Research Report 1994

Department of Mathematics
Instituto Superior Técnico
Lisbon, Portugal

Departamento de Matemática
Instituto Superior Técnico
1049-001 Lisboa
Portugal

Telephone: +351-21-8417211
Fax: +351-21-8417598
URL: http://www.math.ist.utl.pt

This document is available at the above URL.

INSTITUTO SUPERIOR TÉCNICO
DEPARTAMENTO DE MATEMÁTICA
AVENIDA ROVISCO PAIS
1096 LISBOA CODEX

RESEARCH REPORT - 1994

Preface

Instituto Superior Técnico (IST) was founded in 1911 with the aim of becoming the leading school of engineering in Portugal. In 1930, together with three other higher education institutes, IST was incorporated into the Universidade Técnica de Lisboa, and presently it is one of the seven schools of this university. Up until 1980 the institute did not have a formal mathematics department, the mathematics courses for engineering students being mostly taught by engineering graduates.

When the Department of Mathematics was created in 1980 it was just a service department for the teaching of mathematics in the engineering programs at IST and counted only five members holding PhD level degrees. In 1983 the department initiated a formal graduate program and adopted the goal of becoming a research department as well. This was the beginning of a period of fast development that is still in progress. Three years later, in 1986, the department began offering its own undergraduate degree in Applied Mathematics and Computer Science, emphasizing mathematical analysis, numerical analysis, statistics and computer science. Since 1992 the geometry and algebra components of this degree have been gradually reinforced.

At present, the department has 45 members holding PhD degrees and relies on the contribution of a large number of teaching assistants. Most of these are also graduate students in mathematics.

For administrative purposes, the department is divided into four sections: *Algebra and Mathematical Analysis, Statistics and Applications, Applied Mathematics and Numerical Analysis, and Computer Science*. The first section accounts for approximately two thirds of the department and includes that part of applied mathematics related to differential and integral equations, linear operator theory, dynamical systems and geometry. In spite of the name of this first section, motivated by historical reasons related to the courses taught at the institute, most of the research activity in this section is on mathematical analysis, and it is within this section that areas like geometry and topology are developing. We are also looking forward to the time when research in algebra can be strengthened in the department.

We regard the annual publication of a research report as an important vehicle, with two complementary purposes. One is internal: to highlight *research publications* by department members and their involvement in *international scientific exchange* as a public statement of the importance we attach to them; the other is external: to provide information to interested people outside the department about our current research work.

I would like to thank everyone who was involved in the organization of this fourth issue, especially Professor Roger Picken, who coordinated the preparation of the report. I am also grateful to Rita Torres for her work in word processing this issue.

Lisbon, April 1995

The Department Chairman

Luis T. Magalhães.

Research areas

The main areas of research pursued in the Department of Mathematics of IST are:

Theory of Distributions and Ultradistributions

The work in this area has addressed problems such as algebraic and topological aspects of some concepts of limit and value of a distribution at a point, generalization to distributions on manifolds of certain results of classical analysis like, for instance, Stoke's theorem, development of the theory of ultradistributions pursuing the holomorphic representations, the axiomatic and functional analytic approaches, multiplicative product of ultradistributions and limit of an ultradistribution at a point.

Operator Theory and Integral Equations

The work in this area is focused on singular integral operators and other related classes of linear operators like Toeplitz, Carleman-shift and pseudo-differential operators. The motivation for the work comes mainly from problems of diffraction theory and other applications leading to elliptic boundary-value problems. These problems are formulated in appropriate Sobolev spaces and treated by operator theory methods. The emphasis is on linear operator theory and Banach algebras and their connections with complex analysis, in particular Hardy spaces. Current problems under investigation include factorization of matrix-valued symbols, Carleman shift operators with unbounded coefficients and wedge diffraction problems.

Dynamical Systems and Differential Equations

The dominant research in this area falls within the general field of mathematical analysis with an emphasis on non-linear problems whose interest in applications is well known. The activities cover the following subjects: dynamical systems, ordinary, partial and functional differential equations, calculus of variations and optimization, geometric, topological and algebraic methods in non-linear analysis, control theory and mechanics of continuous media. The research is organized along four lines of work: qualitative theory of dynamical systems, geometric mechanics and hamiltonian systems, methods of non-linear analysis in mechanics of continuous media and methods of non-linear systems analysis in control theory.

Geometry and Topology

The work in this area is mostly concerned with problems spanning geometry, topology, algebra and analysis, namely questions related to the connection of some classical topics - differential geometry, mathematical physics, dynamical systems, symplectic geometry -

with modern developments, including infinite-dimensional and discrete problems, for which K-theory, von Neumann algebras, noncommutative geometry and combinatorics are essential tools.

Probability, Statistics and Applications

The research in this general area has focused on queueing theory and quality control, multivariate analysis, stochastic optimization, categorical data analysis and statistical inference. In queueing theory and quality control, interest is concentrated on order relations, transient behaviour, threshold problems, and on control charts. In the area of multivariate analysis, topics of interest are factor analysis and related models, multidimensional scaling and discriminant analysis. Particular attention is given to the study of the robustness of these methods. In categorical data analysis and statistical inference, emphasis has been given to incomplete data and statistical theory advanced topics relying on measure and integration.

Numerical Analysis

Two lines of research are pursued: mathematical and numerical analysis in fluid dynamics, and numerical methods for differential and integral equations. The first is concerned with the questions of existence, uniqueness and asymptotic behaviour of solutions to the equations modeling the flow of incompressible non-Newtonian fluids of differential type. For the models under consideration, various flow situations (flows in bounded domains, flow past an object or past an infinite plate) have been studied. The numerical study of the Stokes and Navier-Stokes equations by the boundary and finite element methods, as well as by domain decomposition methods, is also addressed. The research on numerical methods for differential and integral equations is mainly directed towards: i) convergence acceleration techniques for ordinary differential equations with singularities and also for integral equations with singular kernels; ii) integral equation methods applied to problems in material science (elasticity and effective properties of composite materials); iii) spline collocation methods for Volterra integral equations with singular kernels.

Computer Science

The work in this area addresses formal system specification with emphasis on the mathematical foundations of object-orientation and concurrency, as well as on verification logics. Most of the work has been carried out within the scope of international cooperation projects, namely the ESPRIT Basic Research Actions IS- CORE and COMPASS.

There are also some individual members of the department working in other areas, such as mathematical physics, combinatorics, logic and operations research.

1 Publications

1.1 Publications which appeared in 1994

Algebra and Mathematical Analysis

Ashwin, P., Buescu, J. and Stewart, I., Bubbling of attractors and synchronization of chaotic oscillators, *Phys. Lett.* **A 193** (1994) 126-139.

Buescu, J. and Stewart, I., Sets, lines and adding machines, in Dynamics, Bifurcations and Symmetry, Proceedings of the 1993 Conference of the European Bifurcation Theory Group, Pascal Chousat Ed., Kluwer, Dordrecht, 1994, pp 59-68.

Caetano, A. and Picken, R. F., An axiomatic definition of holonomy, *Intern. J. Math.* **5** (1994) 835-848.

Câmara, M. C. and Santos, A. F. dos, Generalized factorization for a class of nxn matrix functions - partial indices and explicit formulas, *Integr. Equat. Oper. Th.* **20** (1994), 198-230.

