

# João Patrício | Curriculum Vitae

Instituto Politécnico de Tomar

Quinta do Contador, Estrada da Serra, 2300-313 Tomar, Portugal

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## Education

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### University of Coimbra

*PhD in Applied Mathematics,*

2007

### Instituto Politécnico de Tomar

*Adjunct Professor Access,*

2001

### University of Coimbra

*BSc in Mathematics,*

1987

## Past and Current Positions

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### Instituto Politécnico de Tomar

*Full Adjunct Professor*

*Since October 2004*

### Instituto Politécnico de Tomar

*Junior Adjunct Professor*

*From October 2001 to September 2004*

### Instituto Politécnico de Tomar

*Invited Adjunct Professor*

*From February 1998 to September 2001*

### Instituto Politécnico de Tomar

*Collaborator*

*From October 1997 to February 1998*

### Instituto Superior Bissaya Barreto

*Lecturer*

*From October 1995 to September 1997*

### Universidade de Coimbra

*Lecturer*

*From July 1991 to September 1997*

Also Fellow at CERFACS - France

### Universidade de Coimbra

*Junior Lecturer*

*From October 1987 to June 1991*

## Lecturing Activity

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### Instituto Politécnico de Tomar

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**MSc in Finance and Auditing:** Decision Support Statistical Methodologies (partial)

**BSc in Informatics and Multimedia Technologies:** Computer Graphics

**MSc in Analytics and Business Intelligence:** Mathematical Models for Decision Analysis and Support (partial), Multidisciplinary Project (partial)

**MSc in Digital Content Production:** Computer Graphics I, Computer Graphics II, Games and Augmented Reality

**MSc in Chemical Technology:** Mathematics and Computation, Process Optimization (partial)

**MSc in Control and Industrial Electronics:** Mathematical Modelling and Simulation

**Business Intelligence Post-Graduate Course:** Mathematical Models for Decision Analysis and Support (partial), Multidisciplinary Project (partial)

**BSc in Civil Engineering:** Mathematical Calculus III (partial), Operations Research, Linear Algebra

**BSc in Computer Engineering:** Logics and Scientific Computing, Operations Research, Linear Algebra

**BSc in Eletrotechnical Engineering:** Operations Research, Applied Mathematics, Linear Algebra

**BSc in Chemical and Biochemical Engineering:** Operations Research, Applied Numerical Methods, Statistical Methods, Linear Algebra

**BSc in Environment and Biological Engineering:** Operations Research, Applied Numerical Methods, Statistical Methods, Linear Algebra

**BSc in Graphical Arts Technology:** Mathematics III

**Technical Course in Multimedia Product Development:** Mathematics Applications

**Technical Course in Accounting and Management:** Mathematics (partial)

**Technical Course in Information Systems Technology and Programming:** Algorithms

**Technical Course in Geographical Information Systems:** Applied Mathematics (partial)

**Technical Course in Electrical Installations and Industrial Automation:** Applied Mathematics (partial)

**Other Courses:** Training Programme “Introduction to Text Processing in  $\LaTeX$ ”

Trainees: High School Teachers, from March to May 2002

## Instituto Superior Bissaya Barreto

**BSc in Management and Public Administration:** Informatics

## Universidade de Coimbra

**BSc Courses in Engineering:** Linear Algebra

**BSc in Mathematics:** Computer Programming, Numerical Analysis, Discrete Mathematics

## Research Activities

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### Research Interests

- Information Systems for *Smart Cities*.
- Computational Kernels for Linear and Nonlinear Optimization.
- Algorithms, Mathematical Models and Applications for Computer Graphics, Virtual Reality, Augmented Reality and Video Games.
- High Performance Computing.

