

Curriculum vitae of Roberto Giambò

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1 Personal details

Born: March 11, 1972

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2 Present position

Associate Professor in Mathematical Analysis at Camerino University, School of Science and Technology, Section of Mathematics, since November 2006.

Holding the italian national scientific qualification as Full Professor pursuant to article 16 of Law 240/2010 for the following Competition Sectors:

- 01/A3 - Mathematical Analysis, Probability and Mathematical Statistics
- 01/A4 - Mathematical Physics

3 Study and past positions

1. **Assistant Researcher** in Mathematical Analysis at Camerino University, Department of Mathematics and Computer Science, from September 2002 to October 2006.
2. **Postdoctoral position** at Department of Mathematics and Computer Science of Camerino University, Research project title: *Calculus of variation and nonholonomics constraints with applications to control theory and general relativity*, from December 2000 to September 2002;
3. **Ph.D in Mathematics** at Florence University, from 1995 to 2000. Final dissertation on April 23, 2001. Thesis title: *"Global variational methods on nonholonomic constraints"*. Research supervisor: Prof. Fabio Giannoni;
4. **Graduate study position** of the CNR, Italian National Research Council, from July to November 1995;
5. **M.Sc. in Mathematics** at Camerino University on June 15, 1995, *cum laude*. Thesis title: *"Connessioni dinamiche"*. Thesis supervisor: Prof. Luigi Mangiarotti;

4 Research activity

4.1 Scientific publications

1. R Giambò, J Miritzis, K Tzanni, *Negative potentials and collapsing universes*, to appear on **Classical and Quantum Gravity**
2. M L Corradini, R. Giambò, S Pettinari, *On the adoption of a fractional-order sliding surface for the robust control of integer-order LTI plants*, to appear on **Automatica**
3. R Giambò, F. Giannoni, P. Piccione, *Morse Theory for geodesics in singular conformal metrics*, **Communications in Analysis and Geometry**, **22(5)** (2014) 779–809

4. R. Giambò, F. Giannoni, P. Piccione, *Multiplicity results for orthogonal geodesic chords and applications*, to appear on **Journal of Fixed Point Theory and Applications**
5. R. Giambò, F. Giannoni, P. Piccione, *Examples with minimal number of brake orbits and homoclinics in annular potential regions*, **Journal of Differential Equations** **256** (2014) 2677–2690
6. R. Giambò, G. Magli, *Qualitative analysis of collapsing isotropic fluid spacetimes*, **Classical and Quantum Gravity**, **31** (2014) 035016
7. F. Ciolletta, R. Giambò, *Collapse of spherical charged anisotropic fluid spacetimes*, **Classical and Quantum Gravity**, **29** (2012) 245008
8. M. L. Corradini, A. Cristofaro, R. Giambò and S. Pettinari, *Design of robust fault detection filters for MIMO uncertain plants with quantised information*, **International Journal of Control**, **85** (2012) 239
9. R. Giambò, F. Giannoni and P. Piccione, *Multiple Brake Orbits and Homoclinics in Riemannian Manifolds*, **Archive for Rational Mechanics and Analysis**, **200** (2011) 691
10. R. Giambò, J. Miritzis, *Energy exchange for homogeneous and isotropic universes with a scalar field coupled to matter*, **Classical and Quantum Gravity**, **27** (2010) 095003
11. R. Giambò, F. Giannoni, P. Piccione, *Existence of orthogonal geodesic chords on Riemannian manifolds with concave boundary and homeomorphic to the N -dimensional disk*, **Nonlinear Analysis Series A: Theory, Methods and Applications**, **73(2)** 290-337 (2010)
12. R. Bettiol and R. Giambò, *Genericity of nondegenerate geodesics with general boundary conditions*, **Topological Methods in Nonlinear Analysis**, **35(2)** 339-365 (2010)
13. R. Giambò and M. A. Javaloyes, *Addendum to “Genericity of nondegeneracy for light rays in stationary spacetimes”*, **Communications in Mathematical Physics**, **295** 289 (2010)
14. R. Giambò, F. Giannoni, P. Piccione, *On the multiplicity of orthogonal geodesics in Riemannian manifold with concave boundary. Applications to brake orbits and homoclinics*, **Advanced Nonlinear Studies** **9(4)** 763 (2009)
15. R. Giambò, F. Giannoni, A. Masiello, *Functional regularity properties for light rays in General Relativity*, **Journal of Mathematical Physics**, **50** 072501 (2009)

