



Research Report 1995

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RESEARCH REPORT

1995

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 50 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, topology and mathematical physics 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 issue, especially Professor Gabriel Pires, who coordinated the preparation of the report. I am also grateful to Ema Silva for her work in word processing this issue.

Lisbon, April 1996

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, Stokes 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 Lie groups, 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 and Mathematical Analysis in Fluid Dynamics

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. The research on fluid dynamics 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. Situations such as flows in bounded and exterior domains and flows in domains with unbounded boundaries (channels, pipes, aperture domains) have been studied. The numerical study of the Stokes and Navier-Stokes equations by boundary and finite element methods as well as by domain decomposition methods has also been addressed.

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 ISCORE and COMPASS.

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

Research seminars

During 1995 the Department of Mathematics at IST ran regular sessions of the following seminars:

- Seminar on Dynamical Systems and Continuous Mechanics, every week.
Organizer: Carlos Rocha.
- Seminar on Mathematical Physics, every week.
Organizers: Rui Loja Fernandes and Esmeralda Dias.
- Seminar on Functional Analysis and Applications, one session every two weeks.
Organizers: Francisco Teixeira and Frank-Olme Speck.
- Seminar on Applied Mathematics and Numerical Analysis, monthly.
Organizer: Adélia Sequeira.
- Seminar on Theory of Computing, every week.
Organizer: Amílcar Sernadas.

1 Publications

1.1 Publications which appeared in 1995

Algebra and Mathematical Analysis

Almeida, P., Géométrie et Physique dans un espace à deux points, selon Alain Connes, *Actes du V^{ème} GIRAGA*, Yaoundé, Cameroun, (1995).

Almeida, P. and Duarte, P. G., Quantum graphs, Proceedings of the Clifford Conference on Geometry, *Topology and Physics*, (1995).

Bastos, M. A., dos Santos, A. F. and Duduchava, R., Finite interval convolution operators on the Bessel potential spaces H_p^s , *Math. Nachr.*, **173**, (1995), 49-63.

Câmara, M. C., Factorization in a Banach algebra and the Gelfand transform, *Math. Nachr.* **176**, (1995), 17-37.

Câmara, M. C., dos Santos, A. F. and Bastos, M. A., Generalized factorization for Daniele-Khrapkov matrix functions-partial indices, *Journal of Mathematical Analysis and Applications*, **190**, (1995), 295-328.

Câmara, M. C., dos Santos, A. F. and Bastos, M. A., Generalized factorization for Daniele-Khrapkov matrix functions-explicit formulas, *Journal of Mathematical Analysis and Applications*, **190**, (1995), 142-164.

Castro, L. P. and Speck, F.-O., On the characterization of the intermediate space in generalized factorizations, *Math. Nachr.*, **176**, (1995), 39-54.

Cordovil, R. and Fachada, J. L., Braid monodromy groups of arrangements of wiring diagrams, *Bol. Unione Mat. Ital.*, (7) **9-B**, (1995), 399-416.

Costa, F. P., Existence and uniqueness of density conserving solutions to the coagulation-fragmentation equations with strong fragmentation, *Journal of Math. Analysis and Appl.*, **192**, (1995), 892-914.

Costa, F. P., On the positivity of solutions to the Smoluchowski equations, *Mathematika.*, **42**, (1995), 406-412.

Faria, T. and Magalhães, L. T., Normal forms for retarded differential equations and applications to Bogdanov-Takens singularity, *Journal of Differential Equations*, **122**, (1995), 201-224.

Faria, T. and Magalhães, L. T., Normal forms for retarded functional differential equations with parameters and applications to Hopf bifurcation, *Journal of Differential Equations*, **122**, (1995), 181-200.

Faria, T. and Magalhães, L. T., Realization of ordinary differential equations by retarded functional differential equations in neighborhoods of equilibrium points, *Proceedings of the Royal Society of Edinburgh*, **125 A**, (1995), 759-776.

Freitas, P., Stability of stationary solutions of a nonlocal reaction-diffusion equation, *Quarterly of Mechanics and Applied Mathematics*, **48**, (1995), 557-582.

Gurtin, M. E., Matias, J., Thermomechanics and the formulation of the Stefan problem for fully faceted interfaces, *Quarterly of Applied Mathematics*, **53** (4), (1995), 761-782.

Kravchenko, V. G., Lebre, A. B., Litvinchuk, G. S. and Teixeira, F. S., Fredholm theory for a class of singular integral operators with Carleman shift and unbounded coefficients, *Math. Nachr.*, **172**, (1995), 199-210.

Kravchenko, V. G., Lebre, A. B., Litvinchuk, G. S. and Teixeira, F. S., Noether and normalization theories for a class of singular integral operators with Carleman shift and unbounded coefficients, *Contemporary Math.*, **189**, (1995), 373-385.

Kravchenko, V. G., Lebre, A. B., Litvinchuk, G. S. and Teixeira, F. S., A normalization problem for a class of singular integral operators with Carleman shift and unbounded coefficients, *Integral Equations and Operator Theory*, **21**, (1995), 342-354.

Ribeiro, L., Sur une notion de limite à l'infini d'une ultradistribution, *Portugaliae Mathematica* **52**, (1995), 193-209.

Santos, P. A. and Teixeira, F. S., Sommerfeld half-plane problems with higher order boundary conditions, *Math. Nachr.*, **171**, (1995), 269-282.

Stewart, I. and Buescu, G., Lyapunov stability and adding machines, *Ergodic Theory and Dynamical Systems*, **15**, (1995), 271-290.

Statistics and Applications

Göb, R., Beichelt, F., Dragger, K., Ramalhoto, M. F. and Schneidemann, H., Process maintenance from the point of view of reliability theory and of statistical process control, *Economic Quality Control Research Reports*, **51**, (1995).

Nunes, C. and Amaral, J., Sequencialização de tarefas num sistema com 3 máquinas idênticas, em regime de "Flow-Shop", Actas do II Congresso da Sociedade Portuguesa de Estatística, (1995), 257-272.

Nunes, C., Sarmiento, A. and O'Connor, P. A., A statistical description of sand waves in a submerged bank, *Computational Mechanics*, (Brebbia, P. A., Traversoni, L. Eds), (1995), 257-264.

Paulino, C. D. and Pereira, C. D. M., Bayesian methods for categorical data under informative general censoring, *Biometrika*, **82**, (1995), 439-446.

Paulino, C. D. and Pereira, C. D. M., On identifiability of parametric statistical models, *Journal of the Italian Statistical Society*, **3**, (1995), 125-151.

Pires, A. M., Branco, J. A., Picado, A. and Mendonça E., Metabolic responses in the assessment of pollution effects, *Environmetrics*, **6**, (1995), 155-163.

Pires, A. M., Branco, J. A. and Turkman, M. A., Comparação de métodos de análise discriminante no diagnóstico da doença coronária, Actas do II Congresso Anual da Sociedade Portuguesa de Estatística, (N. Mendes Lopes Ed.), FCTUC, Coimbra, (1995), 319-343.