### Invited Talks

- *Vehicle Mechanics (and other issues)*, in GISU Alliance Session on Driver’s Cognition, Guangzhou, October 2023.
- *High Performance Graphics using OpenGL*, in MAGnUS Summer School, Baku, Azerbaijan, September 2022.
- *The role of localization in interactive systems*, in MAGnUS Summer School, Baku, Azerbaijan, September 2022.
- *From Interaction to Augmented Reality — some methods and technologies*, in Online MAGnUS Summer School, Baku, Azerbaijan, July 2020.
- *Computer Graphics, Augmented Reality and Beyond*, in MAGnUS Workshop, Tallinn, Estonia, October 2019.
- *(Alguma) Matemática na Animação Gráfica e na Realidade Virtual*, with Miguel Abreu (SKETCH-PIXEL), in Tardes de Matemática da Sociedade Portuguesa de Matemática, FNAC Colombo (Lisboa), January 2019.

- *Sistemas e apps para Smart Cities: de Tomar para o Mundo*, with J. Rosa, T. Domingos, G. Rodrigues, A. Araújo, P. Lemos, I. Costa, P. Luís (IBM), L. M. Oliveira and N. Madeira (IPT), Fórum Politécnico 5 - Tecnologias da Informação e Comunicação e Competências Digitais, Instituto Politécnico do Cávado e Ave, Barcelos, January 2017.
- *Smarter Fest: feeling the pulse of a Festival – Information, Security & Safety*, with H. Mourisca (IBM), and L. Oliveira and N. Madeira (IPT), Carnval Workshop, Instituto Politécnico de Tomar, November 2015.
- *A Matemática na Animação 3D*, with Miguel Abreu (SKETCHPIXEL), Escola Profissional de Vila Verde, January 2015.
- *(Alguma) Matemática na Animação Gráfica*, Semana Cultura da Escola Secundária de Santa Maria do Olival, April 2014.
- *Métodos Matemáticos em Animação*, with Miguel Abreu (SKETCHPIXEL), in “Seminário Animação + HTML5 + Android”, Instituto Politécnico de Tomar, May 2013.
- *A Matemática na Animação Gráfica*, com Miguel Abreu (SKETCHPIXEL), in “Tardes da Matemática”, organized by Sociedade Portuguesa de Matemática - Norte, Braga, Portugal, February 2013.
- *Interior-point algorithms for monotone complementarity problems and their applications*, in “20th Anniversary of Instituto de Telecomunicações”, Coimbra, Portugal, July 2012.
- *A Matemática na Animação Gráfica*, with Miguel Abreu (SKETCHPIXEL), in “A Matemática das Coisas”, organized by Sociedade Portuguesa de Matemática and Programa Ciência Viva, Lisboa, Portugal, May 2012.
- *Objectivos e realidades no ensino da Matemática a Cursos de Engenharia*, in “O Ensino da Engenharia para a Inovação e o Desenvolvimento”, IEEE Education Society - Portuguese Chapter, Tomar, Portugal, November 2008.

#### Other talks.....

- *SolarSystemGO - An Augmented Reality Based Game with Astronomical Concepts*, with M. C. Costa, J. A. Carrança and B. Farropo, CISTI 2018, Cáceres, Spain, June 2018.
- *Virtual and augmented reality with mobile platforms for learning astronomy in primary schools*, with M. C. Costa, World Conference on Learning, Teaching & Educational Leadership, Budapest, November 2016.
- *Framework for an intelligent operations center - architecture of decision support systems*, with J. Rosa, T. Domingos, G. Rodrigues, L. Oliveira and N. Madeira, CISTI 2016, Las Palmas de Gran Canaria, June 2016.
- *Emergency plans support systems — integration of safety and security operational procedures*, with A. Araújo, P. Lemos, I. Costa, L. Oliveira and N. Madeira, CISTI 2016, Las Palmas de Gran Canaria, June 2016.
- *Numerical computation and applications of nonnegative matrix factorizations*, with L. M. Fernandes, MatTriad 2011, Tomar, June 2011.
- *On the computation of a nonnegative matrix factorization and its application in telecommunications*, with L. M. Fernandes, J. Júdice e A. M. Almeida, Conftele2009, Santa Maria da Feira, May 2009.
- *Viagem Multimédia pelo Mundo dos Fractais*, with C. Andrade, Festa da Ciência Cultura e Tecnologia do Instituto Politécnico de Tomar, April 2008.
- *Números Complexos, Trigonometria e Aplicações*, Escola Secundária Marquesa de Alorna, Almeirim, May 2004.
- *An investigation of a nonlinear obstacle plate optimization problem*, with L. Fernandes, I. Figueiredo and J. Júdice, 18th International Symposium on Mathematical Programming, Copenhagen, August 2003.
- *Em torno da determinação das soluções de equações algébricas*, Instituto Politécnico de Tomar, March 2002.
- *A primal-dual interior point algorithm for the solution of an optimization thermal dispatch model*, with

