

# Andrea Loi: Curriculum Vitae et Studiorum.

## Personal Details

Date of birth: September 28, 1969

Place of birth: Cagliari, Italy.

address: Dipartimento di Matematica e Informatica  
Via Ospedale 72, 09124 Cagliari-Italy

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## Current Position

Full Professor at University of Cagliari (Italy).

## Postgraduate studies

1998 Ph.D. in Mathematics at the University of Warwick, supervisor J. Rawnsley, dissertation titled *Quantization of Kähler manifolds and Holomorphic immersions in projective spaces*.

1994 Master in Mathematics at the University of Warwick, supervisor J. M. Micallef, dissertation titled *Deformation of complex structures : Complex Tori and K3 Surfaces*.

## Skills

- Proficient in written and spoken English; good in written and spoken French.

## Scientific travels

- Jussieu Paris (France) (22 February-24 February 2018)
- Luminy (France) (14 January–19 January 2018).
- University of Evora (Portugal) (1 September–06 September 2013).
- Visiting Professor, Institut Fourier de Mathématiques (Grenoble) (9 January - 9 February 2012).
- University of München (Germany) (18-21/12/2011).
- University of Bilbao (Spain) (06-10/10 2011).
- The thirteenth international conference on Geometry, Integrability and Quantization; Varna (Bulgaria), (with a cast grant) (03-08/06 2011).
- Workshop on Symplectic Geometry, Contact Geometry, and Interactions; Department of Mathematics, Uppsala University (with a CAST grant) (27-29/1 2011).
- University of Sofia (Bulgary) (6-8/9 2010).
- University of Veliko Tarnovo (Bulgary) (8-10/9 2010)].

- Mathematics Institute, Princeton University (invitation by G. Tian);  
Courant Institute, Department of Mathematics New York (invitation by M. Gromov) (01/04-30/04 2008)
- University of Sofia (15/7-15/9 2003).
- I.H.E.S. (invitation by J. P. Bourguignon) (one month: October 1995)
- University of Warwick, England (1993-98)
- Mathematics Institute Louis Pasteur, Strasbourg (one year: 1990-91).

### Invited speakers to the following conferences

- 2018 *Symplectic coordinates on Kähler manifolds*, Sèminarie de Gèometrie Hamiltonienne, Jussieu Paris (France)
- 2018 *Kähler immersions of homogeneous Kähler manifolds into complex space forms*, CIRM Luminy (France), 14 January 2018.
- 2013 *The Gromov width of symmetric spaces*, XXII International fall workshop on Geometry and Physics, 2-5 September 2013, Evora (Portugal).
- 2012 *Kähler immersions of homogeneous Kähler manifolds into complex space forms*, Institut Fourier de Mathématiques (Grenoble), 24 Gennaio 2012.
- 2011 *Balanced metrics, TYZ expansion and Szegő kernel*, conference at the Mathematics Institute of the University of München, München (Germany) 20 Dicembre 2011.
- 2011 *Global Symplectic coordinates on Kähler manifolds*, EMS-RSME JOINT MATHEMATICAL WEEKEND, Bilbao, October 7-9, 2011.
- 2011 *Balanced metrics, Tian–Yau–Zelditch expansion and quantization of a Kähler manifold*, The thirteenth international conference on Geometry, Integrability and Quantization, Varna (Bulgaria) 3-8 June 2011.
- 2011 *Metrische bilanciate, espansione di Tian–Yau–Zelditch e quantizzazione di una varietà di Kähler*, Geometry in Bicocca (Milan) 2011, 12-13 May 2011.
- 2010 *Kähler immersions of homogeneous Kähler manifolds into complex space forms* Global Analysis and PDE on Manifolds, IMI, BAS, SOFIA, 6-8 September 2010.
- 2010 *Kähler immersions of homogeneous Kähler manifolds into complex space forms* ICDG (International Congress in Differential Geometry 2010, Veliko Tarnovo 8-10 September 2010.
- 2008 *Holomorphic immersions of Kähler-Einstein manifolds into complex space forms* (School and Conference on Differential Geometry, ICTP, Trieste, 2 June - 20 June 2008)
- 2008 *Symplectic duality between complex domains* (Extremal Kaehler metrics and Kaehler-Ricci flow, Centro De Giorgi, Pisa, 2 March - 29 March 2008).