Ramalhoto, M. F. and Morais, M., Cartas de controlo para o parâmetro de escala da população Weibull tri-paramétrica, Actas do II Congresso Anual da Sociedade Portuguesa de Estatística, (1995), 345-371.

Ramalhoto, M. F., et al., Flexible and distance learning in engineering education, *European Journal of Engineering Education (EJEE)*, Guest Editor M. F. Ramalhoto, Regular Editor Jean Michel, Carfax Publishing Company, Vol. 20, **2**, (1995), 139-253.

Ramalhoto, M. F., Queueing systems of the Service Industry - a TQM approach, Proceedings of the 1st World Congress on Total Quality Management, (Gopal K. Kanji Ed.), Chapman & Hall, (1995), 407-411.

Ramalhoto, M. F., Statistics in engineering and management research and advanced training, Bulletin of the International Statistical Institute, 50th session, *Beijing Book*, **2**, (1995), 1003-1004.

Ramalhoto, M. F., Stochastic modelling in the quality improvement of service industries-some new approaches, Proceedings of the International Conference on Statistical Methods and Statistical Computing for Quality and Productivity Improvement, *ICSQP'95*, Vol.I, (Park, S. H. Ed.), Seoul, Korea, (1995), 27-35.

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 phase crack, Mathematical and Numerical Methods for Wave Propagation (III Int. Conference), Mardelien - La Naponle - SIAM, (1995).

Alves, C. and Ha Duong, T., Numerical resolution of the boundary integral equations for elastic scattering by a plane crack, *Int. J. Num. Meth. in Eng.*, **38B**, (1995), 2347-2371.

Coscia, V., Sequeira A. and Videman J., Existence and uniqueness of classical solutions for a class of complexity-2 fluids, *Int. J. Non-linear Mech.*, **30**, (1995), 531-551.

Coscia, V. and Videman J., On a class of abstract evolution equations related to the motion of complexity-2 fluids, Navier-Stokes Equations and Related Nonlinear Problems, (A. Sequeira Ed.) Plenum Press Publishing., (1995), 245-258.

Franco, N. M. B. and Diogo, T., Solução numérica de uma equação integral de Volterra de segunda espécie, *Annais da XVII CNMAC 95, Sociedade Brasileira de Matemática Aplicada e Computacional*, Vol. II (1995), 594-597.

Lima, P. and Graça, M., Convergence acceleration for boundary value problems with singularities using the E-algorithm, *Comp. Appl. Math.*, **61**, (1995), 139-164.

Passerini, A. and Videman, J., Decay in time of kinetic energy of second and third grade fluids in unbounded domains, *Trends in Applications of Mathematics to Mechanics*, (Marques M. M. and Rodrigues, J. F. Eds.), Pitman Monographs and Surveys in Pure and Applied Mathematics, Longman (1995), 195-208.

Romeiras, F. J., A note on integrable two-degrees-of-freedom hamiltonian systems with a second integral quartic in the momenta, *J. Phys A: Math. Gen.*, **28**, (1995), 5633-5642.

Romeiras, F. J., Separability and Lax pairs for the two-dimensional hamiltonian system with a quartic potential, *J. Math. Phys.*, **36**, (1995), 3559-3565.

Sequeira, A. and Videman, J., Global existence of classical solutions for the equations of third grade fluids., *J. Math. Phys. Sci.*, **29**, (1995), 47-69.

Sequeira, A.,(Ed.), Navier-Stokes equations and related nonlinear problems, Plenum Press (1995).

Computer Science

Caleiro, C., On the relationship between operational and denotational semantics of temporal logic specification of object behavior, *Information Systems Correctness and Reusability - Selected Papers*, (R. Wieringa and R. Feenstra Eds), World Scientific, (1995), 69-83.

Costa, J. F. and Sernadas, A., Progress assumption in concurrent systems, *Formal Aspects of Computing*, **7** (1), (1995), 18-38.

Dionísio, F. M., Lipeck, U. W. and Brass, S., Composition of default specifications, *Information Systems Correctness and Reusability - Selected Papers*, (R. Wieringa and R. Feenstra Eds), World Scientific, (1995), 207-221.

Ehrich, H.-D. and Sernadas, A., Distributed semantics for concurrent families of sequential objects, *Recent Trends in Data Type Specification*, (E. Astesiano, G. Reggio and A. Tarlecki Eds), Springer Verlag, LNCS **906**, (1995), 219-235.

Gouveia, P. and Sernadas, C., Abduction in object specification using tableaux, Theorem Proving with Analytic Tableaux and Related Methods, (Baumgartner, P., Hahnle, R. and Possega, J. Eds), Tech. Rep. **2/95**, University of Koblenz, (1995), 43-48.

Gouveia, P. and Sernadas, C., Introducing explanations in temporal object specification, Information Systems Correctness and Reusability - Selected Papers, (R. Wieringa and R. Feenstra Eds), World Scientific, (1995), 53-68.

Li, R. and Carmo, J., On completeness of a positional interval logic with equality, overlap and subinterval relations, *Journal of IGPL*, Vol. 3, 5, (1995), 765-790.

Resende, P., Observational system specification, Information Systems Correctness and Reusability - Selected Papers, (R. Wieringa and R. Feenstra Eds), World Scientific, (1995), 135-151.

Ryan, M., Sernadas, A. and Sernadas, C., Adjunctions between default institutions, Information Systems Correctness and Reusability - Selected Papers, (R. Wieringa and R. Feenstra Eds), World Scientific, (1995), 155-172.

Saake, G., Sernadas, A. and Sernadas, C., Evolving object specifications, Information Systems Correctness and Reusability - Selected Papers, (R. Wieringa and R. Feenstra Eds), World Scientific, (1995), 84-99.

Sernadas, A., Sernadas, C. and Costa, J. F., Object specification logic, *Journal of Logic and Computation*, 5 (5), (1995), 603-630.

Sernadas, A., Sernadas, C. and Valença, J., A theory-based, topological notion of institution, Recent Trends in Data Type Specification, (E. Astesiano, G. Reggio and A. Tarlecki Eds), Springer Verlag, LNCS **906**, (1995), 420-436.

1.2 Articles submitted in 1995

Algebra and Mathematical Analysis

Barreira, L., A non-additive thermodynamic formalism and applications to dimension theory of hyperbolic dynamical systems, to appear in *Ergodic Theory & Dynamical Systems*.

Barreira, L., Cantor sets with complicated geometry and general symbolic dynamics, to appear in *Random & Comp. Dyn.*.

Cannas da Silva, A. and Guillemin, V., On the Kostant multiplicity formula for groups actions with non-isolated fixed points, to appear in *Advances of Mathematics*.

Castro, L. P. and Speck, F.-O., On the inversion of higher order Wiener-Hopf operators, Preprint 7/95.