Carr, J. and Costa, F. P., Asymptotic behavior of solutions to the coagulation-fragmentation equations. II. Weak fragmentation, *J. Stat. Phys.* **77** (1994) 89-123.

Cordovil, R., On the center of the fundamental group of the complement of an arrangement of hyperplanes, *Portugal. Math.* **51** (1994) 363-373.

Cordovil, R., On the homotopy type of Salvetti complexes determined by simplicial arrangements, *Europ. J. Combinatorics* **15** (1994) 207-215.

Fernandes, R. L., A note on Poisson symmetric spaces, in Proceedings of the Cornelius Lanczos International Conference, J. David Brown, Moody T. Chu, Donald C. Ellison, Robert J. Plemmons Eds., S. I. A. M. , 1994, pp. 638 - 642.

Fernandes, R. L., Completely integrable bi-Hamiltonian systems, J. *Dynamics Differential Equations*. **6** (1994) 53-69.

Freitas, P., A nonlocal Sturm-Liouville eigenvalue problem, *Proc. Roy. Soc. Edinburgh* **124A** (1994) 169-188.

Freitas, P., Bifurcation and stability of stationary solutions of nonlocal scalar reaction-diffusion equation, *J. Dynamics Differential Equations* **6** (1994) 613-629.

Freitas, P. and Grinfeld, M., Multiplicity and stability of stationary solutions of an equation modelling ohmic heating, *Applied Math. Lett*. **7** (1994) 1-6.

Girão, P. and Kohn, R., Convergence of a crystalline algorithm for the heat equation in one dimension and for the motion of a graph by weighted curvature, *Numer. Math.* **67** (1994) 41-70.

Meister, E., Penzel, F., Speck, F.-O. and Teixeira, F. S., Two canonical wedge problems for the Helmholtz equation. *Math. Meth. Appl. Sc.* **17** (1994) 877-899.

Oliva, W., Oliveira, J. C. F. and Solà-Morales, J., An infinite dimensional Morse-Smale map, *NODEA* **1** (1994) 365-387.

Oliva, W., Realidade matemática: a controvérsia dos computadores, extraindo ordem do caos, medindo simetria, e outros ensaios, *Notas do ICMSC - USP* **15** (1994) 1-20.

Picken, R. F., Loop variables in quantum gravity and generalised knot invariants, in Quantization and Infinite - Dimensional Systems, J.-P. Antoine, S. Twareque Ali, I. M. Mladenov and A. Odzijewicz Eds., Plenum Press, London and New York, pp. 29-41.

Picken, R. F., Non-local variables in quantum gravity and Vassiliev invariants, in Proceedings of the II Workshop on Constraints Theory and Quantization Methods, F. Colomo, L. Lusanna and G. Marmo Eds., World Scientific, Singapore, 1994, pp. 328-340.

Ragazzo, C. G., Koiller, J. and Oliva, W., On the motion of two-dimensional vortices with mass, J. *Nonlinear Sci.* **4** (1994) 375-418.

Rocha, C., On the singular problem for the scalar parabolic equation with variable diffusion, *J. Math. Anal. Appl.* **183** (1994) 413-428.

Statistics and Applications

Branco, J. A. and Pires, A. M., Projection Pursuit: uma estratégia geral para análise de observações multivariadas, in A Estatística e o Futuro e o Futuro da Estatística, D. Pestana et al. Eds., Novas Tecnologias/Estatística, Edições Salamandra, Lisboa, 1994, pp. 333-342.

Branco, J. A., Pires, A. M., Picado, A. M. and Mendonça, E., A statistical evaluation of toxicity tests of waste waters, in Statistics for the Environment 2: Water Related Issues, V. Barnett and K. F. Turkman Eds., Wiley, 1994, pp. 285-293.

Duarte, F., Catarino, J., Picado, A., Mendonça, E., Ralha, F., Caldeira, Z., Pires, A., Taborda, F. and Peneda, C., Impacte do tratamento secundário de efluentes de pasta de papel, in Actas da 4ª Conferência Nacional sobre a Qualidade do Ambiente, F. Santana, M. P. Antunes, A. M. F. Rodrigues, J. Farinha and I. Peres Eds., Departamento de Ciências e Engenharia do Ambiente, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Lisbon, 1994, vol. III, pp. 164-168.

Freitas, A. and Paulino, C.D.M., Análise de sobrevivência de casos de SIDA em Portugal, in A Estatística e o Futuro e o Futuro da Estatística, D. Pestana et al. Eds., Novas Tecnologias/Estatística, Edições Salamandra, Lisboa, 1994, pp. 31-37.

Pestana, D., Turkman, A., Branco, J., Duarte, L. and Pires, A. (Eds.), *A Estatística e o Futuro e o Futuro da Estatística*, Novas Tecnologias/Estatística, Edições Salamandra, Lisboa, 1994.

Pires, A. M. and Branco, J. A., A robust linear discriminant by projection pursuit, in COMPSTAT 1994: short communications in computational statistics, R. Dutter and W. Grossman Eds., VIS, Vienna, 1994, pp. 51-52.

Pires, A. M. and Branco, J. A., Estatística robusta: passado, presente e futuro, in A Estatística e o Futuro e o Futuro da Estatística, D. Pestana et al. Eds., Novas Tecnologias/Estatística, Edições Salamandra, Lisboa, 1994, pp. 531-549.

Ramalhoto, M. F., The 3rd Erlang formula and advanced continuing engineering education, *Intern. J. of Continuing Engineering Education* **4** (1994) 58-68.

Ramalhoto, M. F., Generalizations of Erlang formulae and some of their 2nd order properties, in Operations Research 93, Gmöor, Bachem et al Eds. , Physica-Verlag, pp. 412-417.

Ramalhoto, M. F., Cooperation between industry and academia - a distance learning approach , Proceedings of the International Congress of Engineering Deans and Industrial Leaders, UNESCO/UATI Publications, June 1994, pp. 349-355.

Ramalhoto, M. F., Statistics in continuing engineering education - A flexible and distance learning approach, Proceedings of the ICOTS 4, National Institute of Statistics and Applied Economics, Morocco, 1994, pp. 330 - 343.

Ramalhoto, M. F. and Ferreira M., Estudo dos parametros básicos do período de ocupação da fila de espera M/G/•, in A Estatística e o Futuro e o Futuro da Estatística, D. Pestana et al. Eds., Novas Tecnologias/Estatística, Edições Salamandra, Lisboa, 1994, pp. 47-60.

Ramalhoto, M. F. and Morais, M., Política VSI aplicada às cartas de controlo $\overline{X}$, CUSUM e EWMA, in A Estatística e o Futuro e o Futuro da Estatística, D. Pestana et al. Eds., Novas Tecnologias/Estatística, Edições Salamandra, Lisboa, 1994, pp. 99-114.

Applied Mathematics and Numerical Analysis

Abboud, T., Girault, V. and Sequeira, A., A stream function-vorticity formulation coupled with boundary integrals for the two-dimensional exterior Stokes problem, *Acta Appl. Math.,* **37** (1994) 3-12.

Diogo, T., McKee, S. and Tang, T., Collocation methods for second-kind Volterra integral equations with weakly singular kernels, *Proc. Roy. Soc. Edinburgh* **124A** (1994) 199-210.

