patterns may emerge.

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Speaker: **Németh Adrián** (Széchenyi István Egyetem, nemetha@sze.hu)
Author(s): Zoltán Horváth, Tihamér Kocsis, Adrián Németh
Title: High order numerical methods for traffic flow PDEs – Magas rendű numerikus módszerek közlekedési rendszerek PDE modelljeire
Abstract: "In this talk we study the performance and analysis of high order methods for the numerical solution of PDEs modeling vehicular traffic flows. Namely, for space discretization we apply the spectral difference (SD) methods on unstructured meshes [1] up to order 6 and Runge-Kutta (RK) methods for time discretization up to order 4. As test problem we use the Lighthill-Whitham-Richards type PDE [2]. We analyse the positivity and maximum principle of the numerical solution, which are of important requirements from the physical meaning of the simulation results. We present our conclusions concerning the requirements on the limiting procedure within SD and special absolute monotonic (or strong stability preserving (SSP)) RK schemes.

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Speaker: **Papp Balázs** (MTA Szegedi Biológiai Központ, pappb@brc.hu)
Author(s): Balázs, Papp
Title: Systems biology and evolution – Rendszerbiológia és evolúció
Abstract: Is biological evolution predictable at the level of molecular circuits of organisms? The ambitious goal to answer this question requires an understanding of the mutational effects that govern the complex relationship between an organism's genetic material and its observable traits (phenotype). In practice, it involves integrating mathematical models of biochemical networks (systems modelling), laboratory evolution experiments using microorganisms and large-scale mutational analyses — a feat that is made possible by the recent availability of the necessary computational tools and experimental techniques.

In this talk I will overview recent progresses in mapping and predicting the course of evolution by mathematical modelling of metabolic networks.

Speaker: **Pataki Máté** (MTA SZTAKI, Mate.Pataki@sztaki.hu)
Author(s): Máté Pataki
Title: Algorithm to search translated texts – Algoritmus fordítások keresésére
Abstract: "A study by Rinsche et al. on the size of the language industry in the EU shows that the estimated value of this industry within the EU Member States will be 16.5 billion EUR by 2015, and that translation alone accounts for more than 50At the Computer and Automation Research Institute of the Hungarian Academy of Sciences we started a one-year research project to build a usable algorithm to find translations and plagiarisms within a large foreign language document collection. The resulting tool is able to search for available translations not only within the local files of a company, but also online on a much larger scale. We incorporated this tool into our online KOPI Plagiarism Search Engine in December 2011 where everybody can try our new algorithm."

Speaker: **Patthy László** (MTA TTK Enzimológiai Intézet, patthy@enzim.hu)
Author(s): Laszlo Patthy
Title: Bioinformatics in the era of genomics: hopes and challenges – A genom korszak bioinformatikája: lehetőségek és kihívások
Abstract: With the completion of the human genome in 2000, biology, medicine and the pharmaceutical industry had entered a new era: the era of genomics. It was obvious that the flood of data coming from the genome projects can revolutionize medicine and drug discovery only if we are able to decipher the genome, "the "Book of Life.... written in the mysterious language of all the ages, the language of God " (Francis Collins, 2001). In the enthusiasm at the beginning of the new millennium it has been taken for granted by the society that this goal will be achieved in a short time, leading to a plethora of novel drugs and personalized medicine. In retrospect we must realize that progress was slower than expected, primarily because bioinformatics failed to solve some key problems. The presentation will discuss some bottle-necks in the genome annotation process that are responsible for the relatively slow progress.

Speaker: **Pitour, Thomas** (Audi AG, Ingolstadt, thomas.pitour@audi.de)
Author(s): Pitour, Thomas
Title: Energymanagement of vehicles
Abstract: The presentaion shows the challange for a car maker to reduce the CO2-emissions due the social discussion of global warming. A few examples of efficient measures even launched or still in development will be presented. Selected electric propulsion concepts from Audi will be explained and we are going to underline the need of having powerful simulation tools and advanced modelling skills.