Cordovil, R., Braid monodromy groups of arrangements of hyperplanes.

Cordovil, R., Coloring matroids.

Cordovil, R., Orestes, J. and Heitor, T. V., On the characterization of Axial Maps.

Costa, F. P., Asymptotic behaviour of low density solutions to the generalized Becker-Döring equations, Preprint 9/95.

Fernandes, R. L., Integrability and hamiltonian structure of the Lotka-Volterra equations, to appear in Proceedings of the Equadiff 95 Conference, Lisbon, Portugal.

Freitas, F., Grinfeld, M. and Knight, P., Stability of finite-dimensional systems with indefinite damping, to appear in *Advances in Mathematical Sciences and Applications*.

Freitas, P., Some results on the stability and bifurcation of stationary solutions of delay-diffusion equations.

Fusco, G. and Oliva, W., Integrability of a system of N electrons subjected to coulombian interactions, to appear in *Journal of Differential Equations*.

Girão, P. and Kohn, V., The crystalline algorithm for computing motion by curvature, to appear in *Variational Methods for Discontinuous Structures*, (R. Serapioni and F. Tonarelli Eds.), Birkhauser.

Lopes, P. A. and Santos, A. F., A new approach to the convolution operator on a finite interval, to appear in *Integr. Equat. Oper. Th.*

Oliva, W. M. and Sallum, E. M., Periodic dynamical systems for infected host and mosquitoes, to appear in *Journal of Public Health*.

Oliva, W. M. and Taboas, P. Z., Existence of periodic orbits, set of global solutions and behavior near equilibrium for Volterra equations of retarded type, to appear in *Portugaliae Mathematica*.

Oliva, W. M., The motion of two dimensional vertices with mass as a singular perturbation hamiltonian problem, Preprint 17/94, to appear in Proceedings of Cocoyoc.

Oliva, W., The asymptotic patterns in the dynamics of N repelling particles, Equadiff 95.

Paluch, M., $S^{-1}S$ for Banach algebras, Preprint 15/95, to appear in *Topology*.

Roberts, R. M. and Sousa Dias, E., Simmetries of Riemann ellipsoids, Preprint 13/95, to appear in *Philosophical Transactions: Physical Sciences and Engineering*, the London Royal Society.

Teixeira, F. S., and Santos, P. A., Sommerfeld type diffraction problems with approximate boundary conditions of arbitrary order, to appear in Proceedings of the International Workshop and Direct and Inverse Scattering, Marmara Research Center, Gebze, Turkey.

Statistics and Applications

Morais, M., Ordenação estocástica: Algumas noções e aplicações a fiabilidade e filas des espera, Preprint 2/95.

Morais, M. and Ramalhoto, M. F., Cartas EWMA unilaterais: Uma aplicação ao controlo de um parâmetro de escala, to appear in Actas do III Congresso da Sociedade Portuguesa de Estatística, Guimarães, Portugal.

Morais, M. and Natário, I., Como tornar mais eficaz uma carta C unilateral superior, to appear in Actas do III Congresso da Sociedade Portuguesa de Estatística, Guimarães, Portugal.

Nunes, C. and Amaral, J., Políticas óptimas e quase-óptimas de inspecção de um sistema sujeito a falhas, to appear in Actas do III Congresso Anual da Sociedade Portuguesa de Estatística, Guimarães, Portugal.

Paulino, C. D. and Silva, G. L., Maximum likelihood analysis of the general linear model in categorical data, to appear in Actas do III Congresso da Sociedade Portuguesa de Estatística, Guimarães, Portugal.

Ramalhoto, M. F. and Morais, M., Algumas cartas do tipo Shewart para o parâmetro de localização de população Weibull tri-paramétrica, Preprint 18/95.

Ramalhoto, M. F., and Morais, M., EWMA control charts for the scale parameter of Weibull distribution with fixed and variable sampling intervals.

Ramalhoto, M. F., and Morais, M., Simple control charts for the scale parameter of Weibull distribution with fixed and variable sampling intervals.

Ramalhoto, M. F., Flexible and distance learning synergies with research and technological development, to appear in the Proceedings of the World Congress of Engineering Educators and Industrial Leaders, Paris, France.

Ramalhoto, M. F., Some further properties of the busy period of the queue.

Ramalhoto, M. F., The state of the $M_t/G/$ queue and its importance to the study of the $M_t/G/r/r+d$ queues.

Ramalhoto, M. F., The Weibull distribution in control charts and in some maintenance strategies, to appear in the Proceedings of the International Conference on Probabilistic Safety Assessment and Management, Springer-Verlag, London.

Applied Mathematics and Numerical Analysis

Lima, P. and Lemos, A. C., Finite element solution of degenerate boundary-value problems for ordinary differential equations, to appear in Proceedings of International Conference on Advanced Mathematics, Computations and Applications , AMCA-95.

Padula, M. and Sequeira, A., A note on vector transport equation with applications to non-newtonian fluids, Preprint 22/95, to appear in Navier-Stokes Equations: Theory and Numerical Methods (Heywood, J. G. , Masuda, K., Rautmann, R. And Solonnikov, V. A., Eds) in Lecture Notes in Mathematics, Springer-Verlag.

Computer Science

Aiguier, M., Bernot, G., Ramos, J. and Sernadas, A., An algebraic semantics for GNOME via a translation to ETOILE specifications.

Caleiro, C., Saake, G. and Sernadas, A., Goal-driven operational semantics of temporal specification of reactive systems behaviour, Preprint 16/95.

Carmo, J. and Jones, A. J. I., Deontic database constraints, violation and recovery, to appear in *Studia Logica*

Gomes, J. and Sernadas, C., Propositional temporal logic with real time.

Gouveia, P., Jungclaus, R., Saake, G. and Sernadas, C., Feasible object certification, Preprint 14/95.

Guerra, S. and Ryan M., Towards feature-oriented specifications.

Menezes, P., Sernadas, A. and Costa, J. F., Nonsequential automata semantics for a concurrent object-based language, Preprint 21/95.

Ramos, J. and Sernadas, A., An informal introduction to GNOME, 1995, made available only on the WWW.

Resende, P., Towards a denotational semantics of imperative objects, Preprint 23/95.

Resende, P., A monoidal category of observable systems, Preprint 4/95.

Santos, F. and Carmo, J., Indirect action influence and responsibility, (Brown, M. and Carmo J. Eds), to appear in *Deontic logic, Agency and Normative Systems*, Springer-Verlag, Workshops in Computing Series.

Sernadas, A. and Sernadas, C., Synchronizing logics.

Sernadas, A. and Sernadas, C., Theory spaces, Preprint 18/95.

Sernadas, A., Sernadas, C. and Ramos, J., A temporal logic approach to object certification, 1995, to appear in *Journal D&KE*.

