

# Optimization, Graph Theory and Combinatorics

Center for Research & Development in Mathematics and Applications

**FCT** Fundação para a Ciência e a Tecnologia

**CIDMA** CENTRO DE I&D EM MATEMÁTICA E APLICAÇÕES  
CENTER FOR R&D IN MATHEMATICS AND APPLICATIONS

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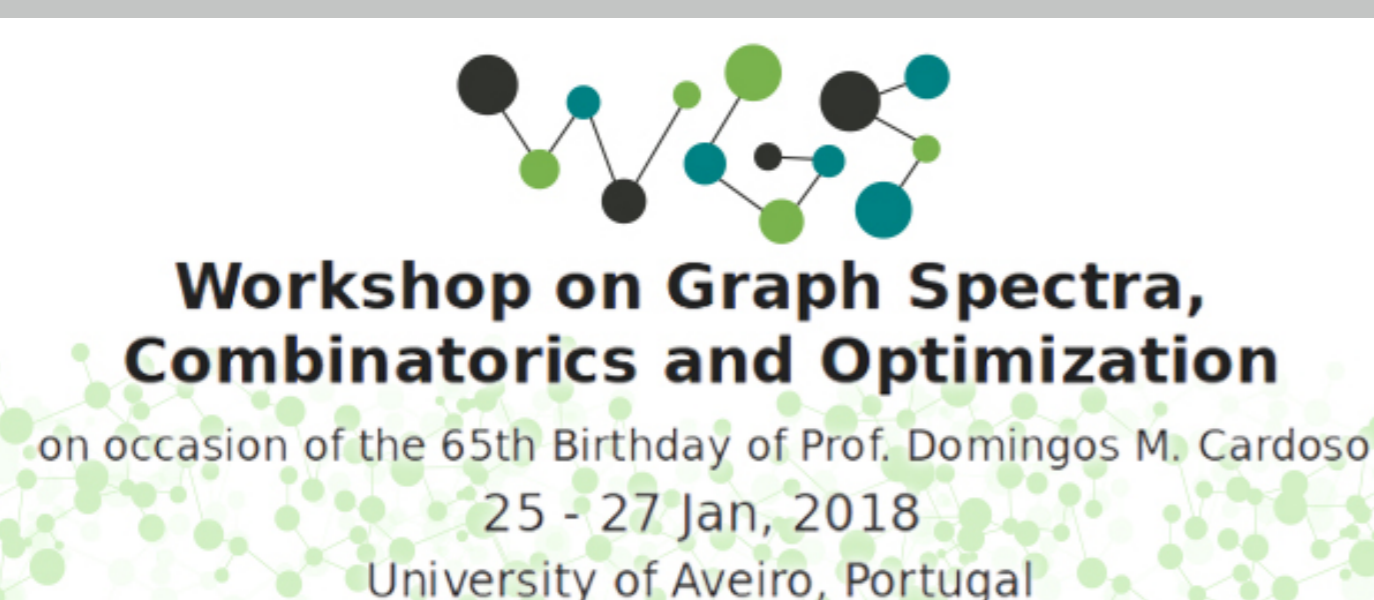
## Objectives

The general objectives of OGTC are to contribute for the development of new results in optimization and operations research, mathematical physics (including theory of billiards and inverse problems), spectral graph theory and its applications to combinatorial optimization, combinatorial matrix theory and combinatorics. It is part of these objectives to give advanced training in any of these areas, namely to do supervision of masters and doctoral theses. It is also among the goals of this group to apply the knowledge of its members as well as the obtained results to real world problems and in expected R&D projects as partnerships with industrial companies and other institutions.

## Publications

- ▶ Books published: **2**; Book chapters: **14**; PhD Theses defended: **5**; MSc Theses defended: **67**.
- ▶ Papers in international journals with referees: **86**, including the journals SIAM J. Math. Anal., SIAM J. Optim., Nonlinearity, SIAM Review, J. Diff. Eq., Proc. Roy. Soc. A, Theor. Math. Phys., Optimization, J. Geom. Phys., Comm. in Partial Diff. Eq., JOTA, Discr. Appl. Math., Discrete Mathematics, Discrete Optimization, Graphs and Combinatorics, Linear Algebra Appl., European Journal of Operational Research, Journal of Inverse and Ill-posed Problems, Applicable Analysis, Journal of Operations Research, Networks, Set-Valued and Variational Analysis, Journal of Combinatorial Optimization, Electronic Journal of Linear Algebra, App. Math. Comput., International Journal of Production Research, Optimization Letters, Journal of Spectral Theory, Rend. Istit. Mat. Univ. Trieste, Linear and Multilinear Algebra, Electronic Notes in Discrete Mathematics, Computers and Operations Research, Transportation Science, Information Systems and Operational Research, Annals of Operations Research, Applicable Analysis and Discrete Mathematics, Contributions to Discrete Mathematics, etc.

