

# Curriculum vitae of Roberto Giambò

## • Personal details

**Born:** March 11, 1972

**Internet:** <http://www.cs.unicam.it/giambo>

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## • Present position

**Associate Professor** in Mathematical Analysis at Camerino University, Department of Mathematics and Computer Science, since November 2006

## • 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 nonholonomic 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;

## • Conference organization

1. **Session organizer**, *Dynamics and Thermodynamics of Blackholes and Naked Singularities* workshop (Milan, May 12–15, 2004);

**• Editorial activity**

1. **Reviewer** for *AMS Mathematical Reviews*, since 2002;
2. **Referee** for many international scientific journals in the fields of Mathematical Analysis and General Relativity.

**• Scientific publications**

1. R. Giambò, *Gravitational Collapse of Homogeneous Perfect Fluids in Higher-order Gravity Theories*, **Journal of Mathematical Physics**, to appear
2. R. Giambò, F. Giannoni, G. Magli, *The dynamical behaviour of homogeneous scalar-field spacetimes with general self-interaction potentials*, **General Relativity and Gravitation**, to appear
3. R. Giambò, S. Quintavalle, *The dimensional dependence of naked singularity formation in spherical gravitational collapse*, **Classical and Quantum Gravity**, **25** 145003 (2008)
4. 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)
5. 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)
6. 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)
7. R. Giambò, F. Giannoni, G. Magli, *A variational approach to Robertson–Walker spacetimes with homogeneous scalar fields*, **Journal of Mathematical Physics**, **47** 112505 (2006)
8. R. Giambò, *Global visibility of naked singularities*, **Journal of Mathematical Physics** (2006) **47** 022501
9. 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

10. R. Giambò, *Gravitational collapse of homogeneous scalar fields*, **Classical and Quantum Gravity**, **22** (2005) 2295–2305
11. 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
12. R. Giambò, G. Magli, *Buchi neri e singolarità nude*, **Bollettino UMI**, **VIII-A** (Apr. 2005), 37-50
13. 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;
14. R. Giambò, F. Giannoni, P. Piccione, *Optimal control on Riemannian manifolds by interpolation*, **Mathematics of Control, Signals, and Systems**, **16(4)** (2004) 278-296
15. 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;
16. R. Giambò, F. Giannoni, P. Piccione, *Gravitational Lensing in General Relativity via Bifurcation Theory*, **Nonlinearity** (2004) **17** 117-132;
17. R. Giambò, F. Giannoni, G. Magli, P. Piccione, *Naked singularities formation in perfect fluids collapse*, **Classical and Quantum Gravity**, **20** (2003) 4943-4948;
18. 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;
19. 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;
20. R. Giambò, F. Giannoni, *Minimal geodesics on manifolds with discontinuous metrics*, **Journal of the London Mathematical Society**, **67** (2003) 527–544;
21. 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;

22. R. Giambò, F. Giannoni, G. Magli, P. Piccione, *New mathematical framework for spherical gravitational collapse*, **Classical and Quantum Gravity**, **20** (2003) L75-L82;
23. R. Giambò, F. Giannoni, P. Piccione, *An Analytical Theory for Riemannian Cubic Polynomials*, **IMA Journal of Mathematical Control and Information**, **19** (2002) 445–460;
24. R. Giambò, *Anisotropic generalizations of de Sitter spacetime*, **Classical and Quantum Gravity**, **19** (2002) 4399–4404;
25. R. Giambò, F. Giannoni, *Global variational methods on smooth nonholonomic constraints*, **Journal des Mathématiques Pures et Appliquées**, **81** (2002) 1011–1052;
26. R. Giambò, *Global variational methods on a class of non-smooth nonholonomic systems*, **Nonlinear Analysis – Real World Application**, **3** (2002) 431–452;
27. 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;
28. R. Giambò, F. Giannoni, G. Magli, *Sufficient condition for Blackhole formation in spherical gravitational collapse*, **Classical and Quantum Gravity**, **19** (2002) L1–L5;
29. 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
30. A. Giambò, R. Giambò, *Su alcune proprietà dei poligoni regolari*, **Periodico di matematiche**, **1** (2001) 5–12;
31. R. Giambò, F. Giannoni, *The brachistochrone problem with frictional forces*, **ESAIM – Control, Optimisation and Calculus of Variations**, **5** (2000) 187–206;
32. R. Giambò, L. Mangiarotti and G. Sardanashvily, *Relativistic and non-relativistic geodesic equations*, **Il Nuovo Cimento**, **114B** (1999) 749–766;
33. G. Giachetta, R. Giambò and L. Mangiarotti, *Conservation laws in metric-affine gravitation theories: superpotentials*, **Il Nuovo Cimento**, **112B** (1997) 1163–1174.