2 Academic degrees awarded in 1995

2.1 Doutoramentos/PhD's

Alves, Carlos, Docteur en Mathématiques, École Polytechnique, France, November 1995. Thesis: *Etude numérique de la diffraction d'ondes acoustiques et élastiques par une fissure plane de forme quelconque. Problèmes directs et inverses*. Supervisor: Tuong Ha Duong.

Buescu, G., Ph.D. in Mathematics, University of Warwick, UK, May 1995. Thesis: *Exotic attractors - from Liapunov stability to riddled basins*. Supervisor: I. Stuart.

Pinto, J., Ph.D. in Mathematics, Georgia Institute of Technology, USA, March 1995. Thesis: *Slow motion manifolds for a class of evolutionary equations*. Supervisor: Jack K. Hale.

Pires, G., Ph.D. in Mathematics, University of Wisconsin, Madison, USA, August 1995. Thesis: *Threshold growth dynamics: A PDE approach*. Supervisor: Panagiotis Souganidis.

Sousa Dias, E., Ph.D., University of Warwick, UK, February 1995. Thesis: *Local dynamics of symmetric hamiltonian systems with applications to the affine rigid body*. Supervisor: R. M. Roberts.

2.2 Mestrados/MSc's

Barreira, L., MSc in Mathematics, Pennsylvania State University, USA. Thesis: *On the dimension of geometric Cantor sets*. Supervisor: Yakov B. Pesin. Equivalência ao grau de Mestre em Matemática Aplicada, Instituto Superior Técnico, Universidade Técnica de Lisboa, 07.04.95.

Brandão, I., Mestrado em Matemática Aplicada, Instituto Superior Técnico, Universidade Técnica de Lisboa. Thesis: *Sistemas de funções iteradas e aplicações*. Supervisor: José Sousa Ramos.

Florentino, C., MSc in Mathematics, State University of New York at Stony Brook.

Morais, M., Mestrado em Matemática Aplicada, Instituto Superior Técnico, Universidade Técnica de Lisboa, 15.11.95. Thesis: *Cartas de controlo FSI e VSI para o parâmetro de escala da população Weibull tri-paramétrica*. Supervisor: M. F. Ramalhoto.

Nunes, C., Mestrado em Matemática Aplicada, Instituto Superior Técnico, Universidade Técnica de Lisboa, Julho de 1995. Thesis: *Sequencialização de tarefas em m máquinas organizadas em regime de flow-shop: algumas contribuições*. Supervisor: João Amaral.

Oliveira, B., MSc in Mathematics, Columbia University, New York, USA.

Pinto, P., Mestrado em Matemática Aplicada, Instituto Superior Técnico, Universidade Técnica de Lisboa, 3.10.95. Thesis: *Subfactores do tipo II_1 e teoria das representações de grupos*. Supervisor: Shingo Okamoto.

Lemos, A., Mestrado em Matemática Aplicada, Instituto Superior Técnico, Universidade Técnica de Lisboa, 31.01.95. Thesis: *Resolução de equações de Emden-Fowler pelo método dos elementos finitos*. Supervisor: Pedro Lima.

Ramos, J., Mestrado em Matemática Aplicada, Instituto Superior Técnico, Universidade Técnica de Lisboa, January 1995. Thesis: *Lógica de certificação GNOME*. Supervisor: Amílcar Sernadas.

Santos, A., Mestrado em Matemática Aplicada, Instituto Superior Técnico, Universidade Técnica de Lisboa, 16.11.95. Thesis: *Problemas de difracção de Sommerfeld com derivadas oblíquas*. Supervisor: Frank Speck.

Silva, R., Mestrado em Matemática Aplicada, Instituto Superior Técnico, Universidade Técnica de Lisboa, 18.07.95. Thesis: *Análise factorial dicotómica: O modelo de variáveis latentes para respostas binárias*. Supervisor: João Branco.

3. Research Lectures

3.1 Lectures at Conferences, Workshops, Meetings etc.

Algebra and Mathematical Analysis

Barreira, L., A non-additive thermodynamic formalism and applications to the dimension theory of dynamical systems, Maryland-Penn State Dynamics Conference, University of Maryland, College Park, USA, March 95.

Barreira, L., Cantor sets with complicated geometry and general symbolic dynamics, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Barreira, L., The dimension theory of hyperbolic dynamics, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Buescu, G., Transverse instability of attractors in invariant submanifolds, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.5.95.

Câmara, M. C., A non-linear method for generalized factorization - application to Daniele-Khmapov symbols, IWOTA 95, Regensburg, Germany, 31.7.95 - 4.8.95.

Costa, F. P., Dynamic scaling in discrete Smoluchowski equations, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Duarte, P., Homoclinic tangencies at conservative dynamical systems, International Workshop on Dynamical Systems, ICTP, Trieste, Italy, 22.5.95 - 2.6.95.

Fernandes, R. L., Nato Advanced Study Institute: From finite dimensional to infinite dimensional dynamical systems, ISAAC Newton Institute for Mathematical Sciences, Cambridge, U.K., 21.8.95 - 1.9.95.

Freitas, P., Stability and bifurcation in delay-diffusion equations. Meeting on Reaction-Diffusion Equations, La Laguna, Tenerife, Spain, January 95.

Freitas, P., Stability results for the wave equation with indefinite damping, Equadiff 95, Lisbon, Portugal, July 95.

Lampreia, J. P., Severino, R. and Ramos, J. S., Bimodal symbolic dynamics, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Martins, P. and Ramos, J. S., Algebraic results on Markov shifts and torus automorphisms, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Matias, J., On the dynamics of crystalline motions, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Oliva, W., Lotka-Volterra equations: Poisson structure and integrability, Evolutionary Problems for Dynamical Systems, Trento, Italy, 4.10.95 - 6.10.95.

Oliva, W., The asymptotic patterns in the dynamics of N repelling particles, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Picken, R., Universal holonomy and related topics, 3º Encontro do Algarve de Gravitação e Física de Altas Energias, Faro, Portugal, 7.4.95.

Pinto, J., Slow motion manifolds for a scalar tristable reaction-diffusion equation, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Rocha, C., Bifurcation diagrams for discretized semilinear parabolic equations, Le 2^{ème} Congrès de Mécanique, Faculté des Sciences Aïn Chok, Casablanca, Maroc, 10.4.95 - 13.4.95.

Santos, A. F. and Lopes, P. A., A new approach to the convolution operator on a finite interval, International Workshop on Operator Theory and Applications, Regensburg, Germany, 31.7.95 - 4.8.95.

Sarreira, M. and Ramos, J. S., Markov shifts in complex dynamical systems, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Severino, R., Ramos, J. S., Dimension groups of iterated maps, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Silva, L. and Ramos, J. S., Newton's methods as symbolic dynamical systems, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Sousa Dias, E., Symmetries of Riemann ellipsoids, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Speck, F.-O., Compatibility conditions in diffraction problems, International Workshop on Direct and Inverse Electromagnetic Scattering, Gebze, Istanbul, Turkey, 24.9.95 - 30.9.95.