Galdi, G. P. and Sequeira, A., Further existence results for classical solutions of the equations of a second grade fluid, *Arch. Rational Mech. Anal.* **128** (1994) 297-312.

Lima, P., Richardson extrapolation in boundary value problems for differential equations with nonregular right-hand side, *J. Comp. Appl. Math.* **50** (1994) 385-400.

Romeiras, F. J., Double three-wave interaction of four waves: Lax representations and exact solutions, *J. Math. Phys.* **35** (1994) 4757-4778.

Romeiras, F. J., The three-wave interaction of four waves revisited: A Lax pair and possibly general solution, in Hamiltonian Mechanics: Integrability and Chaotic Behaviour, J. Seimenis Ed., Plenum Press, 1994, pp. 321-328.

Computer Science

Böhm, K. and Sernadas, A., A logic to specify real-time object behaviour, in Proceedings of the Fourth International Conference on Dynamic Modeling and Information Systems, A. Verbraeck, H. Sol and P. Bots Eds., TU Delft, 1994, pp. 53-69.

Caleiro, C., Operational semantics of temporal object specifications, INESC Journal on Junior Activities in Science and Technology **1** (1994) 7-35.

Carmo, J. and Jones A. J. F., Deontic database constraints and the characterisation of recovery, in Proceedings of the Second International Workshop on Deontic Logic in Computer Science (Deon'94), A. J. F. Jones and M. Sergot Eds., Complex 1/94 NRCCL, 1994, 56-85.

Costa, J. F., Sernadas, A. and Sernadas, C., Object inheritance beyond subtyping, *Acta Informática* **31** (1994) 5-26.

Ehrich, H.-D., Jungclaus, R., Denker, G. and Sernadas, A., Object-oriented design of information systems: theoretical foundations, in Advances in Database Systems, Implementations and Applications, J. Paredaens and L. Tenenbaum Eds., Springer Verlag, 1994, pp. 201-218.

Sernadas, A. and Sernadas, C., Object certification, in Proceedings of the Fifth International Workshop on Deductive Approach to Information Systems, A. Olivé Ed., UP Catalunha, 1994, pp. 55-78.

Sernadas, A., Costa, J., and Sernadas, C., An institution of object behaviour, in Recent Trends in Data Type Specification, H. Ehrig and F. Orejas Eds., Springer Verlag, 1994, pp. 337-350.

1.2 Articles submitted in 1994

Algebra and Mathematical Analysis

Ashwin, P., Buescu, J. and Stewart, I., From attractor to chaotic saddle: a tale of transverse instability, University of Warwick Preprint 74/1994.

Bastos, M. A., Santos, A. F. dos and Duduchava, R., Finite interval convolution operators on the Bessel potential spaces H_p^s, to appear in*Math. Nachr*.

Baturev, A., Kravchenko, V. G. and Litvinchuk, G. S., Approximate methods for singular integral equations with a non-Carleman shift, Preprint 7/94.

Câmara, M. C., Factorization in a Banach algebra and the Gelfand transform.

Castro, L. P. and Speck, F.-O., On the characterization of the intermediate space in generalized factorizations, Preprint 15/94.

Costa, F. P., On the dynamic scaling behaviour of solutions to the discrete Smoluchowski equations, Preprint 20/94.

Fiedler, B., Rocha, C., Heteroclinic orbits in one-dimensional parabolic equations, Preprint 5/94, to appear in *J. Differential Equations*.

Freitas, P., On some eigenvalue problems related to the wave equation with indefinite damping.

Freitas, P. and Vishnevskii, M., Stability of stationary solutions of nonlocal reaction-diffusion equations in n-dimensional space.

Gomes, D., Equação de Duffing, método de Liapunov-Schmidt e caos, to appear in *Técnica*.

Magalhães, L. T., Restrictions on the flows of functional differential equations in neighborhoods of singularities, to appear in *Resenhas IME-USP*.

Oliva, W., The motion of two dimensional vortices with mass as a singular perturbation problem, Preprint 17/94.

Penzel, F. and Teixeira, F. S., A Wiener-Hopf-Hankel approach for the scattering by a disk, Fachbereich Mathematik, Technische Hochschule Darmstadt, Preprint Nr. 1649.

Ramos, J. S. and Okamoto, S., On orbit weak equivalence classes of piecewise linear maps.

Ramos, J. S. and Severino, R., Dimension groups on iteration theory, to appear in Proceedings of the European Conference on Iteration Theory.

Ramos, J. S. and Severino, R., K-theory and bimodal maps, to appear in the Proceedings of Thirty Years after Sharkowskii's Theorem.

Ramos, J. S., Severino, R. and Lampreia, J. P., Factorizations in dynamics of the interval, to appear in the Proceedings of the European Conference on Iteration Theory.

Rocha, C., Bifurcations in discretized reaction-diffusion equations, Preprint 13/94, to appear in *Resenhas IME-USP*.

Santos, J. P. dos, A mecânica quântica de Heisenberg, to appear in *Técnica*.

Santos, P. A. and Teixeira, F.S., Sommerfeld half-plane problems with higher order boundary conditions, Preprint 4/94, to appear in *Math. Nachr*.

Statistics and Applications

Nunes, C. and Amaral, J., Sequencialização de tarefas, num sistema com 3 máquinas idênticas, em regime de "Flow-shop", to appear in Actas do II Congresso Anual da Sociedade Portuguesa de Estatística.

Oliveira, M. R. and Branco, J. A., Análise factorial para variáveis dicotómicas.

Paulino, C. D. M. and Pereira, C. A. B., Bayesian methods for categorical data under informative general censoring, to appear in *Biometrika*.

Pires, A. M., Branco, J. A. and Amaral-Turkman, M. A., Comparação de métodos de análise discriminante no diagnóstico da doença coronária, to appear in Actas do II Congresso Anual da Sociedade Portuguesa de Estatística.

Ramalhoto, F., Morais, M., Cartas de controlo para parâmetro de escala da população Weibull tri-paramétrica, to appear in Actas do II Congresso Anual da Sociedade Portuguesa de Estatística.

Ramalhoto, M. F., Queueing systems of the service industry - a TQM approach.

Applied Mathematics and Numerical Analysis

Alves, C. and Ha Duong, T., Numerical experiments on the resonance poles associated to acoustic and elastic scattering by a plane crack, to appear in Proceedings of the 3ème Congrès International sur les Méthodes Mathématiques et Numériques de la Propagation d' Ondes.

Alves, C. and Ha Duong, T., Numerical resolution of the boundary integral equations for elastic scattering by a plane crack, to appear in *Internat. J. Numer. Methods Engrg.*

Coscia, V., Sequeira, A. and Videman, J. H., Existence and uniqueness of classical solutions for a class of complexity 2 fluids, Preprint 19/94, to appear in *Internat. J. Non-Linear Mech.*

Coscia, V. and Videman, J. H., On a class of abstract evolution equations related to the motion of complexity 2 fluids, to appear in Navier-Stokes Equations and Related Nonlinear Problems, Proceedings of the Third International Conference on Navier-Stokes Equations and Related Nonlinear Problems, Madeira, May 1994.

Diogo, T. and Franco, N. B., Numerical solution of Volterra integral equations of the second kind, Preprint 22/94 .

