



**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 Benaïm, 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

Lorenz 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



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

Portugal

28 August to 6 September 2013

Keynote Speakers
Thematic Sessions
Advanced School
Book of Abstracts
Conference Schedule

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

Venues

The International Conference, 2-4 September 2013 will be hosted in Calouste Gulbenkian Foundation (FCL), Lisbon, Portugal.

Rooms: Auditório 2, Auditório 3, Sala 1, Sala 2.

The Advanced School, 28-30 August and 5-6 September 2013 will be hosted at Instituto Superior de Economia e Gestão, Universidade Técnica de Lisboa (ISEG-UTL), Lisbon, Portugal.

Room: Auditório CGD.

Proceedings of the CIM series

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).

Proceedings editors:

- Jean Pierre Bourguignon, IHES, Paris, France
- Rolf Jeltsch, ETH, Zurich, Switzerland
- Alberto Pinto, INESC-TEC, University of Porto, Portugal
- Marcelo Viana, IMPA, Rio de Janeiro, Brazil

Submission: 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.

Sponsors

These activities are enthusiastically supported and co organized by the Portuguese Society of Mathematics (SPM), the Portuguese Society of Statistics (SPE); the Portuguese Society of Operational Research (APDIO); UECE-Research Unit on Complexity and Economics; CEMAPRE-the Centre for Applied Mathematics and Economics; INESC-TEC Instituto de Engenharia de Sistemas e Computadores do Porto - Tecnologia e Ciência; CEAUL-Centro de Estatística e Aplicações, UL; CMAL-UNL-Centro de Matemática e Aplicações, UNL; CMAF-UL-Centro de Matemática e Aplicações Fundamentais, UL; ISR-Institute for Systems and Robotics, Lisbon; IDL-UL-Instituto D. Luís, UL; IN+ -Centro de Estudos em Inovação Tecnologia e Políticas de Desenvolvimento; ISEG-Instituto Superior de Economia e Gestão; Instituto de Telecomunicações; FCT - Fundação para a Ciência e a Tecnologia; Ciência Viva; FCUL-Faculdade de Ciências da UL e FCG-Fundação Calouste Gulbenkian.

Organization: CIM Direction

Local organization committee:

Alberto Pinto, FCUP (President); Michel Benaim, Université de Neuchâtel; Henrique Silveira, IST; Renato Soeiro, FCUP; Filipe Martins, FCUP; João Passos Coelho, FCUP; Joana Becker, FCUP; João Paulo Almeida, IPB; Carla Azevedo, FCUP; Ricardo Cruz, FCUP; José Martins, IPLeiria; Renato Fernandes, FCUP; Isabel Figueiredo, FCUP; Telmo Parreira, UM.

Thematic Sessions

Bayesian Statistics: Applications in Biology and Ecology

Organizer: *Luís Silva*

CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, Universidade dos Açores

Speakers:

- João Casaca, Laboratório Nacional de Engenharia Civil, "*Bayesian inference: general framework*".
- Luís Silva, Departamento de Biologia, Universidade dos Açores, "*Multinomial and Dirichlet distributions in Bayesian inference: applications to Biology and Ecology*".
- Giovani L. Silva, Departamento de Matemática, Instituto Superior Técnico, Universidade Técnica de Lisboa, "*A Bayesian spatio-temporal analysis of forest fires in Portugal*".
- Francesco Minunno, PhD programme in Forestry Modelling, Instituto Superior de Agronomia, Universidade Técnica de Lisboa, "*Selecting parameters for Bayesian calibration of a process-based model: A methodology based on canonical correlation analysis*".

September 2nd, 10:30-11:30, Auditório 3

Discrete Dynamics and Numerical Semigroups

Organizer: *Sara Fernandes*

Universidade de Évora

Speakers:

- Clara Grácio, Universidade de Évora, "*Ihara zeta function, symbolic dynamics and seismic events networks*".
- Susana Santos, PhD student Universidade de Évora, "*Discrete Dynamical Systems and Numerical Semigroups*".
- Teresa Silva, PhD student Universidade de Évora e ISEL, "*About equilibrium distributions of discrete non autonomous systems*".
- Denise Torrão, PhD student Universidade de Évora, "*On the enumeration of the set of saturated numerical semigroups with fixed Frobenius number*".