Speaker: **Rásonyi Miklós** (University of Edinburgh, Miklos.Rasonyi@ed.ac.uk)
Author(s): Rasonyi, Miklos
Title: Arbitrage and bubbles in financial markets – Arbitrazs es buborekok penzugyi piacokon
Abstract: "We consider a standard model of financial markets where asset prices are described by diffusion processes. We recall examples where such models admit arbitrage opportunities and/or bubbles. We show that, under mild regularity conditions, both arbitrage and bubbles disappear in the presence of transaction costs. We draw conclusions about the possible detection of these phenomena and about their fragility with respect to model mis-specification.

P. Guasoni, M. Rasonyi: Fragility of arbitrage and bubbles in diffusion markets. Preprint."

Speaker: **Rétvári Gábor** (Budapesti Műszaki és Gazdaságtudományi Egyetem,
retvari@tmit.bme.hu)
Author(s): Rétvári Gábor

Title: The Graph Theoretic Foundations of Failure Protection in IP networks – IP hálózatok hibavédelmének gráfelméleti alapjai
Abstract: Failure protection in IP networks is special as both the default forwarding paths, used for transmitting packets when the network is fully operational, and the detours, used as bypasses around failed network components, are shortest paths according to some positive edge cost function. This raises intriguing graph theoretical questions, already difficult enough when costs are uniform at each edge: which are the graph topologies that can be protected against the failure of each edge/node?, which are the topologies with the worst protection?, in the latter case, how to improve protection by adding the smallest number of new edges? etc. The talk gives a graph-theory-centered introduction to these problems and raises some open questions.

Speaker: **Röst Gergely** (SZTE, rost@math.u-szeged.hu)
Author(s): Röst, Gergely
Title: Epidemic spread and international travel – Járványterjedés és utazási modellek
Abstract: We discuss two examples of the interaction of the spread of an epidemics and international travel patterns. First, we develop a delay differential model to describe the global spread of influenza via long distance flights with possible infections during travel. For simulations we use Canadian air traffic data. Second, we show how the events of the Euro Cup 2012 impose risk of measles outbreaks in European countries, as due to the ongoing Ukrainian epidemics, returning football fans may cause outbreaks in their home countries.

Speaker: **Simon L Péter** (ELTE TTK Matematikai Intézet, simonp@cs.elte.hu)
Author(s): Peter L Simon
Title: Epidemic propagation on networks: a differential equation approach – Járványterjedés hálózatokon: differenciálegyenlet megközelítés
Abstract: "The dynamics of disease transmission strongly depends on the properties of the population contact network. The spread of the epidemic can be described by a stochastic process where the states of the nodes are the elements of a finite state space (typically an SIS or an SIR epidemic is considered), and the states of the nodes change depending on the states of their neighbours. The mathematical model is a continuous time Markov chain that can be considered as a large system of linear differential equations. Due to the large number of equations two different approaches are typically applied. On one hand Monte-Carlo simulation is applied, and on the other hand nonlinear differential equation approximations are introduced. The latter enables us to get insight to the relation of network structure and system behaviour. In the talk we show the most important differential approximations and compare their performance to Monte-Carlo simulation. We present other network processes, like rumour spreading and the propagation of neuronal activity, and show how can these processes, together with epidemic propagation, be investigated in a unified mathematical framework."

Speaker: **Stépán Gábor** (Budapest University of Technology and Economics, stepan@mm.bme.hu)
Author(s): Stépán Gábor
Title: Modelling traffic jams with mechanical analogies – Forgalmi dugók modellezése mechanikai analógiákkal
Abstract: "A nonlinear car-following model that includes the reaction-time delay of drivers is considered. When investigating the linear stability of the uniform flow solution, boundaries of Hopf bifurcations are determined in the parameter space. Crossing these boundaries oscillations with different frequencies may appear corresponding to travelling wave solutions with different wave numbers. Eliminating the singularities related to the continuous translational symmetry along the road, Hopf normal form calculations are performed. Robustly subcritical behaviour is found leading to bistability between the stable uniform traffic flow equilibrium and the stop-and-go waves travelling against the flow of vehicles. To introduce the model, analogies with brake pad dynamics, human/robotic force control and balancing are presented."