Graça, M. M., The sign-regularity of the auxiliary family $g_i(\#)= \#^{\bullet i}.(- \ln \#)^{\bullet i}$ in convergence acceleration processes using the E-algorithm, Preprint 10/94, to appear in *J. Comput. App. Math.*

Lima, P., Numerical methods and asymptotic error expansions for the Emden-Fowler equations, Preprint 12/94.

Romeiras, F. J., A note on integrable two-degrees-of-freedom Hamiltonian systems with a second integral quartic in the momenta.

Romeiras, F. J., Integrable reductions of coupled nonlinear Schrödinger equations.

Romeiras, F. J., Separability and Lax pairs for the two-dimensional Hamiltonian with a quartic potential.

Sequeira, A. and Videman, J. H., Global existence of classical solutions for the equations of third grade fluids, Preprint 11/94, to appear in J. *Math. Phys. Sciences.*

Computer Science

Caleiro, C., On the relationship between operational and denotational semantics of temporal logic specification of object behaviour, to appear in IS-CORE'94 Selected Papers, R. Wieringa and R. Feenstra, Eds., World Scientific.

Dominguez, L. and Crespo, R., One method to transpose set-theorectic specifications for reuse, submetido a 14 de Nov. 94 à conferência SSR'95.

Ehrich, H.-D., Saake, G., Sernadas and A., Sernadas, C., Distributed temporal logic for concurrent object families, 12 pp., 1994, to appear in IS-CORE'94 Selected Papers, R. Wieringa and R. Feenstra, Eds., World Scientific.

Gouveia, P. and Sernadas, C., Abduction in object specification using tableaux, to appear in the Fourth International Workshop on Theorem Proving with Analytic Tableaux and Related Methods.

Gouveia, P. and Sernadas, C., Introducing explanations in temporal object specification, to appear in IS-CORE'94 Selected Papers, R. Wieringa and R. Feenstra Eds., World Scientific.

Li, R. and Carmo, J., On completeness of a positional interval logic with equality, overlap and subinterval relations, to appear in *Bulletin of IGPL.*

Menezes, P., Algebraic implementation of transition systems, Preprint 3/94.

Menezes, P., Object reification, Preprint 24/94.

Menezes, P., Compositional reification of Petrinets, Preprint 25/94.

Menezes, P., Compositional reification of concurrent systems, Preprint 26/94.

Menezes, P. and Costa, J. F., Synchronization in Petri nets, Preprint 2/94.

Resende, P., Observational system specification, to appear in IS-CORE'94 Selected Papers, R. Wieringa and R. Feenstra, Eds., World Scientific.

Ryan, M., Sernadas, A. and Sernadas, C., Adjunctions between default institutions, to appear in IS-CORE'94 Selected Papers, R. Wieringa and R. Feenstra Eds., World Scientific.

Saake, G., Sernadas, A. and Sernadas, C., Evolving object specifications, to appear in IS-CORE'94 Select Papers, R. Wieringa and R. Feenstra, Eds., World Scientific.

Sernadas, A., Sernadas, C. and Valença, J., Theory-based, topological notion of institution, to appear in Recent Trends in Data Type Specification, E. Astesiano, G. Reggio and A. Tarlecki Eds., Springer Verlag.

Sernadas, A. and Sernadas, C., Distribute semantics for concurrent families of sequential objects, H.-D. Ehrich and A. Sernadas, to appear in Recent Trends in Data Type Specification, E. Astesiano, G. Reggio and A. Tarlecki, Eds., Springer Verlag.

Sernadas, A., Sernadas, C. and Valença, J., Topological institutions.

2 Academic degrees awarded in 1994

Agregações

Rocha, C., Agregação em Matemática, IST, 25.02.94.

Doutoramentos/PhDs

Fernandes, R. L., Ph. D. in Mathematics, University of Minnesota, USA, Jan. 1994. Thesis: *Integrable bi-Hamiltonian systems.* Supervisor: Peter J. Olver. Equivalência ao Grau de Doutor em Matemática, IST, Universidade Técnica de Lisboa, 21.11. 94.

Freitas, P., PhD in Mathematics, Heriot-Watt University, UK, June 1994. Thesis: *Some problems in nonlocal reaction-diffusion equations.* Supervisor: Andrew A. Lacey. Equivalência ao Grau de Doutor em Matemática, IST, Universidade Técnica de Lisboa, November 1994.

Pires, A. M. P., PhD in Operations Research, Cornell University, 29.5.94. Thesis: *Markov additive processes arising in storage models for communication systems.* Supervisor: N. U. Prabhu. Equivalência ao Grau de Doutor em Matemática, IST, Universidade Técnica de Lisboa, 12.12. 94.

Speck, F.-O., Equivalência ao Grau de Doutor em Matemática, IST, Universidade Técnica de Lisboa, 14.03.1994.

Mestrados/MScs

Alves, J., Mestrado em Matemática, Faculdade de Ciências, Universidade de Lisboa, 6.8.94. Thesis: *Polinómios de Bernstein-Sato e imagens directas de D-módulos.* Supervisor: Orlando Neto.

Borges, M. J., Mestrado em Matemática Aplicada, IST, Universidade Técnica de Lisboa, 21.7.94. Thesis: *Problemas singulares em equações de reacção-difusão. Método das duas escalas.* Supervisor: Carlos Rocha.

Cannas da Silva, A., MSc in Mathematics, MIT, USA, February 1994. Thesis: *Atiyah-Bott-Lefschetz theory of orbifolds and Dedekind sums.* Supervisor: V. Guillemin. Equivalência ao Grau de Mestrado em Matemática, IST, Universidade Técnica de Lisboa, July 1994.

Castro, L. F., Mestrado em Matemática Aplicada, IST, Universidade Técnica de Lisboa, 25.07.94. Thesis: *A caracterização do espaço intermédio em factorizações generalizadas*. Supervisor: F.-O. Speck.

Lucena, P. M., Mestrado em Matemática Aplicada, IST, Universidade Técnica de Lisboa, 25.10.94. Thesis: *Propriedades de regularidade dos operadores lineares*. Supervisor: F.-O. Speck.

Santos, P. A., Mestrado em Matemática, IST, Universidade Técnica de Lisboa, July 1994. Thesis: *Operadores de Wiener-Hopf com Presímbolos em* $[PC_p(R)]^{mxn}$ *e Aplicações*. Supervisor: F. S. Teixeira.

3. Research Lectures and Seminars

3.1 Lectures at Conferences, Workshops, Meetings etc.

Algebra and Mathematical Analysis

Almeida, F. P., Non-commutative geometry via examples, III Porto Meeting on Knot Theory and Physics, Porto, Portugal, 6.6.94 - 8.6.94 .

Barreira, L., Entropy-like invariants and their relationships, III Porto Meeting on Knot Theory and Physics, Porto, Portugal, 6.6.94 - 8.6.94 .

Bastos, M. A., Fredholm properties and invertibility of convolution operators on a finite interval with periodic kernel, Workshop on Singular Integral Operators and Applications, Lisbon, Portugal, July, 1994.

Bastos, M. A., Convolution operators on a finite interval with periodic kernel, Euromech 316: Advanced Techniques in Structural Acoustics, University of Manchester, UK, 9.4.94 - 15.4.94.