Speck, F.-O., On the inversion of higher order Wiener-Hopf operators, International Workshop on Operator Theory and Applications, Regensburg, Germany, 31.7.95 - 4.8.95.

Statistics and Applications

Branco, J. A. and Miranda, M. M. S., Robust estimation with instrumental variables in the errors-in-variables model, 21st European Meeting of Statisticians, University of Aarhus, Denmark, 21.8.95 - 25.8.95.

Branco, J. A., Duarte, E. A. and Pires, A. M., The statistical modelling of climatic conditions influencing natural evaporation in pollution control (poster), SPRUCE III, The third SPRUCE International Conference on the theme: Statistical Aspects of Pollution, Assessment and Control, Merida, Mexico, 11.12.95 - 15.12.95.

Branco, J. A. and Miranda, M. M. S., The choice of tuning constants in bounded influence estimators (poster), 21st European Meeting of Statisticians, University of Aarhus, Denmark, 21.8.95 - 25.8.95.

Branco, J. A. and Oliveira, M. R., Factor analysis for binary data: a simulation study, 9th European Meeting of the Psychometric Society, Leiden, Holland, 4.7.95 - 7.7.95.

Morais, M., Cartas EWMA unilaterais: Uma aplicação ao controlo de um parâmetro de escala., III Congresso Anual da Sociedade Portuguesa de Estatística, Guimarães, Portugal, 26.6.95 - 28.6.95.

Morais, M., Como tornar mais eficaz uma carta C unilateral superior, III Congresso Anual da Sociedade Portuguesa de Estatística, Guimarães, Portugal, 26.6.95 - 28.6.95.

Nunes, C., Ordonnancement optimal d'execution de n tâches par m machines organisées en "Flow-shop", INRIA, Sophia-Antipolis, Nice, France, 29.8.95.

Nunes, C., Políticas óptimas e quase-óptimas de inspecção de um sistema sujeito a falhas, III Congresso da Sociedade Portuguesa de Estatística, Guimarães, Portugal, 26.7.95 - 28.7.95.

Paulino, C. D., A análise por máxima verosimilhança do modelo linear geral em dados categorizados, 3^o Congresso Anual da SPE, Guimarães, Portugal, 26.6.95 - 28.6.95.

Pires, A. M., Branco, J. A., Picado, A. and Mendonça E., Modelling the results of the toxicity test based on the reproduction rate of *Daphnia Magna* (poster), SPRUCE III, The third SPRUCE International Conference on the theme: Statistical Aspects of Pollution, Assessment and Control, Merida, Mexico, 11.12.95 - 15.12.95.

Ramalhoto, F., Statistics in engineering and management research and advanced training, 50th Session of the International Statistical Institute, Beijing, China, 21.8.95 - 29.8.95.

Ramalhoto, F., Stochastic modelling in the quality improvement of the service industry: some new approaches, International Conference on Statistical Methods and Statistical Computing for Quality and Productivity Improvement, ICSQP'95, Seoul, Korea, 17.8.95 - 19.8.95.

Applied Mathematics and Numerical Analysis

Diogo, T. and N. Franco, Solução numérica de uma equação integral de Volterra de 2^a espécie, XVII CNMAC, Curitiba, PR, Brasil, 28.8.95 - 1.9.95.

Diogo, T., Numerical solution of a singular Volterra integral equation, 16th Biennial Conference on Numerical Analysis, University of Dundee, Scotland, 27.6.95 - 30.6.95.

Lima, P., Finite element solution of degenerate boundary-value problems for ordinary differential equations, International Conference on Advanced Mathematics Computations and Applications, Novosibirsk, Russia, 20.6.95 - 24.6.95.

Moura, M., Fast and high order calculation of the effective conductivity of a composite material, IV Workshop em Equações Diferenciais Parciais: Teoria da Computação e Aplicações - Instituto de Matemática Pura e Aplicada (IMPA), Rio de Janeiro, Brasil, 17.7.95 - 21.7.95.

Sequeira, A., Existence of regular, global solutions of the equations of a second grade fluid in two dimensions, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Sequeira, A., Mathematical theory of certain non-newtonian fluids, International Colloquium on Mathematical and Numerical Results of Navier-Stokes Equations, - 65th Birthday of Prof. Rautmann, Ferrara, Italy, 23.10.95 - 25.10.95.

Sequeira, A., On the existence of regular solutions for second grade fluids in a bounded domain, 4th International Conference on Navier-Stokes Equations and Related Nonlinear Problems, Toulon-Hyères, France, 22.5.95 - 27.5.95.

Sequeira, A., Steady flow of a second grade fluid past an object, International Conference on Recent Advances in Non-Linear Fluid Dynamics and Related Topics, Pittsburgh, USA, 6.2.95 - 9.2.95.

Videman, J. H., Mathematical results on some non-newtonian fluids, 4th Winter School on Mathematical Theory in Fluid Mechanics, Paseky, Czech Republic, 3.12.95 - 9.12.95.

Videman, J. H., Steady flow of a second-grade fluid in unbounded domains, Int. Conf. on Recent Advances in Non-Linear Fluid Dynamics and Related Topics, Pittsburgh, USA, 6.2.95 - 8.2.95.

Videman, J. H., Steady motions of a second-grade fluid in an exterior domain, 4th Int. Conf. on Navier-Stokes Equations and Related Nonlinear Problems, Toulon-Hyères, France, 22.5.95 - 27.5.95.

Videman, J. H., Steady motions of a second-grade fluid in an exterior domain, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Computer Science

Caleiro, C., A temporal object logic institution over labelled event structures, COMPASS General Meeting, Sintra, Portugal, 15.2.95 - 18.2.95.

Caleiro, C., An event structure semantics of distributed object communities, ISCORE-95 Workshop, University of Evry, France, 7.9.95 - 10.9.95.

Dionísio, F. M., Composition and instantiation mechanisms for default theories, 2nd Dutch/German Workshop on Non-Monotonic Reasoning and its Applications, University of Utrecht, Holland, 29.3.95 - 31.3.95.

Dionísio, F. M., Composition of default specifications, ISCORE-95 Workshop, University of Evry, France, 7.9.95 - 10.9.95.

Gomes, J., A decidable tableaux system for propositional temporal logic with explicit time, ISCORE-95 Workshop, University of Evry, France, 7.9.95 - 10.9.95.

Ramos, J., An algebraic semantics for GNOME via a translation to ETOILE specifications, ISCORE-95 Workshop, University of Evry, France, 7.9.95 - 10.9.95.

Ramos, J., GNOME certification logic, ISCORE-95 Workshop, University of Evry, France, 7.9.95 - 10.9.95.

Resende, P., A monoidal category of observable systems, COMPASS General Meeting, Sintra, Portugal, 15.2.95 - 18.2.95.

Resende, P., Compositional denotational and operational semantics of objects with one-way interaction, ADT-95 Workshop, Oslo, Norway, 19.9.95 - 22.9.95.