Speaker: **Szabó Adrienn** (MTA SZTAKI, szabo.adrienn@sztaki.hu)
Author(s): Adrienn Szabó, Ádám Novák, István Miklós, Jotun Hein
Title: Reticular alignment: A progressive corner-cutting method for multiple sequence alignment – Reticular Alignment: hatékony többszörös szekvencia illesztés
Abstract: "Background: In this paper, we introduce a progressive corner cutting method called Reticular Alignment for multiple sequence alignment. Unlike previous corner-cutting methods, our approach does not define a compact part of the dynamic programming table. Instead, it defines a set of optimal and suboptimal alignments at each step during the progressive alignment. The set of alignments are represented with a network to store them and use them during the progressive alignment in an efficient way. The program contains a threshold parameter on which the size of the network depends. Results: We implemented the program in the Java programming language, and tested it on the BAliBASE database. Reticular Alignment can outperform ClustalW even if a very simple scoring scheme (BLOSUM62 and affine gap penalty) is implemented and merely the threshold value is increased. However, this set-up is not sufficient for outperforming other cutting-edge alignment methods. On the other hand, the reticular alignment search strategy together with sophisticated scoring schemes (for example, differentiating gap penalties for hydrophobic and hydrophylic amino acids) overcome FSA and in some accuracy measurement, even MAFFT. The program is available from http://phylogeny-cafe.elte.hu/RetAlign/ Conclusions: Reticular alignment is an efficient search strategy for finding accurate multiple alignments. The highest accuracy achieved when this searching strategy is combined with sophisticated scoring schemes. "

Speaker: **Szamoránsky János** (AEGON Magyarország Általános Biztosító Zrt., szamoransky@gmail.com)
Author(s): János Szamoránsky
Title: Application of GLM techniques in insurance pricing – GLM alkalmazásai a biztosítási díjkalkulációkban
Abstract: "Generalized linear models (GLMs) are simple generalizations of the general linear model, where not itself the dependent variable but some specific function of the dependent variable are modelled as a lineary function of the explanatory variables. For example logit(X) in the case of logistic regression. Further simplification is that we leave the Normal distribution and take the distribution from a specific distribution family: the exponential distribution family. Now we can handle multiplicative effects between the variables. It is most commonly used in insurance with pricing non-life products. In my lecture I would like to present this application from an actuarial view.

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- Duncan Anderson, Sholom Feldblum, Claudine Modlin,Doris Schirmacher,Ernesto Schirmacher, Neeza Thandi - A Practitioner's Guide to Generalized Linear Models, Non-Refereed Paper/Article, 2004, 1-116"

Speaker: **Szántai Tamás** (Budapesti Műszaki és Gazdaságtudományi Egyetem, szantai@math.bme.hu)
Author(s): Edith Kovács, Tamás Szántai
Title: Discovering the dependence structure between the exchange rates
Abstract: "The aim of the paper is to introduce a method which on the basis of a sample data, for example multidimensional time series, exhibits the conditional independences between the random variables involved. This task is achieved using the information content of the low dimensional marginals obtained from the discrete probability distribution of the sample data. The efficiency of our method is presented by revealing some of the conditional independences of 9 US-exchange rates. First for each marginal exchange rate series, an appropriate ARMA(P,Q)- GARCH(p,q) model was determined in [1]. It turned out that ARMA(1,1)-GARCH(1,1) models are sufficient to remove the time dependence in each

of the individual US-exchange rates. The resulting standardized residuals of these models were transformed using the "Empirical Cumulative Distribution Function". Then the multivariate data set have been transformed using the concept of sample derivated copula [2]. Based on the information content of the lower order marginals we determined the best fitting t-cherry junction tree probability distribution [3]. This made possible to reveal some of the conditional independences. This method can also be applied for finding the truncated copula vine structure.