- J. Júdice and M. C. Guedes, Optimization 2001, Aveiro, July 2001.
- *Fortran subroutines for computing a minimum cost flow using a truncated primal-infeasible dual-feasible network interior point method*, with J. Júdice, M. Resende and G. Veiga, 17th International Symposium on Mathematical Programming, Atlanta, August 2000.
  - *PDNET: Subrotinas FORTRAN para resolução de problemas de fluxos em redes utilizando um algoritmo de pontos interiores*, with J. Júdice, L. Portugal, M. Resende and G. Veiga, IO2000 – 9º Congresso da APDIO, Setúbal, April 2000.
  - *Interior Point algorithms for a General Linear Complementarity Problem*, with J. Júdice and L. M. Fernandes, EURO XVI, Brussels, July 1998.
  - *Solution of large-scale monotone linear complementarity problems*, with J. Júdice and L. M. Fernandes, SIAM Conference on Optimization, Chicago, July 1992.
  - *Solução de Problemas Lineares Complementares Estritamente Monótonos de Grandes Dimensões*, with J. J. Júdice and L. M. Fernandes, 5º Congresso da APDIO, Évora, April 1992.
  - *Solution of large-scale strictly convex linear complementarity problems with bounds*, with J. J. Júdice, F. M. Pires and L. M. Fernandes, 14th International Symposium on Mathematical Programming, Amsterdam, August 1991.
  - *Solution of large-scale strictly convex linear complementarity problems*, with J. J. Júdice, F. M. Pires and L. M. Fernandes, Workshop on Large-Scale Optimization, Coimbra, July 1991.
  - *A truncated envelope preconditioning technique*, with J. J. Júdice, IMACS International Symposium on Iterative Methods in Linear Algebra, Brussels, April 1991.
  - *Método de Newton Truncado para problemas de grandes dimensões de Optimização Não Linear sem restrições*, with J. J. Júdice, 1ª Conferência em Estatística e Optimização, Tróia, December 1990.
  - *Uso do Método do Invólucro como Precondicionamento para a resolução de sistemas de equações lineares de grandes dimensões*, with J. J. Júdice, XV Jornadas Luso- Espanholas de Matemática, Évora, September 1990.
  - *The Preconditioned Envelope Conjugate-Gradient Method*, with J. J. Júdice, Copper Mountain Conference on Iterative Methods, Copper Mountain, April 1990.
  - *Um estudo do método do invólucro para sistemas de equações lineares de grandes dimensões*, with J. J. Júdice, Conference on Linear Algebra and Applications, Valencia, October 1989.

## Poster Presentations.....

- *Traveling through the planetary systems with an augmented reality application*, with M. C. Costa, A. Manso and P. Santos, ICGI 2023, Tomar, November 2023.

## Publications.....

- Books:
  - *Sistemas de Equações Lineares*, with J. Júdice, Universidade de Coimbra, 1996.
- Theses:
  - *Algoritmos de Pontos Interiores para Problemas Complementares Monótonos e suas Aplicações*, PhD, Universidade de Coimbra, 2007.
  - *Algoritmos de Pontos-Interiores para Problemas de Optimização Linear e Quadrática*, Adjunct Professor Access, Instituto Politécnico de Tomar, 2001.
  - *Um Estudo do Método do Invólucro para Matrizes Esparsas Simétricas Positivas Definidas*, Pedagogical and Scientific Habilitation, Universidade de Coimbra, 1991.
- Invited papers in national journals:
  - *Matemática na Animação Gráfica*, Gazeta de Matemática 202(2024), pp. 37.  
<https://www.gazeta.spm.pt/fichagazeta?id=202>
- Papers in national journals with scientific refereeing:
  - *On the solution of a spatial equilibrium problem*, with J. Júdice, M. A. Coelho and L. Fernandes, Investigaçao Operacional 13(1993)119-134.