Caetano, A. J., On the kernel of holonomy, III Porto Meeting on Knot Theory and Physics, Porto, Portugal, 6.6.94 - 8.6.94 .

Cordovil, R., Braid monodromy of arrangements of hyperplanes, Arrangements of Hyperplanes, C.I.R.M. - Lurning, France, 6.6.94 - 13.6.94.

Cordovil, R., Braid monodromy groups of wiring diagrams, III Porto Meeting on Knot Theory and Physics, Porto, Portugal, 6.6.94 - 8.6.94 .

Florentino, C., Vassiliev invariants of knots and links, III Porto Meeting on Knot Theory and Physics, Porto, Portugal, 6.6.94 - 8.6.94 .

Freitas, P., Bifurcation from complex eigenvalues for scalar nonlocal reaction-diffusion equations, International Conference on Nonlinear Dynamics and Pattern Formation in the Natural Environment, Noordwijkerhout, Holland, July 1994.

Lebre, A., Factorization techniques in problems of diffraction theory, Euromech 316: Advanced Techniques in Structural Acoustics, University of Manchester, UK, 9.4.94 - 15.4.94.

Magalhães, L. T., Restrictions on the flows of functional differential equations in neighborhoods of singularities, Dynamic Phase Transitions, Instituto de Matemática e Estatística & Instituto de Estudos Avançados, Universidade de São Paulo, Brazil, 27.6.94 - 2.7.94.

Okamoto, S., Knot theory and operator algebra, III Porto Meeting on Knot Theory and Physics, Porto, Portugal, 6.6.94 - 8.6.94 .

Oliva, W., Symmetric structures for systems of repelling particles, International Symposium of Hamiltonian Systems and Celestial Mechanics, Cocoyoc, México, 13.9.94 - 17.9.94.

Oliva, W., Vortices with mass, Dynamic Phase Transitions, Instituto de Matemática e Estatística & Instituto de Estudos Avançados, Universidade de São Paulo, Brazil, 27.6.94 - 2.7.94.

Picken, R. F., Gravity and braids, 2nd Algarve Meeting on Gravity and High Energy Physics, Faro, Portugal, 14.2.94.

Picken, R. F., Kontsevich integrals and related topics, III Porto Meeting on Knot Theory and Physics, Porto, Portugal, 6.6.94 - 8.6.94.

Ramos, J. S., Knot theory and dynamical systems, III Porto Meeting on Knot Theory and Physics, Porto, Portugal, 6.6.94 - 8.6.94.

Rocha, C., Heteroclinic connections in reaction-diffusion equations and their discretizations, Dynamic Phase Transitions, Instituto de Matemática e Estatística & Instituto de Estudos Avançados, Universidade de São Paulo, Brazil, 27.6.94 - 2.7.94.

Santos, A. F. dos, A non-linear method for generalized factorization of matrix function, Singular Integral and Pseudodifferential Operators and Their Applications, Mathematisches Forschungsinstitut Oberwolfach, Germany, 23.1.94 - 29.1.94.

Speck, F.-O., Operator matrix factorization through Bessel potential spaces, Singular Integral and Pseudodifferential Operators and Their Applications, Mathematisches Forschungsinstitut Oberwolfach, Germany, 23.1.94 - 29.1.94.

Teixeira, F. S., Scattering by a metal-backed half-plane with generalised boundary conditions of arbitrary order, Euromech 316: Advanced Techniques in Structural Acoustics, University of Manchester, UK, 9.4.94 - 15.4.94.

Teixeira, F. S., Singular integral operators with Carleman shift and unbounded coefficients, Singular Integral and Pseudodifferential Operators and Their Applications, Mathematisches Forschungsinstitut Oberwolfach, Germany, 23.1.94 - 29.1.94.

Statistics and Applications

Pires, A. M., A robust linear discriminant by projection pursuit, COMPSTAT 1994, 11th Symposium on Computational Statistics, Viena, Austria, 22.8.94 - 26.8.94.

Pires, A. M., Comparação de métodos de análise discriminante no diagnóstico da doença coronária, II Congresso Anual da Sociedade Portuguesa de Estatística, Luso, Portugal, 20.6.94 - 23.6.94.

Oliveira, M. R., Análise factorial para variáveis dicotómicas, II Congresso Anual da Sociedade Portuguesa de Estatística, Luso, Portugal, 20.6.94 - 23.6.94.

Ramalhoto, M. F. (jointly with Ferreira, M. A.), The M/G/• infinity queueing systems revisited, ORSA/TIMS Conference, Detroit, USA, 23.10.94 - 26.10.94.

Ramalhoto, M. F. (jointly with Teixeira Lopo, Ramoa Ribeiro, Aires de Barros and A. Pinto), Results of the 2rd European forum for CEE, Plenary Session, 3rd European Forum for Continuing Engineering Education, Vienna, Austria, 9.11.94 - 11.11.94.

Applied Mathematics and Numerical Analysis

Lima, P., Numerical solution of boundary-value problems for the Emden-Fowler equations using extrapolation methods, HERMIS'94, Athens, 22.9.94 - 24.9.94.

Lima, P., Numerical solution of Emden-Fowler equations using extrapolation methods, II World Congress on Computational Mechanics, Tokyo 1.8.94 - 5.8.94.

Rodrigues, J., Numerical resolution of Navier-Stokes equations by domain decomposition methods, Third International Conference on Navier-Stokes Equations and Related Nonlinear Problems, Madeira, Portugal, 21.5.94 - 27.5.94.

Romeiras, F. J., A Lax pair for the three-wave interaction of four waves, General Conference of the Human Capital and Mobility Network "Non-Linear Phenomena in Microphysics of Collisionless Plasmas. Applications to Space and Laboratory Plasmas", Orsay, France, 9.5.94 - 11.5.94.

Romeiras, F. J., Integrable reductions of coupled nonlinear Schrödinger equations, Dynamics Days, Budapest, Hungary, 15.6.94 - 18.6.94.

Sequeira, A., On a vector transport equation with applications to non-Newtonian fluids, Navier-Stokes Equations: Theory and Numerical Methods, Oberwolfach, Germany, 5.6.94 - 11.6.94.

Videman, J. H., An abstract formulation of a class of problems in nonlinear fluid mechanics, Third International Conference on Navier-Stokes Equations and Related Nonlinear Problems, Madeira, Portugal, 21.5.94 - 27.5.94.

Videman, J. H., Existence of classical solutions for some non-Newtonian fluid models, Symposium on Trends in Applications of Mathematics to Mechanics, Lisboa, Portugal, 23.7.94 - 30.7.94.

Computer Science

Caleiro, C., On the relationship between operational and denotational semantics of temporal logic specification of object behaviour, IS-CORE'94 Workshop, Amsterdam, Holland, 27.9.94 - 30.9.94.

Gouveia, P. (jointly with Sernadas, C.), Abductive reasoning in temporal object specification, IS-CORE'94 Workshop, Amsterdam, Holland, 27.9.94 - 30.9.94.

Resende, P., Observational system specification, IS-CORE'94 Workshop, Amsterdam, Holland, 27.9.94 - 30.9.94.

Sernadas, A. (jointly with Sernadas, C.), Object certification, Fifth International Workshop on Deductive Approach to Information Systems, Aiguablava, Spain, 19.9.94 - 21.9.94.