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Speaker: **Szederkenyi Gabor** (MTA SZTAKI , szeder@scl.sztaki.hu)
Author(s): Gábor Szederkényi, Katalin M. Hangos
Title: Computation techniques for finding reaction network structures with given properties – Adott tulajdonságú reakcióhálózati struktúrák meghatározása számítási módszerekkel
Abstract: "(Bio)chemical reaction networks (CRNs) obeying the mass action law form an important model class for describing dynamical phenomena in biological systems such as gene regulation networks, metabolic networks or signalling pathways. Moreover, CRNs have gained an increasing interest among mathematicians and engineers in recent years, because this algebraically simple system class is able to produce all the important qualitative dynamical features necessary to model complex natural or technological processes. Chemical Reaction Network Theory (CRNT) has strong and typically structure-dependent results for the qualitative properties of CRN dynamics such as multiplicity and stability of equilibrium points, persistence and boundedness of solutions etc. However, it is known that the network structure corresponding to a given kinetic dynamics is generally non-unique. Therefore, it is definitely of interest to systematically search for such structures within a group of candidates that allow us to apply the results of CRNT for the analysis of the corresponfing dynamics. This lecture gives a brief overview of optimization-based techniques to determine dynamically equivalent and linearly conjugate CRN structures with prescribed properties such as (weak) reversibility, detailed or complex balance and minimal deficiency. The proposed methods will be illustrated on the models of simple biological systems.

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Speaker: **Szilágyi Szabolcs** (Debreceni Egyetem, szilagyi.szabolcs@inf.unideb.hu)
Author(s): Szabolcs Szilágyi, Béla Almási
Title: A Review of Congestion Management Algorithms on Routers – Forgalomirányítók Torlódáskezelési Algoritmusainak Áttekintése
Abstract: "In his paper we will present one aspect of the DS (Differentiated Services) architecture, which is congestion management (queuing). Based on the DS value, packets may be put in separate buffer queues, and various forwarding policies can be used to favor high priority packets in different ways.

The primary reason for queuing is that a router needs to hold a packet in memory while the outgoing interface is busy sending another packet. The queuing tools are covered in the order in which they were added as Cisco IOS features: FIFO (First-In First-Out), CQ (Custom Queuing), PQ (Priority Queuing), WFQ (Weighted Fair Queuing), CBWFQ (Class Based Weighted Fair Queuing) and LLQ (Low Latency Queuing).

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[11] P. K. Verma, L. Wang, "Voice over IP Networks - Quality of Service, Pricing and Security", Lecture Notes in Electrical Engineering, Vol. 71, Springer, 2011

[12] S. Kashihara, "VoIP Technologies", INTECH Open Access Publisher, 2011"

Speaker: **Szirányi Tamás** (MTA SZTAKI, sziranyi@sztaki.hu)
Author(s): Tamás Szirányi
Title: The part and the whole: relations in the scene of sensors' measurement space – A rész és az egész: összefüggések a szenzorok mérési terében
Abstract: "Relations among different views and scales in imaging

- Optimization strategies in the sensors' networks

- Graph-based features

- Clustering and recognition on connected features' structure

- Stochastic image alignment

- Scale-Space axioms to a new paradigm of image description

- Stochastic and physical models for background discrimination

- Neighborhood and geometrical relations

- Graph based features"