Resende, P., Compositional denotational and operational semantics of objects with one-way interaction, ISCORE-95 Workshop, University of Evry, France, 7.9.95 - 10.9.95.

Sernadas, C., Adjunctions between logics, FLIRTS Workshop, Genova, Italy, 26.10.95 - 28.10.95.

Sernadas, C., An institutional view on default logic, COMPASS General Meeting, Sintra, Portugal, 15.2.95 - 18.2.95.

Sernadas, C., Theory spaces, ADT-95 Workshop, Oslo, Norway, 19.9.95 - 22.9.95.

Sernadas, C., Theory spaces, ISCORE-95 Workshop, University of Evry, France, 7.9.95 - 10.9.95.

3.2 Invited lectures

Algebra and Mathematical Analysis

Barreira, L., A non-additive thermodynamic formalism and the dimension theory of dynamical, American Mathematical Society Conference, Smooth Dynamical Systems and Dimension Theory, University of Washington, Seattle, Washington, USA, June 95.

Costa, F. P., Convergence to equilibria in coagulation-fragmentation equations, Dynamics of Microstructures: Analysis and Efficient Simulation, Garbsen, Hannover, Germany, June 1995.

Duarte, P., Tangências homoclínicas em dinâmica conservativa, Seminário de Sistemas Dinâmicos, IMPA, Rio de Janeiro, Brasil, 20.2.95.

Fernandes, R. L., Espaços de Poisson simétricos, Seminário de Geometria, CMAF, Lisbon, April 1995.

Freitas, P., Some eigenvalue problems related to the wave equation with indefinite damping, Winter School on Evolution Equations, Centre for Partial Differential Equations, Leiden University, Holland, January 95.

Freitas, P., Some stability results for vibrating systems with indefinite damping: I- the infinite dimensional case: the wave equation II - the finite dimensional case: a system of coupled oscillators, Vrije Universiteit Amsterdam, Holland, February 95.

Freitas, P., Vibrating systems with indefinite damping, Department of Pure Mathematics, Delft University of Technology, May 95.

Freitas, P., Vibrating systems with indefinite damping, Dep. de Matemática Aplicada, Universidad Complutense, Madrid, Spain, June 95.

Matos, J., Young measures supported on the union of a point and a well, Institute for Mathematics and its Applications, University of Minnesota, USA, November 95.

Oliva, W., Comportamento assintótico de um sistema de electrões, Centro de Matemática Aplicada da Universidade do Porto, Porto, Portugal, 24.4.95.

Oliva, W., Existence of periodic orbits and set of global solutions for Volterra equations of retarded type, Department of Mathematics of Trento University, Italy, 10.10.95.

Oliva, W., Formation of symmetric structures in the dynamics of repelling particles, Isaac Newton Institute for Mathematical Sciences, University of Cambridge, England, 29.10.95.

Paluch, M., Filtrações em K-teoria, Complexo II, Lisbon, Portugal, 16.6.95.

Picken, R., Aspectos geométricos e algébricos das tranças e dos emaranhados, Seminário de Geometria, CMAF, Complexo II, Lisbon, Portugal, 26.5.95.

Rocha, C., Bifurcações em equações de reacção-difusão discretizadas, Centro de Matemática Aplicada, Universidade do Porto, Portugal, 15.2.95.

Rocha, C., Bifurcation diagrams for discretized semilinear parabolic equations, Faculté des Sciences Aïn Chok, Casablanca, Marocco, 10.4.95.

Teixeira, F. S., Sommerfeld type diffraction problems with approximate boundary conditions of arbitrary order, International Workshop on Direct and Inverse Scattering, Marmara Research Center, Gebze, Turkey, 24.9.95.

Statistics and Applications

Branco, J. A., Comparação de configurações, Departamento de Matemática, Universidade Portucalense, Porto, Portugal, 21.3.95.

Ramalhoto, M. F., Some further properties of the busy period of an $M/G/\bullet$ queue, Advanced Institute of Science and Technology, Mathematics Department, Korea (KAIST), 16.8.95.

Ramalhoto, M. F., Stochastic modelling in the quality improvement of service industries - some new approaches, City University of Hong Kong, Department of Applied Statistics & Operational Research, Hong Kong, 5.9.95.

Ramalhoto, M. F., Stochastic modelling in the quality improvement of service industries - some new approaches, Pohang University of Science and Technology, Department of Industrial Engineering, Pohang, Korea, 14.8.95

Ramalhoto, M. F., Stochastic modelling in the quality improvement of service industries, Department of Statistics and Econometry, University Carlos III of Madrid, 20.12.95.

Ramalhoto, M. F., The state of the $M_t/G/\oplus\bullet$ queue and its importance to the study of the $M_t/G/r/r+d$ queue, Academia Sinica, Institute of Applied Mathematics, Beijing, China, 28.8.95.

Ramalhoto, M. F., TQM applied to the queueing systems of the service industry, Department of Applied Mathematics, Tsinghua University, Beijing, China, 24.8.95.

Applied Mathematics and Numerical Analysis

Diogo, T., Métodos numéricos para equações integrais singulares, XVII CNMAC, Brasil, 28.8.95 - 1.9.95.

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

Sequeira, A., Écoulement stationnaire d'un fluide de grade 2 dans un domaine extérieur, Université de Campiégne, France, 28.11.95.

Sequeira, A., Resultados de existência para as equações de fluidos não-newtonianos de segundo grau num domínio exterior, CMAF/UL, Lisboa, Portugal, 16.3.95.

Videman, J. H., Análise matemática de fluídos não-newtonianos de complexidade 2, CMAF, Lisbon, 26.1.95.

Videman, J. H., Well-posedness of the equations of motion of a certain class of complexity 2 fluids, University of Pittsburgh, USA, 22.2.95.

Computer Science

Sernadas, C., Theory spaces, University of Birmingham, UK, 20.6.95.

4. Guest Programme

Algebra and Mathematical Analysis

Angenent, S., University of Wisconsin, 3.12.95 - 10.12.95. *Lecture:* Closed geodesics on surfaces and curve shortening, 4.12.95.

Beffa, G. M., University of Wisconsin, 3.12.95 - 10.12.95. *Lecture:* Differential invariants and the 2nd KdV hamiltonian structure, 6.12.95.

Bokowski, J., Technische Hochschule, Darmstadt, Germany, 12.2.95 - 16.2.95.

Castro, L., Universidade de Aveiro, Portugal, 18.5.95 - 19.5.95. *Lecture:* A inversão de operadores de Wiener-Hopf de ordem superior, 19.5.95.

Fiedler, B., Frei Universität Berlin, Germany, 25.3.95 - 3.4.95. *Lecture:* Morse permutations and global attractors, 29.3.95.

Fonseca, I., *Lecture:* A-quasiconvexidade: Semicontinuidade inferior e multiplicadores de Fourier, 6.7.95.