- Papers in international journals with scientific refereeing:
  - *An interactive information system that supports an augmented reality game in the context of game-based learning*, M. C. Costa, J. M. Patrício, P. Santos, A. Manso, *Multimodal Technologies and Interaction* 82(2021)5, 1 - 25. <https://www.mdpi.com/2414-4088/5/12/82>
  - *Design of a Mobile Augmented Reality Platform with Game-Based Learning Purposes*, M. C. Costa, A. Manso, J. M. Patrício, *Information* 11(2020)3, 127. <http://dx.doi.org/10.3390/info11030127>
  - *On the natural merit function for solving complementarity problems*, with R. Andreani, J. Júdice and M. Martinez, *Mathematical Programming* 130(2011) 211 - 223. DOI: 10.1007/s10107-009-0336-z
  - *A projected-gradient interior-point algorithm for complementarity problems*, with R. Andreani, J. Júdice and M. Martinez, *Numerical Algorithms* 57(2011) 457 - 485. DOI: 10.1007/s11075-010-9439-0
  - *FORTTRAN subroutines for network flow optimization using an interior point algorithm*, with J. Júdice, L. Portugal, M. Resende and G. Veiga, *Pesquisa Operacional* 28(2008) 241 - 259.
  - *A study of preconditioners for network interior point methods*, with J. Júdice, L. Portugal, M. Resende and G. Veiga, *Computational Optimization and Applications* 24(2003) 5 - 35.
- Papers in Conference Proceedings with scientific refereeing:
  - *An augmented reality platform targeted to promote learning about Planetary Systems*, with M. C. Costa, A. Manso, A. Carvalho, B. Alegria and V. Zinatulins, *Proceedings of SIIE2019*, December 2019
  - *Design of a mobile augmented reality game in the framework of problem based learning*, with M. C. Costa and A. Manso, *Proceedings of the 11th International Conference on Education and New Learning Technologies*, July 2019
  - *A gamified augmented reality system for the teaching of astronomical concepts*, with M. C. Costa and A. Manso, *Actas de la 14ª Conferência Ibérica de Sistemas y Tecnologías de la Información CISTI 2019*.
  - *Augmented reality technologies to promote STEM learning*, with M. C. Costa, J. A. Carrança and B. Farropo, *Actas de la 13ª Conferência Ibérica de Sistemas y Tecnologías de la Información CISTI 2018*.
  - *SolarSystemGO — An augmented reality based game with astronomical concepts*, with M. C. Costa, J. A. Carrança and B. Farropo, *Actas de la 13ª Conferência Ibérica de Sistemas y Tecnologías de la Información CISTI 2018*.
  - *Emergency plans support systems — integration of safety and security operational procedures*, with A. Araújo, P. Lemos, I. Costa, L. Oliveira and N. Madeira, *Sistemas y Tecnologías de la Información — Actas de la 11ª Conferência Ibérica de Sistemas y Tecnologías de la Información CISTI 2016*, vol. 1, pp. 579-585.
  - *Framework for an intelligent operations center - architecture of decision support systems*, with J. Rosa, T. Domingos, G. Rodrigues, L. Oliveira and N. Madeira, *Sistemas y Tecnologías de la Información — Actas de la 11ª Conferência Ibérica de Sistemas y Tecnologías de la Información CISTI 2016*, vol. 1, pp. 645-649.
  - *On the computation of a nonnegative matrix factorization and its application in telecommunications*, with L. Fernandes, J. Júdice e A. Almeida, *Proc Conf. on Telecommunications — ConfTele 2009*.