Speaker: **Szkaliczki Tibor** (Computer and Automation Research Institute of the Hungarian Academy

of Sciences, sztibor@sztaki.hu)
Author(s): Tibor Szkaliczki, Anita Sobe, László Böszörményi
Title: Determining optimal multimedia content delivery in complex networks – Optimális multimédia tartalom kiszolgálás meghatározása komplex hálózatokban
Abstract: "People produce numerous photos and videos at social events, but it takes hours and days until other people can consume this content. By connecting their devices enables sharing of content during the event, but leads to a complex dynamic network. The resulting content delivery problem is an extremely complex and computationally hard optimization problem. We show that the addressed problem is NP-complete, containing several hard problems including edge-disjoint path routing, scheduling and the knapsack problem. A bio-inspired, hormone-based approach has been developed for search and delivery of content units in unstructured dynamic networks (Sobe et al., 2010). It is scalable, robust and adaptive, however, hard to evaluate. We therefore define a formal model and introduce an ILP based optimization method in order to get the exact global optimum. The optimum serves as a lower bound in the evaluation of the distributed approach. The optimization tool helps to discover the Quality of Service (QoS) limits of a content delivery system under a specific request pattern.

Anita Sobe, Wilfried Elmenreich, and Laszlo Böszörmenyi. Towards a self-organizing replication model for non-sequential media access. In Proceedings of the 2010 ACM MM workshop on Social, adaptive and personalized multimedia interaction and access, pages 3-8. ACM, 2010."

Speaker: **Tapolcai Janos** (Budapest University of Technology and Economics, tapolcai@tmit.bme.hu)
Author(s): Janos Tapolcai
Title: Application of Combinatorial Group Testing in Networks – Kombinatorikus csoporttesztelés hálózati alkalmazásai
Abstract: "Out-of-band monitoring has been proposed as an effective approach for link failure localization in all-optical Wavelength Division Multiplexing (WDM) mesh networks. In this presentation, the recent research related to out-of-band monitoring is overviewed. We define and formulate the related optimization problems under several design constraints, summarize the analytical results and discuss the related heuristic algorithms."

Speaker: **Telek Miklós** (Budapesti Műszaki és Gazdaságtudományi Egyetem, telek@hit.bme.hu)
Author(s): Miklos Telek
Title: Stochastic modeling of communication systems – Távközlési rendszerek sztochasztikus modellezése
Abstract: "One of the main characteristic property of today communication systems is the integrations of a wide range of services and access methods. This integration process resulted in plenty industrial needs motivated research problems. The talk is going to summarize some of the research challenges of the resent years with special attention to the stochastic modeling problems. They include modeling of communication traffic, analysis optimization and dimensioning of queuing systems and networks.

Another important issue of the talk is the difficulty of applying basic research results for answering practical industrial questions. As it is appears in the title of a well known textbook of the field ""the art of modeling"" is required for giving meaningful answers to practical needs."

Speaker: **Turányi Tamás** (ELTE, turanyi@chem.elte.hu)
Author(s): Tamás Turányi
Title: Determination of reaction kinetic parameters from large amount of experimental data – Reakciókinetikai paraméterek meghatározása nagyszámú mérési adatból
Abstract: "In direct chemical kinetic measurements, the reaction conditions are selected in such a way that the measured signal depends mainly on the rate parameters of a single reaction step, thus a rate coefficient can be determined from it directly. In the indirect measurements, the experimental results depend on the rate parameters of several reaction steps and these data can be interpreted via simulations using a reaction mechanism. We have suggesed [1] [2] a new method that consists of the following main steps: (i) Indirect measurements belonging to the chemical system to be investigated are selected and

the most influental rate parameters of a detailed reaction mechanism are identified by local sensitivity analysis. (ii) Direct measurement values are collected to these rate parameters and their domain of uncertainty is determined. (iii) The optimized values of the rate parameters of the selected elementary reactions within their domain of uncertainty are determined using a newly developed global nonlinear fitting procedure based on both the direct and indirect experimental data.

[1] Nagy, T.; Turányi, T. Int. J. Chem. Kinet. 2011, 43, 359-378.

[2] Turányi, T.; Nagy, T.; Zsély, I. G.; Cserháti, M.; Varga, T.; Szabó, B. T.; Sedyó, I.; Kiss, P. T.; Zempléni, A.; Curran, H. J. Int. J. Chem. Kinet. 2012, 44, 284-302."