Friesecke, G., Universität Freiburg, Germany, 15.5.95 - 19.5.95. *Lecture:* Infinite-dimensional dynamic in a model equation for solid-solid phase transitions, 18.5.95.

Galves, A., IME - Universidade de São Paulo, Brasil, 28.3.95 - 3.4.95. *Lecture:* Um modelo matemático de aquisição e mudança linguística: O que Boltzman e Bayes têm a dizer que pode interessar a Chomsky, 3.3.95.

Langevin, R., Université de Bourgogne, Dijon, France, 2.5.95 - 4.5.95. *Lecture:* Geometria integral em \mathbb{R}^3 e S^3 , 3.5.95.

LeFloch, P., CMAP Ecole Polytechnique, 26.6.95 - 30.6.95. *Lecture:* Gas dynamics equations, 28.6.95.

Oliva, S., IME - Universidade de São Paulo, 2.7.95 - 31.7.95. *Lecture:* Atratores para equações parabólicas com condições de fronteira não-lineares, 7.7.95.

Passov, A., Technische Hochschule Darmstadt, Germany, 6.3.95 - 24.3.95. *Lecture:* Higher impedance boundary conditions in Sommerfeld diffraction problems, 16.3.95.

Pereira, A., IME - Universidade de São Paulo, Brasil, 10.10.95 - 30.10.95. *Lecture:* Semicontinuidade superior para os atratores de uma equação hiperbólica, 23.10.95.

Pinto, A. *Lecture:* Classificação de aplicações expansivas uniformemente assintoticamente afins de grau 2, 2.3.95.

Poláčik, P., Comenius University, 17.7.95 - 30.7.95. *Lecture:* Space-time asymptotics of positive solutions of nonautonomous reaction-diffusion equations on a ball, 20.7.95.

Rauch-Wojciechowski, S., Linköpings Universitet, 27.6.95 - 1.7.95. *Lecture:* Schrödinger spectral problem, soliton equations and integrable structures, 29.6.95.

Roch, S., Technische Universität Chemnitz-Zwickau, 3.9.95 - 17.9.95. *Lecture:* Asymptotic stability of the collocation method for singular integral operators, 13.9.95.

Roch, S., Technische Universität Chemnitz-Zwickau 3.9.95 - 17.9.95. *Lecture:* Local inclusion theorems for Banach algebras, 6.9.95.

Samko, S., Universidade de Rostov on Don, Russia, 2.5.95 - 7.5.95. *Lecture:* Inversion of one-dimensional and multidimensional integral equations of the first kind, I e II, 3.5.95 - 4.5.95.

Silbermann, B., Technische Universität Chemnitz-Zwickau, Germany, 26.6.95 - 8.7.95. *Lecture:* Asymptotic behavior of spectra of Toeplitz matrices, 6.7.95.

Silbermann, B., Technische Universität Chemnitz-Zwickau, Germany, 26.6.95 - 8.7.95. *Lecture:* Asymptotic Moore-Penrose inversion of singular integral operators, 29.6.95.

Silbermann, B., Technische Universität Chemnitz-Zwickau, Germany, 26.6.95 - 8.7.95. *Lecture:* Banach algebras of operators and symbol constructions, 27.6.95.

Spitkovsky, I., The College of William and Mary, U.S.A., 15.5.95 - 30.5.95. *Lecture:* Generalization of the Gelfand theory to non-commutative algebras and applications to singular integral operators with discontinuous coefficients.

Teixeira, M. A., IMECC-UNICAMP, Brasil, 11.6.95 - 15.6.95. *Lecture:* Singularidades de sistemas reversíveis, 14.6.95.

Vavilov, S., St. Petersburg State University, 18.12.95 - 22.12.95. *Lecture:* Bifurcations of degenerate limit cycles, 19.12.95.

Vavilov, S., St. Petersburg State University, 18.12.95 - 22.12.95. *Lecture:* The method to study the existence of nontrivial solutions to some classes of operator equations, 21.12.95.

Statistics and Applications

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

Göb, R., Würzburg University, 7.12.95 - 16.12.95.

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

Tapiero, C., ESSEC, France, 24.11.95 - 27.11.95.

Applied Mathematics and Numerical Analysis

Beirão da Veiga, H., University of Pisa, Italy, 6.3.95 - 10.3.95. *Lecture: Sobre a regularidade das soluções das equações de Navier-Stokes.*

Beirão da Veiga, H., University of Pisa, Italy, 12.11.95 - 18.11.95.

Galdi, G. P., University of Ferra, Italy, 31.3.95 - 5.4.95.

Gama, S., FEUP, 24.11.95. *Lecture: Viscosidades turbulentas em escoamentos de Navier-Stokes bi e tri-dimensionais.*

Hundsdoerfer, W. , CWI, Amsterdam, Holland, 19.5.95. *Lecture: Method of lines versus direct discretizations: a comparison for linear advection.*

Pileckas, K., University of Paderborn, Germany, 16.9.95 - 7.10.95. *Lecture: The steady motion of a compressible fluid under large potential forces.*

Simader, C. G., University of Bayreuth, Germany, 28.10.95 - 4.11.95. *Lecture: L^q - theory for an exterior Dirichlet problem.*

Tome, M. F., ICMSC-USP de São Carlos, Brasil, 20.2.95 - 24.2.95. *Lecture: Freeflow: Simulação numérica de escoamentos transientes de fluidos newtonianos com fronteira livre.*

Computer Science

Bernot, G., University of Evry, France, 27.4.95 - 28.4.95.

Ehrich, H. D., University of Braunschweig, Germany, 20.2.95 - 23.2.95.

Ryan, M., University of Birmingham, UK, 11.9.95 - 15.9.95.

Saake, G., University of Magdeburg, Germany, 15.3.95 - 17.3.95.

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, n° 89/94, coordinated by L. T. Magalhães.
- Center for Signal Analysis and Processing, n° 82/94, 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 José Tito Mendonça (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)

Costa, F. P., Coordinated the projects:

- Phase Transitions and Partial Differential Equations, JNICT, PBIC/C/MAT/2139/95.
- Dynamics of Phase Transitions in Systems of Interacting Particles, /423/INIDA.

Ferreira, J. M., Coordinated the research project: Algebraic Methods in Discrete Dynamics Geometry, JNICT-STRIDE, STRDA/C/CEN/425/92.

Fernandes, R. L., Coordinates the project: Geometric and Topological Methods in Hamiltonian Dynamical Systems and Ergodic Theory, JNICT, PBIC/C/MAT/2140/95.

Freitas, P., Postdoctoral Fellow under the Human Capital and Mobility Programme (ERB-CHRX-CV930409) at the Department of Pure Mathematics, Technical University of Delft, Holland, from 01.8.94 to 31.07.95.