Sernadas, A. (jointly with Sernadas, C.), Object certification, IS-CORE'94 Workshop, Amsterdam, Holland, 27.9.94 - 30.9.94.

Sernadas, C. (jointly with Sernadas, A., Valença, J.), A topological view on institutions, Joint IS-CORE COMPASS Meeting, Lisboa, Portugal, 21.2.94 - 23.2..94.

Sernadas, C. (jointly with Sernadas, A., Valença, J.), A topological view on institutions, 10th ADT/COMPASS Workshop, St Margherita, Italy, 30.5.94 - 3.6.94.

Sernadas, C. (jointly with Sernadas, A., Valença, J.), A topological view on institutions, IS-CORE'94 Workshop, Amsterdam, Holland, 27.9.94 - 30.9.94.

3.2 Invited lectures

Algebra and Mathematical Analysis

Bastos, M. A., Operador de convolução de intervalo limitado nos espaços, H_p^s, Universidade do Algarve, Portugal, July 1994.

Buescu, J., Loss of transverse stability and symmetric chaos, Nonlinear Systems Seminar, Mathematics Institute, University of Warwick, UK, July 1994.

Caetano, A. J., Conexões generalizadas, Seminário de Geometria do CMAF, Universidade de Lisboa, Portugal, 28.10.94.

Caetano, A. J., Holonomy algebras, Universidade do Algarve, Portugal, October 1994.

Fernandes, R. L., Decomposições de Iwasawa e espaços simétricos de Poisson, Universidade do Algarve, Portugal, 12.12.94.

Freitas, P., Some problems in scalar nonlocal reaction-diffusion equations, University of Leiden, Holland, September 1994.

Lebre, A., Operadores de Wiener-Hopf e factorização de funções com valores matriciais, Universidade do Algarve, Portugal, 30.06.94.

Magalhães, L. T., Shadow ordinary differential equations for retarded functional differential equations with small delays, Universidade de São Paulo, São Carlos, Brazil, July 1994.

Oliva, W., Realidade matemática: a controvérsia dos computadores, extraindo ordem do caos, medindo simetria, e outros ensaios, Aula Magna, Instituto de Ciências Matemáticas de São Carlos, Universidade de São Paulo, Brazil, 4.4.94.

Picken, R. F., Kontsevich integrals and related topics, Universidade do Algarve, Portugal, 10.10.94.

Picken, R. F., Vassiliev invariants of knots, Universidade do Algarve, Portugal, 23.03.94.

Ramos, J. S., As árvores que ordenam o caos, Colóquio "O Caos e a Ordem" ACARTE - Fundação Calouste Gulbenkian, Lisboa, Portugal, 25.2.94 - 26.2.94.

Ramos, J. S., As árvores que ordenam o caos, Centro Cultural da Fundação Calouste Gulbenkian, Paris, France, 7.3.94.

Rocha, C., Órbitas heteroclinicas de equações semilineares parabólicas, Universidade Federal de São Carlos, Brazil, 6.7.94.

Speck, F.-O., Neuere Aspekte in der Theorie singulärer Operatoren, Technische Universität Dresden and Freie Universität Berlin, Germany, 2.2.94 and 3.2.94, respectively.

Teixeira, F. S., Operadores de Wiener-Hopf e aplicações, Universidade do Algarve, Portugal, May 1994.

Statistics and Applications

Branco, J. A., Modelação estatística em multidimensional scaling, Seminário de Estatística, Departamento de Matemática, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Portugal, 13.7.94.

Ramalhoto, M. F., Total quality management in queues, Statistics and Quality Seminar, Linköping University, Sweden, 16.5.94.

Ramalhoto, M. F., The 3rd Erlang formula in the design and performance of Markovian congestion systems, Economics and Business Administration Seminar, Tilburg University, Holland, 9.6.94.

Ramalhoto, M. F., TQM in queueing systems of the service industry, Decision Sciences Program Seminar, Operations Research and Decision Sciences Center, MIT, USA, 29.9.94.

Applied Mathematics and Numerical Analysis

Diogo, T., Solução numérica de equações integrais singulares do tipo Volterra, usando métodos de colocação, Seminários do SCE, Universidade de São Paulo, São Carlos, Brazil, May 1994.

Rodrigues, J., Methodes de decomposition de domaines nonconformes pour les equations d' advenction-difusion - differents types de stabilisation, INRIA, France, June 1994.

Videman, J. H., On a class of abstract evolution equations arising in the study of non-Newtonian fluids, University of Ferrara, Italy, 18.11.94.

Videman, J. H., Well-posedness of the equations of third-grade fluids, University of Pittsburgh, USA, 12.2.94.

Computer Science

Carmo, J., Lógicas deônticas: problemas e aplicações, Colóquio de Apresentação da Nova Licenciatura da Universidade de Lisboa - Engenharia da Linguagem e do Conhecimento, Auditório da Torre do Tombo, Lisboa, Portugal, 6.6.94.

4. Guest programme

Algebra and Mathematical Analysis

Isabel Labouriau, Faculdade de Ciências, Universidade do Porto, Portugal, 18.1.94. *Lecture:* Bifurcações e equações do impulso nervoso, 18.1.94.

Stefano Demichelis, Max Planck Institut, Bonn, Germany, 3.2.94. *Lecture:* Gauge theory and exotic structures on R^4, 3.2.94.

Giorgio Fusco, Universitá di Roma II, Italy, 21.2.94 - 24.2.94. *Lecture:* The dynamics of a drop on a smooth surface, 22.2.94.

Frank Penzel, Technische Hochschule Darmstadt, Germany, 27.2.94 - 27.3.94. *Lecture:* A combined boundary element and Fourier method - analytical and numerical results, 18.3.94.

Bernold Fiedler, Freie Universität Berlin, Germany, 20.3.94 - 30.3.94. *Lecture:* Discretization of homoclinic orbits, rapid forcing and "invisible chaos", 22.3.94.

Artur Vaz Ferreira, Universitá di Bologna, Italy, 1.6.94 - 30.6.94.

Adrian Ocneanu, Penn State University, USA, 9.6.94 - 19.6.94. *Course of lectures:* Low dimensional operator cohomology.

Jorge Rocha, Faculdade de Ciências, Universidade do Porto, Portugal, 14.6.94. *Lecture:* Difeomorfismos da esfera na fronteira do caos, 14.6.94.

Andrei Sarychev, Universidade do Aveiro, Portugal, 21.6.94. *Lecture:* Abnormal extrema in variational problems, 21.6.94.

Wolfgang Sprössig, Bergakademie Freiburg, Germany, 6.7.94 - 9.7.94. *Lecture:* Quaternionic analysis and elliptic boundary value problems, 8.7.94.

Irene Fonseca, Carnegie-Mellon University, 16.7.94 - 23.7.94. *Lectures:* Movimentos minimizantes e evolução de interfaces por curvatura média, 18.7.94, Minimização e relaxação de funcionais em espaços de Sobolev fracos, 20.7.94.

Luc Tartar, Carnegie-Mellon Uniuversity, 16.7.94 - 23.7.94. *Lecture:* Optimality conditions in optimal design, 22.7.94.

Yuri Karlovich, University of Odessa, Ucraine, 18.7.94 - 31.7.94. *Lecture:* Algebras of singular integral operators with piecewise continuous coefficients on weighted Lebesgue spaces on Carleson curves, 26.7.94.