- 2007 *Immersioni simplettiche in spazi di forme complessi* (Giornate di Geometria, Pavia, February 13-14).
- 2006 *Symmetric coordinates on symmetric domains and their compact duals* (Mathematics and its applications, Torino, July 3-7).
- 2006 *Symmetric coordinates on symmetric domains and their compact duals* (Recenti sviluppi della geometria complessa, differenziale, simplettica, Centro di Ricerca Matematica Ennio de Giorgi, Pisa, Marzo 9-11).
- 2003 *On Nash's  $C^1$ -isometric theorem* (Miniworkshop on PDE and Geometry, Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, Sofia, Settembre 1-2).
- 2002 *Una versione simplettica del teorema di immersione isometrica di Nash* (Nuovi contributi italiani alla geometria differenziale III, Palermo).
- 2000 *Isometric Immersions and Symplectic Geometry* (Dynamical Systems and PDE, Cagliari).
- 1999 *Decomposizioni a libro aperto positive e strutture di contatto bordo sulle 3-variet* (Nuovi contributi italiani alla geometria differenziale II, Palermo).
- 1997 *Quantizzazione di variet di Kähler* (Nuovi contributi italiani alla geometria differenziale I, Bari).

### Research interests

1. Induction of geometric structures (Kähler form, symplectic forms, Riemannian metrics and connections);
2. analytic and geometric methods for the quantization (geometric and by deformation) of a Kähler manifold;
3. balanced metrics and the TYZ (Tian–Yau–Zelditch) expansion.

### Organization of events

1. *Odysseus 2018*, Cagliari, 3-8 June 2018.
2. *Indam-Day*, Cagliari, 1 June 2018.
3. *Two days of Geometry in honor of Giusi D'Ambra*, Cagliari, 16-17 February 2018.
4. *Complex and Riemannian Geometry days*, Cagliari, 8-9 September 2016.
5. *New Trends in Differential Geometry*, Villasimius, 18-20 September 2014.

## Research publications

1. (joint with M. Zedda and F. Zuddas) *Ricci flat Calabi's metric is not projectively induced* to appear in TMJ.
2. (joint with R. Mossa and F. Zuddas) *Finite TYCZ expansions and cscK metrics* J. Math. Anal. Appl. 484 (2020).
3. (joint with B. Cappelletti Montano) *Einstein and  $\eta$ -Einstein Sasakian submanifolds in spheres* Ann. Mat. Pura Appl. (4) 198 (2019), no. 6, 2195-2205.
4. (joint F. Lilliu, D. Reforgiato Recupero, M. Sissini) *An uncertainty-aware optimization approach for flexible loads of smart grid prosumers: A use case on the Cardiff energy grid* Sustainable Energy, Grids and Networks, 20 (2019) 100272,
5. (joint F. Cannas Aghedu) *The Simanca metric admits a regular quantization* Ann. Global Anal. Geom. 56 (2019), no. 3, 583-596.
6. (joint with S. Bonzio) *The Plonka product of topological spaces*, Algebra Universalis 80 (2019), no. 3, 1-29.
7. (joint with S. Bonzio e L. Peruzzi) *A duality for involutive bisemilattices*, Studia Logica (2019) 107, 423-444.
8. (joint with R. Mossa and F. Zuddas) *Bochner coordinates on flag manifolds*, Bull. Braz. Math. Soc, New Series, 50 497-514 (2019).
9. (joint with F. Salis and F. Zuddas) *On the third coefficient of TYZ expansion for radial scalar flat metrics*, Journal of Geometry and Physics 133, 210-218 (2018).
10. (joint with F. Salis and F. Zuddas) *Two conjectures on Ricci flat metrics*, Math. Z. (2018) 290, 599–613.
11. (joint with S. Bonzio and L. Peruzzi) *On the  $n \times n \times n$  Rubik's Cube*, Math. Slovaca. 68 (2018), No. 5, 957-974.
12. (joint with S. Matta) *Curvature in Ecomomy*, J. Math. Econom. 74 (2018), 62-67.
13. (joint with B. Cappelletti Montano and D, Zuddas) *On codimension one submanifolds of the real and complex projective space*, Topology Appl. 232 (2017), 237-241.
14. (joint with S. Bonzio and L. Peruzzi) *On the first law of cubology for the Rubik's Revenge*. Math. Slovaca 67 (2017), No. 3, 561-572.
15. (joint with M. Zedda) *The diastasis function of the Cigar metric*, Journal of Geometry and Physics 110, 269-276 (2016).
16. (joint with F. Zuddas) *Explicit symplectic coordinates on Kähler manifolds*, Special metrics and group actions in geometry, 215-239, Springer INdAM Ser., 23, Springer, Cham, 2017