#### • Preprints and work in progress

34. R. Giambò, A. Stimilli, *Singularity formation in General Relativistic Dynamics of homogeneous scalar fields*, 2008

35. R. Giambò, F. Giannoni, P. Piccione, *Multiple brake orbits and homoclinics in Riemannian manifolds*, 2007

• **Monography**

36. A. Giambò, R. Giambò, *Matematica pre-universitaria: storia e didattica*, Pitagora Editrice, Bologna, 2005;

• **Proceedings acts**

1. R. Giambò, *Naked singularity existence for an acceleration free solution of Einstein's equations*, **Recent Developments in Gravitational Physics: Proceedings of the 15<sup>th</sup> SIGRAV Conference on General Relativity and Gravitational Physics**, 2006;
2. R. Giambò, F. Giannoni, G. Magli, P. Piccione, *Non-linear o.d.e. techniques in Gravitational Collapse*, **Recent Developments in Gravitational Physics: Proceedings of the 15<sup>th</sup> SIGRAV Conference on General Relativity and Gravitational Physics**, 2006;
3. R. Giambò, F. Giannoni, P. Piccione, *On the Least Action Principle – Hamiltonian Dynamics on fixed energy levels in the non-convex case*, **Proceedings of the International Workshop on Current trends in Nonlinear Analysis**, *Advanced Nonlinear Studies* **6(2)**, 255–268, (2006)
4. R. Giambò, *The geometry of gravitational collapse*, **Proceedings of the XIII Escola de Geometria Diferencial**, *Matematica Contemporanea* **28** 151–162, 2005
5. R. Giambò, *An analytical theory for optimal controls on Riemannian manifolds*, **Proceedings of the 2<sup>nd</sup> Junior Meeting on Control Theory and Stabilization**, *Rendiconti del Seminario Matematico dell'Università e del Politecnico di Torino*, **63** 4, 2005
6. R. Giambò, *Metodi non lineari per lo studio del collasso gravitazionale*, **XVII Congresso UMI – Conferenze e comunicazioni**, (2003) (solo abstract);
7. R. Giambò, *Existence, multiplicity and regularity for sub-Riemannian geodesics by variational methods*, **Proceedings of the 41<sup>st</sup> IEEE Conference on Decision and Control** (2002), 1926–1931.

**• Talks and Lectures**

1. **Rende (CZ)**, 18th SIGRAV Conference on General Relativity and Gravitational Physics, 25/09/2008, *Cosmic Censorship Conjecture: still puzzling after 40 years* (invited lecture);
2. **Thessaloniki (Greece)**, XIII Conference on Recent Developments in Gravity, 5/6/2008, *Black hole formation in scalar field collapse*;
3. **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);
4. **Santiago (España)**, IV International Meeting on Lorentzian Geometry, 6/2/2007, *A Variational Approach to Robertson-Walker Spacetimes with Homogeneous Scalar Fields*;
5. **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*;
6. **Sao Paulo (Brazil)**, XIII Escola de Geometria Diferencial, 27/7/2004, *The geometry of gravitational collapse*;
7. **Torino**, 2<sup>nd</sup> Junior Meeting on Control Theory and Stabilization, 3/12/2003, *An analytical theory for interpolation in Riemannian manifolds*;
8. **Brescia**, Workshop "Topological Methods in the Calculus of Variations and Dynamical Systems", 19/9/2003, *Perfect fluid models for spherical gravitational collapse* (invited lecture);
9. **Milano**, XVII Convegno UMI, 8/9/2003, *Metodi nonlineari per lo studio del collasso gravitazionale*;
10. **Las Vegas (Nevada, USA)**, 41<sup>st</sup> IEEE Conference on Decision and Control, 11/12/2002, *Existence, Multiplicity and Regularity for sub-Riemannian Geodesics by Variational Methods* (invited lecture);
11. **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*;