Ilya Spitkovski, College of William and Mary, U.S.A., 18.7.94 - 31.7.94. *Lecture:* Almost periodic factorization: old problems and new developments, 26.7.94.

Giuseppe Buttazzo, Universitá di Pisa, Italy, 22.7.94 - 30.7.94. *Lecture:* Some shape optimization problems with Dirichlet condition on interface, 27.7.94.

Viktor Kravchenko, Universidade do Algarve, Portugal, 22.7.94 - 29.7.94. *Lecture:* Uma classe de problemas de fronteira mal-postos da teoria das funções analíticas, 26.7.94.

Nenad Manojlovic, Universidade do Algarve, Portugal, 25.7.94 - 28.7.94. *Lecture:* Riemann-Hilbert problems and chiral equations in two dimensions, 26.7.94.

François Bereux, Ecole Polytechnique de Paris, France, 17.10.94 - 20.10.94. *Lecture:* Une méthode numérique pour les systèmes hyperboliques avec terme de relaxation, 20.10.94.

Mauricio Peixoto, IMPA, Brazil, 20.10.94 - 21.10.94. *Lecture:* O problema de contorno por dois pontos: geometria e aritmética, 20.10.94.

Jaume Llibre, Universitat Autonoma Barcelona, 26.10.94. *Lecture:* Lefschetz numbers for periodic points, 26.10.94.

José Basto Gonçalves, Faculdade de Ciências, Universidade do Porto, Portugal, 21.11.94. *Lecture:* Equações Hamiltoneanas implícitas, 21.11.94.

Piero Negrini, Universitá degli Studi di Roma "La Sapienza", Italy, 21.11.94 - 27.11.94. *Lecture:* The problem of the stability for the equilibrium of Lagrangian systems with gyroscopic terms, 24.11.94.

Statistics and Applications

Trevor Cox, University of Newcastle-upon-Tyne, UK, 22.5.94 - 28.5.94.

Júlio Singer, IME, Universidade de São Paulo, Brazil, 15.6.94 - 15.7.94. *Lecture:* Estratégias para a análise de dados longitudinais, 8.7.94.

Applied Mathematics and Numerical Analysis

Giovanni P. Galdi, Universitá di Ferrara, Italy, 18.3.94 - 23.3.94.

Mariarosario Padula, Universitá di Potenza, Italy, 18.3.94 - 23.3.94.

Vera Maslennikova, Russian Friendship of Nations University, 21.5.94 - 31.5.94. *Lecture:* The maximum principle for the equation of continuity of compressible medium, 30.5.94.

Giovanni P. Galdi, Universitá di Ferrara, Italy, 25.11.94 - 30.11.94.

Computer Science

Stefan Brass, University of Hannover, Germany, 16.2.94 - 19.2.94.

Udo Lipeck , University of Hannover, Germany, 16.2.94 - 19.2.94.

Hans-Dieter Ehrich, University of Braunschweig, Germany, 18.7.94 - 21.7.94.

5. Research programmes and sponsorship

Several members of the Department participate in research units that received grants under the "Programa de Financiamento Plurianual de Unidades de I&D", JNICT:

- Center for Mathematical Analysis, Dynamical Systems and Applications, coordinated by L.T. Magalhães
- Center for Signal Analysis and Processing, coordinated by A. Ferreira dos Santos
- Robotics and Systems Institute at Lisbon, coordinated by J. Sentieiro (Department of Electrical Engineering and Computers)
- Center of Electrodynamics, coordinated by Francisco Marques Dias (Complexo Interdisciplinar)
- Multidisciplinary Center for Astrophysics, coordinated by Alfredo Barbosa Henriques (Department of Physics)
- Research Unit for Naval Engineering and Technology, coordinated by Guedes Soares (Section of Naval Engineering)

José Carmo coordinated the research project JURAD (Lógicas para representação de conhecimento jurídico - administrativo), financed by the STRIDE and FEDER programmes and by JNICT (project number STRDA/C/TIT/86/92 - JURAD, Jan. 1993 - Dec. 1994).

Teresa Diogo received a research grant from FAPESP (Fundação de Amparo à Pesquisa do Estado de S. Paulo) and JNICT, for a visit to the Instituto de Ciências Matemáticas de São Carlos (University of São Paulo), Brazil from 25.7.94 to 24.9.94.

José Manuel Ferreira coordinated the research project "Métodos Algébricos em Geometria da Dinâmicas Discretas", financed by JNICT-STRIDE (project number STRDA/C/CEN/425/92).

Waldyr Oliva coordinated the research project "Dynamical Phase Transistions", financed by FAPESP (Fundação de Amparo à Pesquisa do Estado de S. Paulo), (FAPESP Grant 90/3918-5, 1991 to 1994).

Roger Picken coordinated the Portuguese team in the "Constrained Dynamical Systems" Network, supported by the European Union under the Human Capital and Mobility Programme (contract ERB-CHRX-CT93-0362, 1.1.94 - 31.12.96).

Maria Fernanda Ramalhoto was the local coordinator of the network "Decision Support for Maintenance Management and Quality Control", supported by the European Union under the Human Capital and Mobility Programme (contract CHRX-CT93-0294).

Carlos Rocha coordinated the research project "Métodos de Análise Não-Linear", financed by JNICT (project number STRDA/C/CEN/528/92).

Adélia Sequeira coordinated the Human Capital and Mobility project "The Equations of Fluid Mechanics and Related Topics" (contract ERB-CHRX-CT93-0407) and the research project "Problemas Matemáticos da Hidrodinâmica", supported by CRUP and DAAD (Germany), in collaboration with the University of Bayreuth.

Amílcar Sernadas coordinated the projects:

- ESPRIT Basic Research Action IS-CORE (Information Systems: Correctness and Reusability) with the participation of nine other European universities and research centers
- ESPRIT Basic Research Action COMPASS (Comprehensive Algebraic Approach to System Specification and Development)
- OBLOG (Object Logic) financed by Grupo Espírito Santo.

The following two projects were started by Frank-Olme Speck, both running for the period 1994-97 and directly supported by JNICT and BMFT (the Federal Minister for Research and Technology in Germany):

- Singular Operators-New Features and Applications, in collaboration with the Technische Hochschule Darmstadt,
- Spline-Galerkin Methods for Integral Equations of Wiener-Hopf Type, in collaboration with the Technische Universität Chemnitz-Zwickau.

Francisco Teixeira coordinated the research project "Métodos Operatoriais em Teoria da Difracção", financed by JNICT, Programa Base (project number PBIC/CEN/1040/92).

Francisco Viegas coordinated the research project "Funções Generalizadas e Cálculo Simbólico", financed by JNICT, Programa Base (project number PBIC/CEN/1066/92).

Some members of the department also received research funding through projects coordinated outside the mathematics department:

- Astrophysics and Gravitational Interaction Physics, ESO, coordinated by A. B. Henriques (Department of Physics, IST) (project number PESO/PRO/1009/93)

- Mathematical Physics, JNICT - Programa Base/PRAXIS XXI, coordinated by A. Cruzeiro (Department of Mathematics, Faculdade de Ciências, Universidade de Lisboa) (project number PBIC/CEN/1631/93)

6. Organization of Conferences etc.

João Branco, chairman of the organizing committee, II Congresso Anual da Sociedade Portuguesa de Estatística, Luso, Portugal, 20.6.94 - 23.6.94.