16. R. Giambò, F. Giannoni, P. Piccione, *Genericity of nondegeneracy for light rays in stationary spacetimes*, **Communications in Mathematical Physics**, **287** 903 (2009)
17. R. Giambò, *Gravitational Collapse of Homogeneous Perfect Fluids in Higher-order Gravity Theories*, **Journal of Mathematical Physics**, **50** 012501 (2009)
18. R. Giambò, A. Stimilli, *Singularity formation in General Relativistic Dynamics of homogeneous scalar fields*, **Journal of Geometry and Physics**, **59** 400–408 (2009)
19. R. Giambò, F. Giannoni, G. Magli, *The dynamical behavior of homogeneous scalar-field spacetimes with general self-interaction potentials*, **General Relativity and Gravitation**, **41** 2130 (2009)
20. R. Giambò, S. Quintavalle, *The dimensional dependence of naked singularity formation in spherical gravitational collapse*, **Classical and Quantum Gravity**, **25** 145003 (2008)
21. R. Giambò, F. Giannoni, G. Magli, *Genericity of blackhole formation in the gravitational collapse of homogeneous self-interacting scalar fields*, **Journal of Mathematical Physics**, **49** 042504 (2008)
22. R. Giambò, V. Girolimetti, *Generalized symplectic Cayley transforms and a higher order formula for the Conley–Zehnder index of symplectic paths*, **Nonlinear Analysis Series A: Theory, Methods and Applications**, **68(12)** 3601–3608 (2008)
23. R. Giambò, M. A. Javaloyes, *A second order variational principle for the Lorentz force equation: conjugacy and bifurcation*, **Proceedings of the Royal Society of Edinburgh. Section A. Mathematics**, **137** 923–936 (2007)
24. R. Giambò, F. Giannoni, P. Piccione, *On the Least Action Principle – Hamiltonian Dynamics on fixed energy levels in the non-convex case*, **Advanced Nonlinear Studies**, **6(2)** 255–268, (2006)
25. R. Giambò, F. Giannoni, G. Magli, *A variational approach to Robertson–Walker spacetimes with homogeneous scalar fields*, **Journal of Mathematical Physics**, **47** 112505 (2006)
26. R. Giambò, *Global visibility of naked singularities*, **Journal of Mathematical Physics** (2006) **47** 022501

27. R. Giambò, F. Giannoni, P. Piccione, *On the multiplicity of brake orbits and homoclinics in Riemannian manifolds*, **Rendiconti Lincei: Matematica e Applicazioni**, **9(16)** (2005) 2, 73–85
28. R. Giambò, *Gravitational collapse of homogeneous scalar fields*, **Classical and Quantum Gravity**, **22** (2005) 2295–2305
29. R. Giambò, F. Giannoni, P. Piccione, *Orthogonal Geodesic Chords, Brake Orbits and Homoclinic Orbits in Riemannian Manifolds*, **Advances in Differential Equations**, **10** (2005) 931–960
30. R. Giambò, *The geometry of gravitational collapse*, **Matematica Contemporanea**, **28** 151–162, 2005
31. R. Giambò, G. Magli, *Buchi neri e singolarità nude*, **Bollettino UMI**, **VIII-A** (Apr. 2005), 37-50
32. R. Giambò, F. Giannoni, G. Magli, P. Piccione, *Naked singularity formation in gravitational collapse of barotropic spherical fluids*, **General Relativity and Gravitation**, **36(6)** (2004) 1279–1298;
33. R. Giambò, F. Giannoni, P. Piccione, *Optimal control on Riemannian manifolds by interpolation*, **Mathematics of Control, Signals, and Systems**, **16(4)** (2004) 278-296
34. R. Giambò, P. Piccione, A. Portaluri, *Computation of the Maslov index and the spectral flow via partial signatures*, **Comptes Rendus Mathématique. Académie des Sciences. Paris**, **338(5)** (2004) 397–402;
35. R. Giambò, F. Giannoni, P. Piccione, *Gravitational Lensing in General Relativity via Bifurcation Theory*, **Nonlinearity** (2004) **17** 117-132;
36. R. Giambò, F. Giannoni, G. Magli, P. Piccione, *Naked singularities formation in perfect fluids collapse*, **Classical and Quantum Gravity**, **20** (2003) 4943-4948;
37. R. Giambò, F. Giannoni, G. Magli, P. Piccione, *New solutions of Einstein equations in spherical symmetry: the Cosmic Censor to the court*, **Communications in Mathematical Physics**, **235(3)** (2003) 545-563;
38. R. Giambò, F. Giannoni, P. Piccione, D. Tausk, *Morse Theory for Normal Geodesics in sub-Riemannian Manifolds with Codimension One Distributions*, **Topological Methods in Nonlinear Analysis**, **21(2)** (2003) 273–291;