17. (joint with R. Mossa and F. Zuddas) *The log-term of the disc bundle over a homogeneous Hodge manifold*, Ann. Global Anal. Geom. 51 (2017), no. 1, 35-51.
18. (joint with F. Zuddas) *On the Gromov width of Homogeneous Kähler manifolds*, Diff. Geom. Appl. 47, 130-132 (2016).
19. (joint with C. Arezzo and F. Zuddas) *Some remarks on the symplectic and Kähler geometry of toric varieties*, Annali di Matematica Pura e Applicata 4, 1287-1304 (2016).
20. (joint with R. Mossa and F. Zuddas) *Symplectic capacities of Hermitian symmetric spaces of compact and non compact type*, Journal of Symplectic Geometry Volume 13, Number 4, 1049-1073 (2015).
21. (joint with R. Mossa) *Some remarks on Homogeneous Kähler manifolds*, Geometriae Dedicata Volume 179 (2015), 1-7.
22. (joint with S. Matta) *On the topology of the set of critical equilibria*. International Journal in Economic Theory (2015).
23. (joint with M. Zedda) *On the coefficients of TYZ expansion of locally Hermitian symmetric spaces*, Manuscripta Mathematica (2015), Vol. 148, 303-315.
24. (joint with D. Uccheddu and M. Zedda) *On the Szegő kernel of Cartan–Hartogs domains*, Arxiv for Matematik, Vol. 54 Issue 2 (2015), 473-484.
25. (joint with S. Matta) *Increasing complexity in structurally stable models*, J. Math. Econom. 57 (2015), 20-24.
26. (joint with L. Cadecdu and Gallot) *Maximizing mean exit-time of the Brownian motion on Riemannian manifolds*, Monatsh. Math. Vol. 176, Issue 4 (2015), 551-570.
27. (joint with R. Mossa and F. Zuddas) *Some remarks on the Gromov width of homogeneous Hodge manifolds*, Int. J. Geom. Methods Mod. Phys. Vol. 11, No. 2 (2014).
28. (joint with C. Arezzo and F. Zuddas) *Szego Kernel, regular quantizations and spherical CR-structures*, Math. Z. (2013) 275, 1207-1216.
29. (joint with M. Zedda) *Global symplectic coordinates on gradient Kähler–Ricci solitons*, Monatsh. Math. (2013) 171:415-423.
30. (joint with S. Matta) *Structural stability and catastrophes*, Economics Bulletin (2012) Vol.32 No. 4, 3378-3385
31. (joint with S. Matta) *Measures of economies with an arbitrarily large number of equilibria*, International Journal of Economic theory (2012) Vol.8, No.4, 337-343.
32. (joint with C. Arezzo and F. Zuddas) *On homothetic balanced metrics*, Ann. Global Anal. Geom. 41, n. 4 (2012), 473-491.
33. (joint with M. Zedda and F. Zuddas) *Some remarks on the Kähler geometry of the Taub–NUT metrics*, Ann. Global Anal. Geom. 41, n. 4 (2012), 515-533.

34. (joint with A. J. Di Scala and H. Hishi) *Kähler immersions of homogeneous Kähler manifolds into complex space forms*, Asian Journal of Mathematics Vol. 16 No. 3 (2012), 479-488.
35. (joint with R. Mossa) *Berezin quantization of homogeneous bounded domains*, Geom. Dedicata 161 (2012) 119-128.
36. (joint with M. Zedda) *Calabi's inhomogeneous Einstein manifold is globally symplectomorphic to  $\mathbb{R}^{2n}$* , Diff. Geom. Appl. (30) 2 (2012), 145-147.
37. (joint with M. Zedda) *Balanced metrics on Cartan and Cartan-Hartogs domains* Math. Z. 270 (2012), no. 3-4, 1077-1087.
38. (joint with M. Zedda), *Kähler-Einstein submanifolds of the infinite dimensional projective space*, Math. Ann. 350 (2011), 145-154.
39. (joint with Roberto Mossa), *The diastatic exponential of a symmetric space*, Math. Z. 268 (2011), no. 3-4, 1057-1068.
40. (joint with G. D'Ambra and R. Deleo) *Partially isometric immersions and free maps* Geom. Dedicata 151 (2011), 79-95.
41. (joint with S. Matta) *Catastrophes minimization on the equilibrium manifold*, J. Math. Econom. 47 (2011), 617-620.
42. (joint with R. Mossa) *Uniqueness of balanced metrics on complex vector bundles*, J. Geom. Phys. 61 (2011) , 312-316.
43. (joint with M. Zedda) *Balanced metrics on Hartogs domains* Abh. Math. Semin. Univ. Hambg. 81 (2011), no. 1, 69-77.
44. (joint with T. Gramchev) *TYZ expansion for some rotation invariant Kähler metrics*, Proceedings of the 2nd International Colloquium on Differential Geometry and Its Related Fields, World Sci., (2011), 91-108..
45. (joint with M. Zedda), *A note on the  $l^2$ -norm of the second fundamental form of algebraic manifolds* , Serdica Math. J. 36 (2010), 67-74.
46. (joint with A. J. Di Scala), *Kähler manifolds and their relatives*, Ann. Scuola Norm. Sup. Pisa Cl. Sci. (5) Vol. IX (2010), 495-501.
47. (joint with S. Matta) *A note on the structural stability of the equilibrium manifold* J. Math. Econom. 46 (2010) n.4, 591-594.
48. (joint with A. J. Di Scala and F. Zuddas), *Symplectic duality between complex domains* Monatsh. Math. 160 (2010) 403-428.
49. (joint with F. Zuddas), *Canonical metrics on Hartogs domains*, Osaka J. Math. Vol. 47, No.2 (2010), 507-521.
50. (joint with A. Greco), *Radial balanced metrics on the unit disk*, J. Geom. Phys. 60 (2010), 53-59.
51. (joint with S. Matta), *Evolution paths on the Equilibrium Manifold*, J. Math. Econom. 45 (2009), 846-851.