## Member of Scientific and Development Projects.....

- *Agendas/Alianças mobilizadoras para a reindustrialização | BLOCKCHAIN.PT – Agenda “Descentralizar Portugal com Blockchain”*, promoted by Void Software SA. January 2023 — 31 December 2025.
- *BREUCA — Development of a high-precision Virtual Reality simulator designed to be used in professional simulation and gaming environments associated with real events*, with Sketchpixel, Universidade do Minho and Bubblecode, Project POCI-01-0247-FEDER-048257, January 2021 — June 2023.
- *CRASH - Development of a high precision reconstruction system designed to be used in a professional simulation environment related with real crash events*, with Sketchpixel, Politécnico de Leiria and National Technical University of Ukraine “Igor Sikorsky Polytechnic Institute”, Project POCI-01-0247-

FEDER-070315, December 2020 — June 2023.

- *MAGnUS* — *Developing a Master's Program in Mobile Application and Web Design*, Project Erasmus+ 588342- EPP-1-2018-1-SE-EPPKA2-CBHE-JP, National Coordinator, April 2019 — January 2023.
- *ORAL* — *Optimal Resource ALlocation*, Project FCT, 2004 — 2008.
- *TRANSPARENTE- TRANSPorte, Acesso e Distribuição em REdes de ComuNicação óptica mulTIplEx-adas*, Project FCT, 2000 — 2002.
- *Modelos Variacionais e Optimização*, Project PRAXIS XXI, 1997 — 2000.
- *Solução de Problemas de Álgebra Linear Numérica e de Optimização e Aplicações em Engenharia Estrutural, Genética e de Finanças*, Project PRAXIS XXI, 1996 — 1999.
- *Resolução de Problemas de Optimização Não Linear de Grandes Dimensões e Aplicações a Problemas de Engenharia Química*, Project INIC, 1990 — 1991.

### **Member of Scientific Societies and Research Centres**.....

- Sociedade Portuguesa de Matemática (SPM).
- Associação Portuguesa de Investigação Operacional (APDIO).
- European Association for Computer Graphics (EuroGraphics).
- Integrated Member of the Smart Cities Research Centre of Instituto Politécnico de Tomar.
- External collaborator of Instituto de Telecomunicações.

### **Participation in the organization of conferences and other scientific events**.....

#### **International Conference on Graphics and Interaction (ICGI 2023)**

*Tomar, Chair of the Organizing Committee* *November 2023*

#### **MAGnUS Workshop on Entrepreneurship**

*Tomar, Chair* *November 2022*

#### **XX Congress of the Portuguese Operations Research Society**

*Tomar, Chair of the Organizing Committee* *July 2019*

#### **CityHack**

*Tomar* *May 2017*

#### **11th International Conference on Computational Management Science**

*Lisboa* *May 2014*

#### **5th International Conference on Risk Analysis**

*Tomar* *May and June 2013*

#### **7th Workshop on Statistics, Mathematics and Computation**

*Tomar* *May 2013*

#### **2nd Workshop on Bio-Optimization**

*Lisboa* *September 2012*

#### **Jornadas de Classificação e Análise de Dados — JOCLAD**

*Tomar* *March 2012*

#### **Workshop sobre o Ensino da Investigação Operacional**

*Coimbra* *February 2011*

#### **Workshop on High Performance Computing**

*Coimbra* *November 2010*

#### **Workshop em Otimização em Transportes**

*Coimbra* *November 2010*

#### **Workshop Investigação Operacional nas Empresas (IONE)**

*Coimbra* *October 2010*

**Workshop IO: que desafios para 2010–2020?***Coimbra**October 2010***EURO XXIV — European Conference on Operational Research***Lisboa**July 2010***Iberian Conference in Optimization***Coimbra**November 2006***3ª Conferência em Telecomunicações — CONFTELE 2001***Figueira da Foz**April 2001***Matemática Aplicada às Telecomunicações — Que Problemas?***Coimbra**September 1998***Optimization 98***Coimbra**July 1998***XVI Olimpíadas Nacionais de Matemática***Sociedade Portuguesa de Matemática**From 1997 to 1998***Workshop on Large-Scale Optimization***Coimbra**July 1991***Referee of scientific papers**.....