39. R. Giambò, F. Giannoni, *Minimal geodesics on manifolds with discontinuous metrics*, **Journal of the London Mathematical Society**, **67** (2003) 527–544;
40. R. Giambò, G. Magli, *Naked singularities in dust collapse as an existence problem for O.D.E. at a singular point*, **Differential Geometry and its Applications**, **18(3)** (2003) 285–293;
41. R. Giambò, F. Giannoni, G. Magli, P. Piccione, *New mathematical framework for spherical gravitational collapse*, **Classical and Quantum Gravity**, **20** (2003) L75-L82;
42. R. Giambò, F. Giannoni, P. Piccione, *An Analytical Theory for Riemannian Cubic Polynomials*, **IMA Journal of Mathematical Control and Information**, **19** (2002) 445–460;
43. R. Giambò, *Anisotropic generalizations of de Sitter spacetime*, **Classical and Quantum Gravity**, **19** (2002) 4399–4404;
44. R. Giambò, F. Giannoni, *Global variational methods on smooth nonholonomic constraints*, **Journal des Mathématiques Pures et Appliquées**, **81** (2002) 1011–1052;
45. R. Giambò, *Global variational methods on a class of non-smooth nonholonomic systems*, **Nonlinear Analysis – Real World Application**, **3** (2002) 431–452;
46. R. Giambò, F. Giannoni, P. Piccione, *Existence, multiplicity and regularity for sub-Riemannian geodesics by variational methods*, **SIAM Journal on Control and Optimization**, **40** (2002) 1840–1857;
47. R. Giambò, F. Giannoni, G. Magli, *Sufficient condition for Blackhole formation in spherical gravitational collapse*, **Classical and Quantum Gravity**, **19** (2002) L1–L5;
48. R. Giambò, *Metodi variazionali globali su vincoli non olonomi*, **Bollettino U.M.I 'La Matematica nella Società e nella Cultura'**, VIII (Vol. IV-A) (2001) 455-458
49. R. Giambò, F. Giannoni, *The brachistochrone problem with frictional forces*, **ESAIM – Control, Optimisation and Calculus of Variations**, **5** (2000) 187–206;
50. R. Giambò, L. Mangiarotti and G. Sardanashvily, *Relativistic and non-relativistic geodesic equations*, **Il Nuovo Cimento**, **114B** (1999) 749–766;
51. G. Giachetta, R. Giambò and L. Mangiarotti, *Conservation laws in metric-affine gravitation theories: superpotentials*, **Il Nuovo Cimento**, **112B** (1997) 1163–1174.

• Preprints

52. R Giambò, F Giannoni and P Piccione, *Multiple brake-orbits in m -dimensional disks*
53. R Giambò, F Giannoni and P Piccione, *On the normal exponential map in singular conformal metrics*

• Educational publications

54. R. Giambò, A. Serafini, *Ripensare la trigonometria con gli integrali*, **Archimede**, **3** (2012) 115
55. A. Giambò, R. Giambò, *Matematica pre-universitaria: storia e didattica* (monograph), Pitagora Editrice, Bologna, 2005;
56. A. Giambò, R. Giambò, *Matematica per le scuole superiori* (monographs), Armando Editore, Roma, (vol. 1–2: 2009, vol. 3–5 to appear)

• Conference papers

1. M.L. Corradini, R. Giambò, S. Pettinari, *FO sliding surface for the robust control of integer-order LTI plants*, accepted by the **19th IFAC World Congress**, Cape Town, South Africa, 24-29 August 2014.
2. R. Giambò, G. Magli, *The Geometry of Collapsing Isotropic Fluids*, in **Recent Trends in Lorentzian Geometry**, Springer Proceedings in Mathematics & Statistics (2013), 195
3. M. L. Corradini, A. Cristofaro, R. Giambò and S. Pettinari, *A Lyapunov-based diagnosis signal for fault detection robust tracking problem of a class of sampled-data systems*, **Proceedings of the IEEE Conference on Decision and Control** (2011) 6161285
4. M. L. Corradini, A. Cristofaro, R. Giambò and S. Pettinari, *Robust fault detection filters for a class of MIMO uncertain sampled-data systems*, **Proceedings of SysTol – Conference on Control and Fault-Tolerant Systems** (2010) 5676010
5. M. L. Corradini, A. Cristofaro, R. Giambò, S. Pettinari, *Design of robust fault detection filters for plants with quantized information*, **Proc. Advanced Control and Diagnosis** (2010) 40-45
6. J. Miritzis and R. Giambò, *Expanding universes in the conformal frame of $f(R)$ gravity*, **AIP Conference Proceedings** 1241 (2010) 1061