12. **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*;
13. **Sammommè (PT)**, Convegno nazionale del gruppo "Metodi variazionali ed equazioni differenziali", 10/4/2001, *Metodi variazionali globali su vincoli non olonomi* (invited lecture);
14. **Milano**, Politecnico, 15/3/2001, *Metodi variazionali globali su vincoli non olonomi* (invited lecture).

### • Teaching activity

Taught courses at Department of Mathematics and Computer Science, Camerino University:

#### 1. Academic year 2008–2009

**Analisi Matematica 1** (93 hours of classes)

**Analisi Superiore** (38 hs)

#### 2. Academic year 2007–2008

**Analisi Matematica 1** (96 hs)

**Analisi Superiore** (40 hs)

#### 3. Academic year 2006–2007

**Calcolo in più variabili** (40 hs)

**Equazioni Differenziali Ordinarie** (40 hs)

**Analisi Superiore** (40 hs)

#### 4. Academic year 2005–2006

**Calcolo in più variabili** (40 hs)

**Equazioni Differenziali Ordinarie** (40 hs)

**Analisi Superiore** (40 hs)

#### 5. Academic year 2004–2005

**Elementi di Analisi** (50 hs)

**Calcolo Differenziale e Integrale** (40 hs)

**Analisi Superiore** (40 hs)

**6. Academic year 2003–2004**

**Elementi di Analisi** (50 hs)

**Calcolo Differenziale e Integrale** (40 hs)

**Equazioni Differenziali alle Derivate Parziali** (40 hs)

**7. Academic year 2002–2003**

**Calcolo Differenziale e Integrale** (40 hs)

**Equazioni Differenziali alle Derivate Parziali** (40 hs)

**Biomatematica** (20 hs)

**8. Academic year 2001–2002**

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

**9. Academic year 2000–2001**

**Teoria delle Funzioni** (36 hs)

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

**10. Academic year 1999–2000**

**Mathematics basic course** (30 hs) for freshmen of Science faculty

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

**11. Academic year 1998–1999**

**Lectures in Istituzioni di Fisica Matematica** course

**• Graduate students supervisorship**

1. Andrea Stimilli, *Analisi qualitativa di soluzioni delle equazioni di Einstein*, laureando (triennale) , a.y. 2006–2007
2. Sara Quintavalle, *Collasso Gravitazionale Relativistico in dimensioni superiori*, a.y. 2006–2007
3. Clarissa Paolini, *Modelli regolari di Universo*, a.y. 2002 2003
4. Giada Marini, *Studio del collasso gravitazionale per una soluzione delle equazioni di Einstein*, a.y. 2002 2003

5. Laura Gentili, *Modelli semplificati di prove di crash*, a.y. 2002 2003 (co-supervisor)
6. Gloria Bratti, *Studio preliminare della struttura sandwich*, a.y. 2002 2003 (co-supervisor),
7. Giorgia Giacani, *Costruzione di un modello matematico per la descrizione di un sistema fisico assegnato*, a.y. 2001 2002 (co-supervisor)

• **Other teaching and organizing activities**

1. **Content management** of Camerino University website, since 2004
2. **Co-Organizing** Camerino University Science Faculty lectures *Immagini della Scienza e della Tecnologia*, 2002–2004
3. **Content management** of Camerino University Science Faculty website, 2003–2004
4. **Supervisor** of Camerino University project for a on-line Mathematics basic course for freshmen, 2003–2004
5. **Co-Organizing** *Stages in UNICAM* for high-school students, since 2002
6. **Expository talks** *Come muore una stella*, for high-school students at Liceo Scientifico di Camerino, and Liceo Scientifico di Macerata, 2003–2005
7. **Co-Organizing** Stages for students participating at Mathematics Olympiads, 2000–2004