September 2nd, 10:30-11:30, Sala 1

Mean-Field Models, Optimal Control and Calculus of Variations

Organizer: *Edgard Pimentel*

Universidade Técnica de Lisboa

Speakers:

- Gabriele Terrone, CAMGSD-IST-UTL, "*Homogenization of certain optimal control problems*".
- Edgard Pimentel, CAMGSD-IST-UTL, "*Regularity for mean-field games in the subquadratic case*".
- Rita Gonçalves Ferreira, Instituto Superior Técnico (IST) & Centro de Matemática e Aplicações of the FCT-UNL (CMA of the FCT-UNL), "*Finite state (potential) mean-field games: long time behavior via Γ -convergence*".

September 2nd, 10:30-11:30, Sala 2

Marine Life in the Wild Wider Ocean

Organizer: *Ricardo Serrão Santos*

Centro do IMAR da Universidade dos Açores (IMAR-DOP/UAç) & LARSyS - Horta/Açores

Speakers:

- Telmo Morato, University of the Azores, "*Seamounts are hotspots of pelagic biodiversity in the open ocean*".
- Fernando Tempera, IMAR - Instituto do Mar, University of the Azores e LARSyS, "*Predicting deep-sea biological distributions using scarce information*".
- Pedro Afonso, Centro do IMAR da Universidade dos Açores (IMAR-DOP/UAç) & LARSyS

Laboratório Associado, "*Fish in space: Modeling movements and essential habitat*".
September 2nd, 11:45-12:45, Auditório 3

Synchronization and Discrete Dynamics

Organizer: *Clara Grácio*

Universidade de Évora

Speakers:

- Sara Fernandes, Universidade de Évora, "*Conductance and clique formation and its applications*".
- Luís Lopes, PhD student Universidade de Évora e ISEL, "*Linear couplings', 'commanded couplings' and their synchronization*".
- André Albino, PhD student Universidade de Évora, "*Analyze of dynamic behavior of Burridge Knopoff model in synchronized and nonsynchronized regime: potential implications*".

September 2nd, 11:45-12:45, Sala 1

Statistics in Environmental and Life Sciences

Organizer: *Marta Faias*

FCT-UNL and CMA

Speakers:

- Dora Prata Gomes, Universidade Nova de Lisboa, FCT and CMA, "*Spatial analysis of extreme precipitation*".
- Inês J. Sequeira, FCT/UNL and CMA, "*Analysis of HIV integration sites in human chromosomes by genetic and statistical methods*".
- Vanda Lourenço, FCT/UNL, Dep. Mathematics and CMA, "*Robust outlier testing with application to a maize data set*".
- Isabel Natário, CEAUL and Dep. de Matemática, FCT/UNL, "*A State Space Model Approach for Modelling the Population Dynamics of Black Scabbardfish*".

September 2nd, 11:45-12:45, Sala 2

Biological Invasions in the Azores

Organizer: *Ricardo Teixeira*

Departamento de Matemática da Universidade dos Açores

Speakers:

- João Canning-Clode, Centre of IMAR of the University of the Azores, Department of Oceanography and Fisheries/Uaz & LARSyS Associated Laboratory, "*Marine invasions in offshore islands: a case study from the Macaronesia region*".
- Luís Silva, CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Pólo dos Açores, Departamento de Biologia, Universidade dos Açores, "*Invasions versus endemisms: quantitative approaches to the study of invasive and rare plants in the Azores*".
- Orlando Guerreiro, Azorean Biodiversity Group (GBA, CITA-A) and Portuguese Platform for Enhancing Ecological Research & Sustainability (PEERS), Universidade dos Açores, Portugal, "*Prediction of the spread of the drywood termite *Cryptotermes brevis* using Maximum Entropy algorithms and Agent Based Modeling approaches*".