7. R. Giambò, F. Giannoni and G. Magli, *Scalar-field cosmological and collapse models with general self-interaction potentials*, Recent Developments in Gravity (NEB XIII), **Journal of Physics: Conference Series 189** (2009) 012017
8. R. Giambò, *Naked singularity existence for an acceleration free solution of Einstein's equations*, **Recent Developments in Gravitational Physics: Proceedings of the 15th SIGRAV Conference on General Relativity and Gravitational Physics**, 2006;
9. R. Giambò, *An analytical theory for optimal controls on Riemannian manifolds*, **Proceedings of the 2nd Junior Meeting on Control Theory and Stabilization**, Rendiconti del Seminario Matematico dell'Università e del Politecnico di Torino, **63** 4, 2005
10. R. Giambò, *Metodi non lineari per lo studio del collasso gravitazionale*, **XVII Congresso UMI – Conferenze e comunicazioni**, (2003) (solo abstract);
11. R. Giambò, *Existence, multiplicity and regularity for sub-Riemannian geodesics by variational methods*, **Proceedings of the 41st IEEE Conference on Decision and Control** (2002), 1926–1931.

4.2 Talks and Lectures

1. **Napoli**, XX Sigrav Conference, 26/10/2012, *Scalar field gravitational collapse: the long story of a controversial issue in cosmic censorship* (invited lecture);
2. **Granada (Spain)**, VI International Meeting on Lorentzian Geometry, 06/09/2011, *The geometry of collapsing isotropic fluids*;
3. **Martina Franca (TA)**, V International Meeting on Lorentzian Geometry, 09/07/2009, *A Genericity problem in Lorentzian Geometry*;
4. **Rende (CZ)**, 18th SIGRAV Conference on General Relativity and Gravitational Physics, 25/09/2008, *Cosmic Censorship Conjecture: still puzzling after 40 years* (invited lecture);
5. **Thessaloniki (Greece)**, XIII Conference on Recent Developments in Gravity, 5/6/2008, *Black hole formation in scalar field collapse*;
6. **Milano**, II Workshop on Dynamics and Thermodynamics of Black Holes and Naked Singularities, 12/5/2007, *Cosmological and gravitational collapse models with scalar field sources* (invited lecture);

7. **Santiago** (España), IV International Meeting on Lorentzian Geometry, 6/2/2007, *A Variational Approach to Robertson-Walker Spacetimes with Homogeneous Scalar Fields*;
8. **Torino**, 17th SIGRAV Conference on General Relativity and Gravitational Physics, 6/9/2006, *Existence of solutions for homogeneous scalar fields in GR: a calculus of variations approach*;
9. **Sao Paulo (Brazil)**, XIII Escola de Geometria Diferencial, 27/7/2004, *The geometry of gravitational collapse*;
10. **Torino**, 2nd Junior Meeting on Control Theory and Stabilization, 3/12/2003, *An analytical theory for interpolation in Riemannian manifolds*;
11. **Brescia**, Workshop "Topological Methods in the Calculus of Variations and Dynamical Systems", 19/9/2003, *Perfect fluid models for spherical gravitational collapse* (invited lecture);
12. **Milano**, XVII Convegno UMI, 8/9/2003, *Metodi nonlineari per lo studio del collasso gravitazionale*;
13. **Las Vegas (Nevada, USA)**, 41st IEEE Conference on Decision and Control, 11/12/2002, *Existence, Multiplicity and Regularity for sub-Riemannian Geodesics by Variational Methods* (invited lecture);
14. **Martina Franca (TA)**, International workshop "Calculus of Variations in Nonlinear Phenomena", 26/9/2002, *New solutions of Einstein field equations: the Cosmic Censor to the court*;
15. **Monte Porzio Catone (Roma)**, 15th SIGRAV Conference on General Relativity and Gravitational Physics, 10/9/2002, *Naked singularity for an acceleration free solution of Einstein equation e Anisotropic generalizations of de Sitter spacetime*;
16. **Sammommè (PT)**, Convegno nazionale del gruppo "Metodi variazionali ed equazioni differenziali", 10/4/2001, *Metodi variazionali globali su vincoli non olonomi* (invited lecture);
17. **Milano**, Politecnico, 15/3/2001, *Metodi variazionali globali su vincoli non olonomi* (invited lecture).