Speaker: **Vajda István** (Technical University of Budapest, vajda@hit.bme.hu)
Author(s): István Vajda
Title: Universal composability techniques in the design and analysis of cryptographic protocols – Univerzális kompozíció a kriptoprotokollok tervezésében és analízisében
Abstract: "The approach of universal composability is a powerful technique in the design of provably secure cryptographic protocols, where the security is maintained within any protocol environment. It is an important tool for modular design and analysis. Key aspects of this technology will be treated during the seminar talk from applications to theoretical results: secure routing protocols from the field of ad-hoc networks; definition of the ideal functionality for the task of anonymous communication; a new look at the result that protocols with hashes Dolev-Yao style models do not have cryptographically sound realization in the sense of BRSIM/UC in the standard model of cryptography."

Speaker: **Varga László** (Eötvös Loránd Tudományegyetem, vargal4@chello.hu)
Author(s): László Varga, András Zempléni
Title: Multiplier bootstrap in GARCH models – Súlyozott bootstrap GARCH folyamatokra
Abstract: "Bootstrap methods are also useful if the data on hand are strongly dependent, especially in case of time series. Using the results of Francq-Zakoian [1], we managed to prove that the multiplier (weighted) bootstrap quasi maximum likelihood estimation of the parameters of GARCH(p,q) processes is strongly consistent and the estimate's limit distribution is Gaussian. We assume that the weights are independent from the process, they are positive with probability one, there exists their first two moments and the correlation between them is weak. The main tools of the proof are the Taylor expansion, the ergodic theorem for stationary processes, Bernstein's theorem, the Lindeberg's martingale central limit theorem and the Cramér-Wold theorem. We examined the practical consequences of the theorem, the covariance matrix of the limit distribution and the rate of convergence via simulations.

[1] C.Francq, J. Zakoian: GARCH models. Wiley, 2010."

Speaker: **Varjú Zoltán** (WebLib Kft, varju.zoltan@weblib.hu)
Author(s): Zoltán Varjú
Title: The Data Deluge – Adatáradat
Abstract: """Data is the new oil"" as the saying goes. The recent developments in IT opened up the possibility of collecting, storing and analyzing large amounts of data. Norvig et al. argues [1] that given a large enough data set, naive algorithms outperform highly sophisticated ones. On the other hand, Bender and Good [2] suggest we have to review our theories about language in the light of the unprecedented amount of available empirical data. This approach is parallel to so-called probabilistic linguistics research program[3]. Using the Internet as a source of data is exciting and challenging. Information is usually encoded into text files and we have to employ natural language processing techniques to extract it. To cope with the sheer size of today's data sets, we have to adapt our algorithms to the modern parallel distributed processing systems.

[1] Alon Halevy, Peter Norvig, and Fernando Pereira: The Unreasonable Effectiveness of Data, IEEE Intelligent Systems, March/April, 2009

[2] Emily M. Bender and Jeff Good. 2010. A Grand Challenge for Linguistics: Scaling Up and Integrating Models. White paper contributed to NSF's SBE 2020 initiative.
http://www.nsf.gov/sbe/sbe_2020/submission_detail.cfm?upld_id=81 (06.06.2012)

[3] Rens Bod, Jennifer Hay, and Stefanie Jannedy (eds): Probabilistic Linguistics, MIT Press, 2003"

Speaker: **Zempléni András** (ELTE TTK Matematikai Intézet, zempleni@ludens.elte.hu)
Author(s): András Zempléni
Title: Flood risk estimation for a real-estate insurance portfolio – Ingatlanbiztosítási állomány árvíz-kockázat-becslése
Abstract: We try to estimate the probability distribution for the annual losses due to flooding for a hypothetic insured real estate portfolio, based on extreme-value modelling of Hungarian hydrological data and on expert estimators for levee breaches. To the estimators international data are used as well, the results are generated by computer simulations.