DGS II 2013 - International Conference and Advanced School Planet Earth Dynamics, Games and Science II

28 August to 6 September 2013

Calouste Gulbenkian Foundation (FCG) and
Instituto Superior de Economia e Gestão, Universidade Técnica de Lisboa (ISEG-UTL)

Lisboa, Portugal

Keynote Speakers and school lecturers

Elvio Accinelli, UASLP, Mexico Michel Benaim, Université de Neuchâtel, Switzerland
Fabio Chalub, Universidade Nova de Lisboa, Portugal
Jim Cushing, University of Arizona, USA
João Lopes Dias, Universidade Técnica de Lisboa, Portugal
Pedro Duarte, Universidade de Lisboa, Portugal
Marta Faias, Universidade Nova de Lisboa, Portugal
Lorens Imhof, University of Bonn, Germany
Yunping Jiang, City University of New York, USA
José Martins, I.P. Leiria, Portugal
Bruno Oliveira, Universidade do Porto, Portugal
Jorge Pacheco, Universidade do Minho, Portugal
Joana Pais, ISEG/Technical University of Lisbon, Portugal
Alberto A. Pinto Universidade do Porto, Portugal
Martin Shubik, Yale University, USA)
Renato Soeiro, Universidade do Porto, Portugal
Satoru Takahashi, National University of Singapore
Jorge Zubelli, IMPA, Brasil

Organized by The International Center of Mathematics CIM - Portugal

Welcome letter to the participants of the President of CIM

The International Center of Mathematics CIM is a partner institution of the International Program Mathematics of Planet Earth 2013 (MPE 2013).

To this extent, CIM is organizing the following CIM-MPE events:

http://sqig.math.ist.utl.pt/cim/mpe2013/

- MECC 2013 - International Conference and Advanced School Planet Earth, Mathematics of Energy and Climate Change, 21-28 March 2013.

- DGS II 2013 - International Conference and Advanced School Planet Earth, Dynamics, Games and Science II, 28 August to 6 September 2013.

The first two volumes of the CIM Series in Mathematical Sciences published by Springer-Verlag will consist of selected works presented in the conferences Mathematics of Planet Earth (CIM-MPE). The editors of these first two volumes are Jean Pierre Bourguignon, Rolf Jeltsch, Alberto Pinto and Marcelo Viana. If you would like to submit a review article, please send it by email to aapinto@fc.up.pt and to info.mpe2013@sqig.math.ist.utl.pt until 31 of December of 2013.

CIM thanks all CIM-MPE events sponsors.

CIM thanks and wishes all keynote speakers, thematic session organizers, invited speakers and participants a fruitful meeting.

Alberto Adrego Pinto
CIM President

Graphs and Combinatorics
Organizer: *Domingos Cardoso*
CIDMA, DMat, Universidade de Aveiro

Speakers:
- Sofia Pinheiro, Univ. de Aveiro, *"The maximum k-regular induced subgraph problem"*.
- Fátima Pacheco, Inst. Politécnico de Bragança, *"(0,2)-regular sets and applications"*.
- Inês Barbedo, Inst. Politécnico de Bragança, *"The construction of the poset of regular exceptional graphs using equitable partitions"*.
- Maria Manuel Torres, Univ. de Lisboa, *"Matchings and orthogonality of symmetrized tensors"*.
- Teresa Sousa, Univ. Nova de Lisboa, *"Graph Decomposition: A blend of Turán numbers and Ramsey numbers"*.
- Paula Carvalho, Univ. de Aveiro, *"Topological Indices of graphs"*.
- Marta Pascoal, Univ. de Coimbra, *"Min-max regret robust shortest path problem in a finite mult-scenario model"*.
- Vasco Mano, Univ. de Porto, *"A Generalization of the Krein parameters and some admissibility conditions for strongly regular graphs"*.
- Paula Rama, Univ. de Aveiro, *"Some results on the modified Schultz index"*.
- Ricardo Mamede, Univ. de Coimbra, *"Singleton free set partitions avoiding a 3-element set"*.
- Rui Duarte, Univ. de Aveiro, *"Maps and hypermaps with large symmetry group"*.
- Ilda Perez, Univ. de Lisboa, *"Shannon switching games and directed variants"*.
- Olga Azenhas, Univ. de Coimbra, *"Growth diagrams, crystal operators and Cauchy kernel expansions"*.
September 3rd, 10:30-11:30, 11:45-12:45 and 14:15-15:15 / September 4th, 10:30-11:30 and 11:45-12:45, Sala 1