4.3 Conference and editorial activities, memberships, and other scientific activities

1. **Member of the Unione Matematica Italiana**, from 2001
2. **Member of the SIGRAV** (Società italiana di Relatività Generale e Fisica della Gravitazione), lifetime
3. **Member of the Scientific Committee**, VII International Meeting on Lorentzian Geometry (Sao Paulo, Brazil, July 22–26 2013)
4. **Scientific coordinator**, project concerning the production of a groundbreaking electric car, in collaboration with Univeristy of Bologna, Belumbury spa and Picchio spa (from December 2011 to December 2012);
5. **Session organizer**, *Dynamics and Thermodynamics of Blackholes and Naked Singularities* workshop (Milan, May 12–15, 2004);
6. **Reviewer** for *AMS Mathematical Reviews*, since 2002;
7. **Referee** for many international scientific journals in the fields of Mathematical Analysis and General Relativity.

4.4 Students supervisorship

- **PhD students**

- Sara Quintavalle, *Critical phenomena in spherical gravitational collapse*, co-supervisorship with F. Giannoni (2011)
- Silvia Pettinari, *Fault Diagnosis Techniques for Linear Sampled Data Systems and a Class of Nonlinear Systems*, co-supervisorship with M. L. Corradini (2012)

- **Graduate students**

I have been supervisor for more than 20 Master's degree and Bachelor's degree thesis, in the fields of general relativity, dynamical systems, mathematical analysis, crashworthiness.

5 Teaching activity

Taught courses at Camerino University for Mathematics and Physics students:

1. **from Academic year 2011–2012 to date**

Analisi Matematica 2 (93 hours of classes)

Relatività Generale (42 hs)

2. **Academic years 2008–2009, 2009-2010 and 2010–2011**

Mathematics basics short course for Mathematics and Physics freshmen (15 hs)

Analisi Matematica 1 (63 hs)

Analisi Superiore (42 hs)

3. **Academic year 2007–2008**

Analisi Matematica 1 (96 hs)

Analisi Superiore (40 hs)

4. **Academic year 2006–2007**

Calcolo in più variabili (40 hs)

Equazioni Differenziali Ordinarie (40 hs)

Analisi Superiore (40 hs)

5. **Academic year 2005–2006**

Calcolo in più variabili (40 hs)

Equazioni Differenziali Ordinarie (40 hs)

Analisi Superiore (40 hs)

6. **Academic year 2004–2005**

Elementi di Analisi (50 hs)

Calcolo Differenziale e Integrale (40 hs)

Analisi Superiore (40 hs)

7. **Academic year 2003–2004**

Elementi di Analisi (50 hs)

Calcolo Differenziale e Integrale (40 hs)

Equazioni Differenziali alle Derivate Parziali (40 hs)

8. **Academic year 2002–2003**

Calcolo Differenziale e Integrale (40 hs)

Equazioni Differenziali alle Derivate Parziali (40 hs)

Biomatematica (20 hs)

9. **Academic year 2001–2002**

Lectures in **Calcolo in più variabili** and **Equazioni Differenziali Ordinarie** courses

10. **Academic year 2000–2001**

Teoria delle Funzioni (36 hs)

Lectures in **Elementi di Analisi** and **Calcolo Differenziale Integrale** courses

11. **Academic year 1999–2000**

Mathematics basics course (30 hs) for freshmen of Science faculty

Lectures in **Geometria II** (36 hs)

12. **Academic year 1998–1999**

Lectures in **Istituzioni di Fisica Matematica** course

6 Other teaching and organizing activities

1. **Teaching Mathematical Analysis**, educational course for secondary school teachers, Camerino University, 2013
2. **Teaching Mathematics** and **Basics of Mathematics**, courses to the Teacher Education Degree program at the Macerata University, from a.y 2010–2011
3. **Camerino University responsible for web content management and communication**, 2004–2011
4. **Co-Organizing** Camerino University Science Faculty lectures *Immagini della Scienza e della Tecnologia*, 2002–2004
5. **Content management** of Camerino University Science Faculty website, 2003–2004

6. **Co-Organizing** *Stages in UNICAM* for high-school students, 2002–2004
7. **Expository talks** *Come muore una stella*, for high-school students at Liceo Scientifico di Camerino, and Liceo Scientifico di Macerata, 2003–2005
8. **Co-Organizing** Stages for students participating at Mathematics Olympiads, 2000–2004

Macerata, November 15, 2014

Roberto Giambò