José Carmo, member of the programme committee and chairman of a session, Second International Workshop on Deontic Logic in Computer Science (Deon'94), Oslo, Norway, 6.1.94 -8.1.94.

José Carmo, organizer, 4th and 5th meetings of the JURAD project, Funchal, Portugal, 28.3.94 - 29.3.94 and Sintra, Portugal, 11.11.94 - 12.11.94.

José Carmo, member of the organizing committee, International Conference on Information Networks and Data Communications (INDC-94), Madeira, Portugal, 18.4.94 - 21.4.94.

Waldyr Oliva, member of the organizing committee, International Conference on Dynamical Phase Transitions, Universidade de São Paulo, Brazil, 27.6.94 - 2.7.94.

Roger Picken, member of the organizing committee, III Porto meeting on Knot Theory and Physics, Porto, Portugal, 6.6.94 - 8.6.94.

M. Fernanda Ramalhoto, organizer and chairperson of the Session 16 - Statistics in Continuing Education for Employees in Industry, ICOTS'4 (International Conference of Teaching Statistics), Marrakesh, Morocco, 25.7.94 - 30.7.94.

M. Fernanda Ramalhoto, chairperson of the session WB 15 - Queueing Systems, ORSA/TIMS (Operations Research Society of America) Conference, Detroit, USA, 23.10.94 - 26.10.94.

M. Fernanda Ramalhoto, member of the programme committee, 3rd European Forum for Continuing Engineering Education, Vienna, Austria, 9.11.94 - 11.11.94.

José Sousa Ramos, chairman of the organizing committee, European Conference on Iteration Theory, Opava, Czech Republic, 28.8.94 - 3.9.94.

Adélia Sequeira, chairman of the organizing committee, Third International Conference on Navier-Stokes Equations and Related Nonlinear Problems, Madeira, Portugal, 21.5.94 - 27.5.94.

Adélia Sequeira, member of the organizing committee, STAMM 94: Symposium on Trends in Applications of Mathematics to Mechanics, Lisbon, Portugal, 24.7.94 - 30.7.94.

Francisco Teixeira, organizer, Workshop on Singular Integral Operators and Applications (in honour of Prof. G. S. Litvinchuk), IST, Lisbon, Portugal, 26.07.94.

Juha Videman, member of the organizing committee, Third International Conference on Navier-Stokes Equations and Related Nonlinear Problems, Madeira, Portugal, 21.5.94 - 27.5.94.

7. Personal notes

Honours and Prizes

Rui Loja Fernandes received the 1994 Outstanding Thesis Award from the University of Minnesota for his thesis entitled: *Integrable bi-Hamiltonian systems.*

Waldyr Oliva became Professor Emeritus at IME - University of São Paulo in 1994. In his honour the international conference "Dynamical Phase Transistions" was held at the Universidade de São Paulo in July 1994.

New Professors and Promotions

Pedro Freitas, Rui Loja Fernandes and António Pacheco Pires were promoted to the position of "Professor Auxiliar" during 1994.

Other Degrees Supervised by Members of the Department

Castro, M. J., Mestrado em Probabilidade e Estatística, Faculdade de Ciências, Universidade de Lisboa, December 1994. Thesis: *Delineamento Cross-Over 2x2 em Ensaios Clínicos*. Supervisor: J. Branco.

Grácio, M. C., Mestrado em Matemática, Faculdade de Ciências, Universidade de Lisboa, March 1994. Thesis: *Quantificação de Sistemas Dinâmicos Hiperbólicos.* Supervisor: José Sousa Ramos.

Lampreia, J. P., Doutoramento em Matemática, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, January 1994. Thesis: *Dinâmica Simbólica de Aplicações do Intervalo.* Supervisor: José Sousa Ramos.

Martins, M. J. T., Mestrado, IST, Universidade Técnica de Lisboa, July 1994. Thesis: *Ajustamento de Curvas por Métodos não Paramétricos.* Joint supervisors: António St. Aubyn (Instituto Superior de Agronomia) and Teresa Diogo.

Moreira, M. L., Doutoramento em Matemática, Faculdade de Ciências, Universidade do Porto, May 1994. Thesis: *Aspectos Geométricos das Teorias de Matroides e de Matroides Orientadas.* Supervisor: Raúl Cordovil.

Other Notes

João Branco is President of the Portuguese Statistical Society.

José Carmo is co-chairman of the programme committee of the Third International Workshop on Deontic Logic in Computer Science (Deon'96), to be held in Lisbon, in January 1996. He is also member of the programme committee of the 7th Portuguese Artificial Intelligence Meeting, to be held in Funchal in October 1995.

Pedro Freitas was awarded a postdoctoral research fellowship under the Human Capital and Mobility programme (ERB-CHRX-CT93 0409) to carry out research at the Department of Pure Mathematics, Technical University of Delft, Holland. The fellowship runs from 1.8.94 to 31.7.95.

Luís Magalhães is Associate Director of the Robotics and Systems Institute in Lisbon. He was the coordinator of the Center for Mathematical Analysis, Dynamical Systems and Applications and one of the members of the Research Coordination Committee for Exact and Natural Sciences of JNICT. He is also the chairman of the organizing committee of the international conference EQUADIFF 95, to be held in Lisbon from 24.7.95 to 29.7.95.

Waldyr Oliva is a member of the scientific committee of the international conference EQUADIFF 95, to be held in Lisbon from 24.7.95 to 29.7.95.

Roger Picken is a member of the organizing commitee of the IV Porto Meeting on Knot Theory and Physics, Porto, 19.6.95 - 22.6.95 and of the Workshop on Modern Methods in Classical and Quantum Gravity, Sintra, 26.7.95 - 28.7.95.

Ana Pires was an invited participant in the III Workshop of the HARMA Concerted Action: Design of Experiments and Statistical Education, Cordoba, Spain, 16.12.94 - 17.12.94.

Maria Fernanda Ramalhoto was Guest Editor of the Special Issue on "Applied Probability Modelling" of the International Journal of Continuing Engineering Education (IJCEE) Vol. 4, 1994. She is also participating in the development of the "European Master Programme in TQM", under the auspices of the European Union.

Carlos Rocha is a member of the scientific committee of the IIéme Congres de Mécanique, Société Marocaine des Sciences Méchaniques, to be held in Casablanca from 10.4.85 to 13.4.95.
He is also a member of the organising committee of the international conference EQUADIFF 95, to be held in Lisbon from 24.7.95 to 29.7.95.

PREPRINT SERIES
1994

1/94 PICKEN, R. F.: Loop Variables in Quantum Gravity and Generalised Knot Invariants. 15 pp.

2/94 MENEZES, P. F.; COSTA, J. F.: Synchronization in Petri Nets. 21 pp.

3/94 MENEZES, P.: Algebraic Implementation of Transition Systems. 55 pp.

4/94 SANTOS, P. A.; TEIXEIRA, F. S.: Sommerfeld Half- Plane Problems with Higher-Order Boundary Conditions. 19 pp.

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11/94 SEQUEIRA, A.; VIDEMAN, J.: Global Existence of Classical Solutions for the Equations of Third Grade Fluids. 16 pp.

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