September 2nd, 14:15-15:15, Auditório 3

Dynamics, Modelling and Optimisation

Organizer: *João Paulo Almeida*

Instituto Politécnico de Bragança

Speakers:

- Ana I. Pereira, ALGORITMI and I.P. Bragança, "*Solving Flexible Job Shop Scheduling using Genetic Algorithm*".
- Carlos Balsa, I.P. Bragança, "*Clustering Techniques Applied on Cross-Sectional Unemployment Data*".

- João P. Almeida, LIAAD - INESC TEC and I.P. Bragança, “Anosov diffeomorphisms and tilings”.
 - Renato Fernandes, University of Porto, “Rivers and the Stock Market”.
- September 2nd, 14:15-15:15 and 15:30-16:30, Sala 1

PDE's and Calculus of Variations

Organizer: *Ana Margarida Ribeiro* and *Rita Ferreira*
 FCT-UNL and IST-UTL & FCT-UNL

Speakers:

- Graça Carita, Universidade de Évora, “3D-2D dimension reduction for nonlinear optimal design with perimeter penalization”.
- José Maria Gomes, Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa, “A geometrical view of the Nehari manifold”.
- Giovanni Pisante, Seconda Università di Napoli, “Second order analysis for non local isoperimetric problems in microphase separation”.

September 2nd, 14:15-15:15, Sala 2

Chaotic Dynamics in Growth models

Organizer: *José Leonel Rocha*
 Instituto Superior de Engenharia de Lisboa -ISEL, IPL

Speakers:

- Sandra M. Aleixo, Instituto Superior de Engenharia de Lisboa -ISEL, IPL, “An Extension of Gompertzian Growth Dynamics: Weibull and Fréchet Models”.
- Acilina Caneco, Instituto Superior de Engenharia de Lisboa -ISEL, IPL, “Synchronization in Richards' Chaotic Systems”.

September 2nd, 15:30-16:30, Auditório 3

Discrete-valued time series

Organizer: *Isabel Pereira*
 Universidade de Aveiro

Speakers:

- Maria Eduarda Silva, Faculdade de Economia - Universidade do Porto, “Multivariate models for integer-valued time series”.
- Isabel Pereira, Departamento de Matemática - Universidade de Aveiro, “Threshold Models in Time Series of Counts”.
- Magda Monteiro, Escola Superior de Tecnologia e Gestão de Águeda - Universidade de Aveiro, “A periodic bivariate Integer-valued Autoregressive model - An application to fire activity”.
- Maria da Conceição Costa, Departamento de Matemática - Universidade de Aveiro, “Optimal alarm systems and application to the INAPARCH model”.

September 2nd, 15:30-16:30, Sala 2

Some economic applications

Organizer: *Alberto A. Álvarez López*
 UNED, Spain

Speakers:

- Orlando Montoro Peinado, UNED, “Emancipation and Household Formation”.
- Meliyara Consuegra, UNED, “Quantification of functional efficiency in energy futures markets”.
- Eduardo Oliva, UNED, “Entropy and negentropy: applications in Game Theory”.
- Alberto A. Álvarez-López, UNED, “Properties and comparative-static effects in models of decision under uncertainty: applications to the theory of the firm”.

September 3rd, 10:30-11:30, Auditório 3

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 multi-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*".

- Maria Joana Torres, CMAT, University of Minho, "*On C^2 -stability of hamiltonians*".
September 3rd, 11:45-12:45, Auditório 3

Evolutionary games and economy

Organizer: *Elvio Accinelli*

Facultad de Economia de la UASLP

Speakers:

- Edgar Carrera Facultad de economía de la UASLP, "*Migrant behavior by imitation*".
- Elvio Accinelli, Facultad de Economia de la UASLP, "*On the dynamics of corruption and polluting firms*".

September 3rd, 14:15-15:15, Auditório 3

Extremes and other statistical properties of dynamical systems

Organizer: *Jorge Freitas*

Universidade do porto

Speakers:

- Laura Cavalcante, CMUP e FCUP, "*Limiting behaviour of high order quantiles estimators*".
- Hale Aytac, CMUP e FCUP, "*Rare events for random dynamics*".