- MDPI Mathematics
- MDPI Applied Sciences
- MDPI Multimodal Technologies and Interaction
- MDPI Electronics
- Actas da 14ª Conferência Ibérica de Sistemas e Tecnologias da Informação CISTI 2019
- Actas da 13ª Conferência Ibérica de Sistemas e Tecnologias da Informação CISTI 2018
- Actas da 12ª Conferência Ibérica de Sistemas e Tecnologias da Informação CISTI 2017
- Actas da 11ª Conferência Ibérica de Sistemas e Tecnologias da Informação CISTI 2016
- Boletim da Sociedade Portuguesa de Matemática
- International Journal of Computer Mathematics
- Numerical Algorithms

**Supervision of BSc and MSc projects and internships**.....

- *SolarSystemGO*, Miguel Silva, Rafael Lopes, Telmo Faria, BSc in Computer Engineering, Instituto Politécnico de Tomar, December 2018 (co-supervision with M. C. Costa and A. Manso, IP Tomar).
- *SolarSystemGO*, Bruno Farropo, BSc in Computer Engineering, Instituto Politécnico de Tomar, December 2017 (co-supervision with M. C. Costa, IP Tomar and P. Chorinca, Sketchpixel).
- *Realidade Aumentada — Conceitos e Aplicações à Astronomia e à Paleontologia*, Alexandre Carrançã, MSc in Digital Content Production, Instituto Politécnico de Tomar, December 2017 (co-supervision with S. Figueiredo, IPT and M. C. Costa, IPT).
- *Internship at Sketchpixel*, Paulo Chorinca, MSc in Digital Content Production, Instituto Politécnico de Tomar, December 2015.
- *Internship at Sketchpixel*, Pedro Isidoro, MSc in Digital Content Production, Instituto Politécnico de Tomar, December 2015.
- *Por um pixel*, Patrícia Lopes, MSc in Digital Content Production, Instituto Politécnico de Tomar, December 2015.
- *Criação de plataformas digitais para a divulgação da atividade do conservador-restaurador*, Diana Moreira, MSc in Digital Content Production, Instituto Politécnico de Tomar, December 2014 (co-supervision with C. Falcão, IP Tomar).
- *Estudo de um processo de reciclagem de óleos lubrificantes usados*, Joana Gonçalves, MSc in Chemical

Technology, Instituto Politécnico de Tomar, November 2011.

## Management Activities

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### Activities at Instituto Politécnico de Tomar

**Data Protection Officer of Instituto Politécnico de Tomar**

*Since December 2022*

**Pro-President of Instituto Politécnico de Tomar**

*Since July 2022*

**Director of Escola Superior de Tecnologia de Tomar of IP Tomar**

*From January 2015 to June 2022*

**Coordinator of the Smart Cities Research Center of IP Tomar**

*From February to December 2018*

**Coordinator of the Research and Development Observatory of IP Tomar**

*Since December 2012*

**Coordinator of the Scientific Computing Center of IP Tomar**

*Since September 2007*

**Member of the General Board of Instituto Politécnico de Tomar**

*From November 2013 to December 2017*

**Director of the Mathematics and Physics Department of IP Tomar**

*From October 2011 to January 2015*

**Director of the MSc Program in Digital Content Production**

*From October 2011 to January 2015*

**Coordinator of the Technical Course in ICT**

*From September 2007 to September 2011*

**Director of the Mathematics Area of ESTT of IP Tomar**

*From September 2010 to September 2011*

### Other activities

**Associação Portuguesa de Investigação Operacional**

*Member of the Board*

*From January 2010 to February 2012*

**Centro Internacional de Matemática**

*Executive Secretary*

*From May 2006 to April 2008*

**Polo de Coimbra do Instituto de Telecomunicações**

*Manager of the ICT infrastructure*

*From March 1997 to July 2000*