Dynamical models and data analysis in epidemiology
Organizer: *Nico Stollenwerk*
CMAF, Universidade de Lisboa

Speakers:
- Maira Aguiar, CMAF, Universidade de Lisboa, *"Modelling dengue fever epidemiology: complex dynamics and its implication for data analysis"*.
- Filipe Rocha, CMAF, Universidade de Lisboa, *"Understanding dengue fever dynamics: study of seasonality in the models"*.
- Urszula Skwara, CMAF, Universidade de Lisboa, *"Spatial epidemiological models, superdiffusion"*.
- Luis Mateus, CMAF, Universidade de Lisboa, *"Bayesian Model Comparison and Semiclassical Approximations in Population Biology"*.
- Peyman Ghaffari, CMAF, Universidade de Lisboa, *"Evolution towards critical fluctuations and Self-Organized Criticality (SOC) in a system of accidental pathogens"*.
- Nico Stollenwerk, CMAF, Universidade de Lisboa, *"Parameter estimation in complex systems"*.
- Max Souza, Universidade Federal Fluminense, Niterói, Brasil, *"Multiscale Modelling in Evolutionary Dynamics"*.
September 3rd, 10:30-11:30 and 11:45-12:45, Sala 2

Dynamical Systems and Bifurcations
Organizer: *Alexandre Rodrigues*
FCUP, CMUP

Speakers:
- Sofia Castro, FEP, CMUP, *"Global Dynamics for Symmetric Planar Maps"*.
- José Pedro Gaivão, CEMAPRE, ISEG, *"Splitting of separatrices near a Hamiltonian-Hopf bifurcation"*.
- Begoña Alarcón, Oviedo University, Spain, *"Rotation numbers for planar attractors of equivariant homeomorphisms"*.

$\alpha_k(G)$. Since the determination of the order of a k-regular induced subgraph is in general a NP-hard problem, it is crucial to find upper bounds determined in polynomial time as good approximations. In this presentation some upper bounds on $\alpha_k(G)$ are proposed and an extension to arbitrary graphs of the convex quadratic upper bound introduced in Cardoso, Kamiński, and Lozin [J. Comb. Optim., 14, 455-463, 2007] for regular graphs is presented. Based on this approach, new spectral upper bounds on the order of maximum size k-regular induced subgraphs are deduced. Finally a few computational experiments are presented.

$(0,2)$-regular sets and applications

Maria de Fátima Pacheco [1,*], Domingos M. Cardoso [2], Carlos J. Luz
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A (κ,τ)-regular set in a graph is a subset of vertices inducing a κ-regular subgraph and such that each vertex not in the set has exactly τ neighbors in it. We will present a new algorithm for the determination of $(0,2)$-regular sets in line graphs as well as its application to the determination of maximum matchings in arbitrary graphs.

The construction of the poset of regular exceptional graphs using equitable partitions

Inês Barbedo [1,*], Domingos M. Cardoso [2], Paula Rama
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An exceptional graph is a connected graph with least eigenvalue greater than or equal to -2 which is not a generalized line graph. In [3] it is shown that the set of regular exceptional graphs is partitioned in three layers. A (κ,τ)-regular set is a subset of the vertices of a graph, inducing a κ-regular subgraph such that every vertex not in the subset has τ neighbors in it [2]. In [1] a new recursive construction of regular exceptional graphs is proposed, where each regular exceptional graph of the first and the second layer is constructed by a $(0,2)$-regular set extension. In this talk we present an algorithm based on this recursive construction and show that this technique induces a partial order relation on the set of regular exceptional graphs. The process of extending a graph is reduced to the construction of the incidence matrix of a combinatorial 1-design, considering several rules to prevent the production of isomorphic graphs, and we show that each regular exceptional graph has an equitable partition which, by this construction technique, is extended with a new element, the set of the additional vertices. The recursive construction is generalized to the construction of arbitrary families of regular graphs, by extending a regular graph G with another regular graph H such that $V(H)$ is a (κ,τ)-regular set of the regular graph produced. This technique is used to construct the exceptional regular graphs of the third layer. The Hasse diagrams of the posets of the three layers are presented.