September 3rd, 14:15-15:15, Sala 2

Piecewise smooth dynamics

Organizer: *José Pedro Gaivão*

ISEG, UTL

Speakers:

- Alexandre Plakhov, Universidade de Aveiro, "*Invisibility and retro-reflection in billiards*".
- Paulo Brito, ISEG-UTL, "*A joint discontinuity and singularity induced bifurcation arising in a Cournot-Ramsey model*".
- Alessandro Margheri, FCUL, "*Complex dynamics in pendulum-type equations with variable length*".

September 3rd, 15:30-16:30, Auditório 3

Biomathematics

Organizer: *José Martins*

School of Technology and Management, Polytechnic Institute of Leiria; LIAAD-INESC TEC

Speakers:

- José Martins, School of Technology and Management, Polytechnic Institute of Leiria; LIAAD-INESC TEC, "*A recursive approximation to the quasi-stationary distribution in epidemiological models*".
- Jorge Pereira, Instituto de Telecomunicações, Leiria, "*An adaptive approach for skin lesion segmentation in dermoscopy images using a multiscale Local Normalization*".
- Rui Santos, School of Technology and Management, Polytechnic Institute of Leiria; CEAUL - Center of Statistics and Applications of University of Lisbon, "*An Overview of Quantitative Compound Tests*".

September 3rd, 15:30-16:30, Sala 1

Economic dynamics and computation

Organizer: *Paulo B. Vasconcelos*

Faculdade Economia Porto and Centro Matemática da UP

Speakers:

- Tiago Pinheiro, Faculdade Economia Porto, "*The dynamics of a cycle smoothing policy in a discrete stochastic growth model with taxes*".
- Paulo Mota, Faculdade Economia Porto and NIFIP, "*The Macrodynamics of Employment under Uncertainty*".

- Óscar Afonso, Faculdade Economia Porto and CEF.UP, *"Dynamic Political Effects in a Neoclassic Growth Model with Healthcare and Creative Activities"*.
- Pedro Mazedra Gil, Faculdade Economia Porto and CEF.UP, *"Industry Dynamics and Aggregate Stability"*.

September 3rd, 15:30-16:30, Sala 2

Bio-Dynamics

Organizer: *Bruno Oliveira*
FCNA, University of Porto

Speakers:

- Isabel Figueiredo, FC - University of Porto and ISEP - Polytechnic Institute of Porto, *"Equilibria when considering asymmetric death rates for active and inactive T cells and Tregs"*.
- Bruno Oliveira, FCNA and INESC TEC - University of Porto, *"Immune response dynamics by T cells with asymmetry in the death rates"*.
- João Coelho, FC - University of Porto, *"A mathematical model of carbon life in vineyards"*.
- Joana Becker, FC - University of Porto, *"Investing to reduce the production costs in a Cournot duopoly"*.

September 3rd, 17:00-18:00, Sala 1

Coupled Cell Networks

Organizer: *Célia Moreira*
University of Porto (CMUP)

Speakers:

- Celia Moreira, University of Porto (CMUP), *"Exploring coupled cell networks"*.
- Ana Dias, University of Porto (FCUP & CMUP), *"Coupled cell networks and the synchrony lattice"*.
- Manuela Aguiar, University of Porto (FEP & CMUP), *"Synchrony and graph operations on coupled cell networks"*.
- Rui Paiva, Instituto Politécnico de Leiria (ESTG) & CMUP, *"Hopf bifurcation in coupled cell networks with abelian symmetry"*.

September 4th, 10:30-11:30, Auditório 3

Marine Systems for Ocean Exploration and Exploitation: Theory and Practice

Organizer: *Fátima Leite* and *Antonio Pascoal*
Universidade de Coimbra and Universidade Técnica de Lisboa

Speakers:

- A. Pascoal, LARSyS/ISR-Lisbon, IST, Lisbon, PT, *"Cooperative Motion Control of Multiple Autonomous Marine Vehicles: Science and Technology"*.
- F. Lobo Pereira, ISR-Porto and FEUP, Porto, PT, *"Dynamic Optimization Control for Autonomous Vehicle Systems"*.
- F. Curado, Centre for Environmental and Marine Studies (CESAM) & Geosciences Dept. University of Aveiro, PT, *"Potential Field Inverse Problems: from Geophysical Prospecting to Autonomous Underwater Navigation"*.
- A. Silva, SiPLAB, FCT - Univ. of Algarve, Campus de Gambelas, Faro, PT, *"Ocean acoustic propagation modeling and communication in the vicinity of submerged structures"*.
- J. Gomes, LARSyS/ISR-Lisbon, IST, Lisbon, PT, *"Range-based localization of nodes in underwater acoustic networks through convex relaxation"*.
- A. Aguiar, LARSyS/ISR-Lisbon and FEUP, Porto, PT, *"Cooperative Marine Vehicle Navigation"*.

September 4th, 10:30-11:30 and 11:45-12:45, Sala 2

Interest Rate, Credit Risk and Investment Models

Organizer: *Cláudia Nunes*

IST/CEMAT

Speakers:

- Cláudia Nunes, IST/CEMAT, "*Investment, suspension or exit from the market, in a declining market*".
- Raquel Gaspar, ISEG/CEMAPRE, " "
- João Bastos, ISEG/CEMAPRE, "*Ensemble predictions of recovery rates*".
- Daniel Schwarz, CMU and IST/CEMAT, "*Price Modelling in Carbon Emission and Electricity Markets*".

September 4th, 11:45-12:45, Auditório 3

Wave Interaction with Floating Bodies

Organizer: *Juha Videman* and *Gonçalo Dias*

Instituto Superior Técnico/CAMGSD and CAMGSD/IST

Speakers:

- Gonçalo Dias, CAMGSD/IST, "*Interaction of water waves with freely floating structures*".
- Filipe Cal, ISEL/CAMGSD, "*Trapped modes around freely floating bodies*".
- Bruno Pereira, ISEL/CAMGSD, "*Edge waves along a sloping beach*".

September 4th, 14:15-15:15, Auditório 3

Stochastic Models

Organizer: *Alberto Pinto*

University of Porto

Speakers:

- Filipe Martins, University of Porto, "*Optimal consumption, life insurance and investment strategies in a general financial market*".
- Ricardo Cruz, University of Porto, "*Semi-stationarity under the prisoner's dilemma*".
- Mikhail Smilovic, Department of Civil Engineering at McGill University, "*Games, Groundwater and Governance*".
- Michal Krzeminski, Department of Probability and Biomathematics, Gdansk University of Technology, Poland, "*Survival analysis under a Markov model of disease*".
- Malgorzata Pulka, Department of Probability and Biomathematics, Gdansk University of Technology, Poland, "*Asymptotic stability of quadratic stochastic operators and their applications in population genetics*".

September 4th, 14:15-15:15 and 15:30-16:30, Sala 1

Dynamic Optimization: Applications to Economics and Management

Organizer: *Orlando Costa Gomes*

ISCAL / IPL

Speakers:

- Armando Mendes, Universidade dos Açores, "*Dairy Farming Systems' Adaptation to Climate Change*".
- Jorge Santos, Universidade de Évora, "*Efficiency measurement in Economics and Management*".
- Luís Cavique Santos, Universidade Aberta, "*Strong and Weak Ties in Social Networks*".
- Orlando Gomes, ISCAL / IPL, "*A Budget Setting Problem*".

September 4th, 14:15-15:15, Sala 2

Lyapunov Exponents and Applications

Organizer: *Mario Bessa*

Universidade da Beira interior

Speakers:

- Silvius Klein, CMAF, "*Positive Lyapunov exponents for higher dimensional quasiperiodic cocycles*".
 - Helder Vilarinho, UBI, "*On the spectrum of L_p cocycles*".
 - César M. Silva, UBI, "*General dichotomic behavior for trajectories of nonautonomous difference equations*".
 - Alexandre Rodrigues, FCUP, "*The Lyapunov exponents of toral maps with a reversing symmetry*".
- September 4th, 15:30-16:30, Auditório 3

Symbolic dynamics and Lorenz-like knots

Organizer: *Luís Silva*

ISEL and CIMA-UE

Speakers:

- Luís Silva, CIMA-UE, ISEL Lisbon, "*Invariants of templates, knots and links generated by renormalizable Lorenz maps*".
 - Nuno Franco, CIMA-UE, University of Évora, "*Thurston's classification of a family of Lorenz knots*".
 - Paulo Gomes, ISEL-Lisbon, "*Lorenz braids, symbolic dynamics and hyperbolic knots*".
 - Pedro Simões, University of Évora, "*Genus for knots and links in renormalizable templates with several branch nodes*".
- September 4th, 15:30-16:30, Sala 2

Clustering Techniques Applied on Cross-Sectional Unemployment Data

Carlos Balsa^{1,*}, Alcina Nunes¹, Elisa Barros¹

¹ Instituto Politécnico de Bragança, Portugal

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An important strategy for data classification consists in organising data points in clusters. The k -means [1] is a traditional optimisation method but other methods, like spectral clustering [2], exist as alternative cluster methods to classify data.

Using a labour market database from different economic contexts (different years), we suggest the application of alternative methods based on clustering techniques. The idea is to understand if an approach to different economic labour market frameworks, using distinct clustering approaches, could affect the expected results.

- [1] J. B. MacQueen. Some Methods for classification and Analysis of Multivariate Observations. In *Proceedings of 5-th Berkeley Symposium on Mathematical Statistics and Probability, University of California Press* 1, 281-297, 1967.
- [2] A. Y. Ng and M. I. Jordan and Y. Weiss. On spectral clustering: Analysis and an algorithm. In *Advances in Neural Information Processing Systems (NIPS)* 14, 849-856, 2002.

Anosov diffeomorphisms and tilings

João P. Almeida^{1,2} and Alberto A. Pinto^{2,3}

¹ Instituto Politécnico de Bragança, Portugal.

² LIAAD - INESC TEC, Portugal.

³ University of Porto, Portugal.

Inspired in the works of Y. Jiang [3] and A. Pinto and D. Sullivan [10], A. Pinto et al. [5] introduced the notion of *golden tiling* and proved the existence of a natural correspondence between golden tilings, smooth conjugacy classes of Anosov diffeomorphisms with invariant measure absolutely continuous with respect to Lebesgue measure and solenoid functions. Here we extend their result and introduce the notion of γ -tiling. Like the golden tilings, the γ -tilings record the infinitesimal geometric structure determined by the dynamics of an Anosov diffeomorphism G along the unstable leaf that is invariant under the action of G . The properties of γ -tilings are defined using a decomposition of natural numbers that we call *γ -Fibonacci decomposition*. The main contribution of this work consists in understanding the way how this γ -Fibonacci decomposition encodes the combinatorics determined by the Markov partition of G along the unstable leaf. Our goal is to exhibit a natural correspondence between γ -tilings, smooth conjugacy classes of Anosov diffeomorphisms with invariant measure absolutely continuous with respect to Lebesgue measure and solenoid functions.

- [1] Almeida, J. P. and Pinto, A. A.: Anosov diffeomorphisms and γ -tilings. (2013), 1-25 (*submitted*).
- [2] de Faria, E., de Melo, W. and Pinto, A.: Global hyperbolicity of renormalization for C^r unimodal mappings. *Annals of Mathematics*, **164**, 731-824 (2006).
- [3] Jiang, Y.: Metric invariants in dynamical systems. *Journal of Dynamics and Differentiable Equations*, Vol. **17** (1), 51-71 (2005).
- [4] de Melo, W. and Pinto, A.: Rigidity of C^2 infinitely renormalization for unimodal maps. *Communications of Mathematical Physics*, **208**, 91-105 (1999).
- [5] Pinto, A. A., Almeida, J. P. and Portela, A.: Golden tilings. *Transactions of the American Mathematical Society*, **364** (2012), 2261-2280.
- [6] Pinto, A. A. and Rand, D. A., Solenoid functions for hyperbolic sets on surfaces. *Dynamics, Ergodic Theory and Geometry: Dedicated to Anatole Katok* (ed. Boris Hasselblat) MSRI Publications, **54**, (2007), 145-178.