Magalhães, L., Coordinates the projects:

- Non-Linear Analysis and Dynamical Systems, PRAXIS XXI, 2/2.1/MAT/199/94.
- Dynamical Phase Transitions, collaboration with the Universidade de São Paulo, São Paulo, Brasil, CNPQ/JNICT.

Picken, R., Coordinated the Portuguese teams in the projects:

- Topological Structures in the Theory of Strings, Fields and Black Hole Physics, Anglo-Portuguese joint research project funded by the Treaty of Windsor Programme, B-47/95.
- Constrained Dynamical Systems Network, funded by the European Union under the Human Capital and Mobility Programme (Contract ERB-CHRX-CT93-0362), 1.1.94 - 31.12.96.

Ramalhoto, M. F., Coordinated the projects:

- European Masters and Research Programme on TQM.
- HCM Project (Contract CHRX-CT-93/024).
- Research Project of the Research Unit Naval Engineering and Technology, Queueing Systems and Quality Management, JNICT.

Resende, P., Participated in the Newton Institute Summer School on the Logic and Semantics of Computation, with a grant from Fundação Calouste Gulbenkian, Cambridge, UK, 24.9.95 - 29.9.95.

Rocha, C., Coordinated the research project: Methods of Non-Linear Analysis, JNICT, STRDA/C/CEN/528/92, finished in August 1995.

Sequeira, A., Coordinated the projects:

- The Equations of Fluid Dynamics and Related Topics, Human Capital and Mobility Project, Contract FRB/CHRX/CT93/0407.
- Mathematical Problems in the Equations of Hydrodynamics, in collaboration with the University of Bayreuth, Germany, CRUP/DAAD.
- Mathematical Analysis and Numeric Simulation of Non-Newtonian Fluids with Applications in Liquid-Crystalline Polymers Technology, PRAXIS XXI,2/2.1/MAT/380/94.
- Mathematical Problems in Non-Newtonian Fluids, in collaboration with the University of Ferra, Italy, JNICT/CNR.

Sernadas, A., Coordinator of the projects:

- ESPRIT Basic Research Action IS-CORE (Information Systems: Correctness and Reusability) with the participation of nine other European Universities and Research Centers. Overall coordinator.
- ESPRIT Basic Research Action COMPASS (Comprehensive Algebraic Approach to System Specification and Development). Coordinator of the portuguese site.
- JNICT and British Council Action on Structured Defaults. Cooperation with Birmingham University.
- GNOME Project, partialy supported by Caixa-SI. (Formal Specification of Software System).

Sousa Dias, E., Received a research grant from Fundação Calouste Gulbenkian for a visit to the University of Warwick.

Speck, Frank-Olme coordinates the following projects, 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.

Teixeira, F., Coordinated the research project: Operator Methods in Diffraction Theory, JNICT, Programa Base, PBIC/CEN/1040/92.

Viegas, F., Coordinated the research project: Generalized Functions in Symbolic Calculus, JNICT, Programa Base, PBIC/CEN/1066/92.

Some members of the Department also received research funding through projects coordinated outside the 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, Meetings, etc.

Barreira, L., Organizer of the Independent Graduate Seminar, The Pennsylvania State University, University Park, E.U.A.

Branco, J., President of the III Annual Congress of the Portuguese Statistical Society, Guimarães, Portugal, 26.6.95 - 28.6.95.

Branco, J., Representative of Portugal in the Meeting of the European Courses in Advanced Statistics (ECAS) held during the 5th ECAS course on Longitudinal Data Analysis and Repeated Measures, Milton-Keynes, United Kingdom, 11.9.95 - 15.9.95.

Carmo, J., 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.

Carmo, J., Member of Programme Committee, 7^o Encontro Português de Inteligência Artificial (EPIA'95), Madeira, Portugal, 3.10.95 - 6.10.95.

Carmo, J., Member of Programme Committee, Workshop on Temporal Reasoning in Deductive and Object-Oriented Databases, Singapur, December 1995.

Magalhães, L., Chairman of the Organizing Committee of the International Conference on Differential Equations, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Oliva, W., Member of the Scientific Committee of the International Conference on Differential Equations, Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.7.95.

Picken, R., Member of the Organizing Committee, IVth Porto Meeting on Knot Theory and Physics, Porto, Portugal, 19.6.95 - 22.6.95.

Picken, R., Member of the Organizing Committee, Workshop on Modern Methods in Classical and Quantum Gravity, Sintra, Portugal, 26.7.95.

Ramalhoto, M. F., Organizer of the Invited Session - Statistical Process Control, in the International Conference on Statistical Methods and Statistical Computing for Quality and Productivity Improvement (ICSQP'95), Seoul, Korea, 17.8.95 - 19.8.95.

Ramalhoto, M. F., Chairperson of the CP 127 Session (replacing Professor Kristensen from Denmark) of the 50th Session of the International Statistical Institute, Beijing, China, 21.8.95 - 29.8.95.

Ramalhoto, M. F., Member of the Programme Committee of the World Congress of Engineering Educators and Industrial Leaders, UNESCO 50 years Celebration, Paris, France, 2.7.96 - 5.7.96.

Rocha, C., Member of the Organizing Committee of the International Conference of Differential Equations Equadiff 95, Lisbon, Portugal, 24.7.95 - 29.4.95.

Rocha, C., Member of the Scientific Committee of the II^{ème} Congrès de Mécanique, Société Marocaine des Sciences Mécaniques, Casablanca, Marocco, 10.4.95 - 13.5.95.

Sernadas, A., Chairman, COMPASS General Meeting, Sintra, Portugal, 15.2.95 - 18.2.95.

7. Personal Notes

Honours and Prizes

Barreira, L., Received the Wheeler P. Davey Award, Eberly College of Science, the Pennsylvania State University, University Park, E.U.A..

New Professors and Promotions

Carlos Rocha was promoted to the position of "Professor Catedrático".

Amarino Lebre, Daniel Paulino, Roger Picken were promoted to the position of "Professor Associado".

Jorge Buescu and M. Esmeralda Dias were promoted to the position of "Professor Auxiliar".

Pedro Duarte transferred as “Professor Auxiliar” from the Faculdade de Ciências, Universidade de Lisboa, to IST.

Other Degrees Supervised by Members of the Department

Alves, C. J. S., Doctorat à L'École Polytechnique, Paris, November 1995. Thesis: *Étude Numérique de la Diffraction d'Ondes Acoustiques et Élastiques par une Fissure Plane de Forme Quelconque. Problèmes Directs et Inverses*. Co-supervisor: Adélia Sequeira.

Miranda, M. M. S., Doutoramento em Matemática, Universidade de Aveiro, January 1995. Thesis: *Estimação Robusta com Variáveis Instrumentais em Modelos com Erros-nas-Variáveis*. Supervisor: João Branco.

Other Notes

Branco, J., President of the Portuguese Statistical Society.

Magalhães, L., 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.

Ramalhoto, M. F., Guest Editor of the European Journal of Engineering Education, Vol. 20, 2, 1995.

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