[1] D.M. Cardoso and D. Cvetković.
Graphs with least eigenvalues -2 attaining a convex quadratic upper bound for the stability number., Bull. Acad. Serbe Sci. Arts, Cl. Sci. Math. Natur., Sci. Math., CXXXIII (31):41–55, 2006.

[2] D. M. Cardoso and P. Rama, *Spectral results on regular graphs with (κ,τ)-regular sets*, Discrete Math. (307) 1306-1316, 2007.

[3] D. Cvetković, P. Rowlinson and S. Simić. *Spectral Generalizations of line graphs: on graphs with least eigenvalue -2*, Cambridge University Press, Cambridge, 2004.

Thematic Sessions

Room: Auditório 3

	September 2nd	September 3rd	September 4th
10:30-11:30	*Bayesian Statistics: Applications in Biology and Ecology* João Casaca Giovani L. Silva Luís Silva Francesco Minunno	*Some economic applications* Orlando Montoro Peinado Meliyara Consuegra Eduardo Oliva Alberto A. Álvarez-López	*Coupled Cell Networks* Celia Moreira Ana Dias Manuela Aguiar Rui Paiva
	Break		
11:45-12:45	*Marine Life in the Wild Wider Ocean* Telmo Morato Fernando Tempera Pedro Afonso	*Dynamical Systems and Bifurcations* Sofia Castro José Pedro Gaivão Begoña Alarcón Maria Joana Torres	*Interest Rate, Credit Risk and Investment Models* Cláudia Nunes Raquel Gaspar João Bastos Daniel Schwarz
	Break		
14:15-15:15	*Biological Invasions in the Azores* João Canning-Clode Luís Silva Orlando Guerreiro	*Evolutionary games and economy* Edgar Carrera Elvio Accinelli	*Wave Interaction with Floating Bodies* Gonçalo Dias Filipe Cal Bruno Pereira
	Break		
15:30-16:30	*Chaotic Dynamics in Growth models* Sandra M. Aleixo Acilina Caneco	*Piecewise smooth dynamics* Alexandre Plakhov Paulo Brito Alessandro Margheri	*Lyapunov Exponents and Applications* Silvius Klein Helder Vilarinho César M. Silva Alexandre Rodrigues

Room: Sala1

	September 2nd	September 3rd	September 4th
10:30-11:30	*Discrete Dynamics and Numerical Semigroups* Clara Grácio Susana Santos Teresa Silva Denise Torrão	*Graphs and Combinatorics (I)* Sofia Pinheiro Fátima Pacheco Inês Barbedo	*Graphs and Combinatorics (IV)* Paula Rama Ricardo Mamede Rui Duarte
	Break		
11:45-12:45	*Synchronization and Discrete Dynamics* Sara Fernandes Luís Lopes André Albino	*Graphs and Combinatorics (II)* Maria Manuel Torres Teresa Sousa	*Graphs and Combinatorics (V)* Ilda Perez Olga Azenhas
	Break		
14:15-15:15	*Dynamics, Modelling and Optimisation* Ana I. Pereira Carlos Balsa João P. Almeida Renato Fernandes	*Graphs and Combinatorics (III)* Paula Carvalho Marta Pascoal Vasco Mano	*Stochastic Models (I)* Filipe Martins Ricardo Cruz Mikhail Smilovic
	Break		
15:30-16:30	*Bio-Dynamics* Isabel Figueiredo Bruno Oliveira João Coelho Joana Becker	*Biomathematics* José Martins Jorge Pereira Rui Santos	*Stochastic Models (II)* Michal Krzeminski Malgorzata Pulka