## Congress Organization



## Acknowledgments

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## Participation in research projects

- ▶ Helena Alvelos, Ana Raquel Xambre: Project "SysSensory - Sistema de Apoio à Decisão ao processo de prova em Análise Sensorial", EXPL/EEI-ESS/1601/2013 (2014-2015), €37,362, supported by FCT. Main Institution: University of Aveiro.
- ▶ J. V. Ferreira, R. B. Lopes, A. L. Ramos: two contracts with industry for Prio Energy, S.A.: "Development of a decision support tool for the supply/raw material purchase and for the distribution of products", Aug. Dec. 2016; "Analysis and improvement of the logistics process concerning the commercialization of fossil fuels", May - July 2016.
- ▶ A. Agra, S. Pinheiro, C. Requejo, D. Cardoso, M. Doostmohamadi: INROUTE - Inventory Routing, EXPL/MAT-NAN/1761/2013, Research project supported by FCT (2014 - 2015).
- ▶ A. Agra, C. Requejo, M. Doostmohamadi : Bilateral project Portugal France, Pessoa Program "Routing problems under demand and travel time uncertainty" (2014 - 2016).
- ▶ C. Requejo, A. Agra, F. Rodrigues: Bilateral project Portugal France, Pessoa Program "Combinatorial optimization for social network applications" (2018 - 2019).
- ▶ A. Plakhov and D. F. M. Torres: Bilateral project UK Portugal, IE160503, "Constrained impulsive optimal control" (2016 - 2018), £11,240.

## Recognition

- ▶ The paper [A. Agra, H. Andersson, M. Christiansen, L. Wolsey. A maritime inventory routing problem: Discrete time formulations and valid inequalities. *Networks*, 62, 297-314, 2013] got two awards: Glover-Klingman Prize (for the best paper of the year published in *Networks* in 2013); Prémio Isabel Themido/IO 2015, by APDIO.
- ▶ The paper [A. Plakhov. *SIAM J. Math. Anal.* 46, 2730-2742 (2014)] was chosen among the best SIAM articles ("significant and well-written papers of particularly broad interest") for publication in *SIAM Review* [A. Plakhov, 2015]. The editors of the journal invited the author to visit the SIAM Annual Meeting in Boston in July 2016 to "stand and be recognized."
- ▶ A review "How close to invisible can a mirror be?" of the paper [A. Plakhov. The problem of camouflaging via mirror reflections. *Proc. R. Soc. A* 473: 20170147] was published in Oct. 2017 on the website [phys.org](http://phys.org)/dedicated to the latest news in science. As referred in the review, this work "has a wide variety of potential uses, including military applications (hiding submarines and aircraft), medical imaging (cloaking internal organs that are blocking an area of interest), and improving the performance of small-scale electronics devices by carefully controlling the flow of light and heat".
- ▶ The result from [N. Abreu, D.M. Cardoso, P. Carvalho, C. T. M. Vinagre, Spectra and Laplacian Spectra of arbitrary powers of lexicographic products of graphs, *Discrete Mathematics* 340, 3235-3244 (2017)] allows one to determine all eigenvalues of graphs with huge number of vertices obtained by the lexicographic product. An example considered in the paper concerns a graph with  $10^{100}$  vertices.

## International cooperation

There have been a very intensive international collaboration. More than **30** foreign researchers visited OGTC (CIDMA) in 2015-2018 and gave a talk. Nearly **60** research papers of OGTC members were published in collaboration with researchers from Norway, UK, USA, Germany, Austria, France, Belgium, Chile, Brazil, Russia, Belarus, Poland, Serbia, Kuwait, India, Nepal in various journals, including *SIAM J. Math. Anal.* (4 papers), *SIAM J. Optim.*, *Commun. Part. Diff. Eq.*, *Theor. Math. Phys.*, *Applicable Analysis*, *JOTA*, *Journal of Inverse and Ill-posed Problems*, *J. Geom. Phys.*, *Annals of Operations Research*, *Discrete Applied Mathematics*, *Rend. Istit. Mat. Univ. Trieste*, *Journal of Spectral Theory*, *European Journal of Operational Research*, *Graphs and Combinatorics*, *Set-Valued and Variational Analysis*, *Linear and Multilinear Algebra*, *Lin. Algebra Appl.*, etc.