52. (joint with F. Zuddas), *Engliš expansion for Hartogs domains*, Int. J. Geom. Methods Mod. Phys. Vol. 6, No. 2 (2009), 233-240.
53. (joint with A. J. Di Scala and F. Zuddas), *Riemannian geometry of Hartogs domains*, International Journal of Mathematics Vol. 20, Number 2 (2009), 139-149.
54. (joint with T. Gramchev), *TYZ expansion for the Kepler manifold*, Comm. Math. Phys. 289, (2009), 825-840.
55. (joint with M. Zedda), *Cartan domains and indefinite Euclidean spaces*, Extracta Math. 23 no. 3 (2008), 255-263.
56. (joint with S. Matta), *Geodesics on the equilibrium manifold*, J. Math. Econom. 44 (2008), no. 12, 1379–1384.
57. (joint with A. J. Di Scala and Guy Roos), *The bisymplectomorphism group of a bounded symmetric domain*, Transformation Groups Vol. 13, Number 2 (2008), 283-304.
58. (joint with A. J. Di Scala) *Symplectic duality of symmetric spaces*, Adv. Math. 217 (2008), 2336-2352.
59. (joint with F. Zuddas), *Symplectic maps of complex domains into complex space forms*, J. Geom. Phys. 58 (2008), 888-899.
60. (joint with C. Arezzo and A. Ghigi) *Stable bundles and the first eigenvalue of the Laplacian*, J. Geom. Anal. Vol. 17, N. 3 (2007), 401-412.
61. (joint with F. Cuccu) *Balanced metrics on  $\mathbb{C}^n$* , J. Geom. Phys. 57 (2007), 1115-1123.
62. (joint with G. D'Ambra) *Non-free isometric immersions of Riemannian manifolds*, Geom. Dedicata 127 (2007), 151-158.
63. (joint with A.J. Di Scala) *Kähler maps of Hermitian symmetric spaces into complex space forms*, Geom. Dedicata 25 (2007), 103-113.
64. *Regular quantizations and covering maps*, Geom. Dedicata 123 (2006), 73-78.
65. *Calabi's diastasis function for Hermitian symmetric spaces*, Differential Geom. Appl. 24 (2006), 311-319.
66. (joint with F. Cuccu) *Global symplectic coordinates on complex domains*, J. Geom. Phys. 56 (2006), 247-259.
67. (joint with S. Matta) *A Riemannian metric on the Equilibrium Manifold: the smooth case*, Economics bulletin 30 (2006), 1-9.
68. *A Laplace integral on a Kähler manifold and Calabi's diastasis function*, Differential Geom. Appl. 23 (2005), 55-66.
69. *Bergman and balanced metrics on complex manifolds*, Int. J. Geom. Methods Mod. Phys. 2 (2005), 553-561.

70. *A Laplace integral, the T-Y-Z expansion and Berezin's transform on a Kaehler manifold* Int. J. Geom. Methods Mod. Phys. 2 (2005), 359-371.
71. *Regular quantizations of Kähler manifolds and constant scalar curvature metrics*, J. Geom. Phys. 53 (2005), 354-364.
72. (joint with C. Arezzo) *A note on Kähler-Einstein metrics and Bochner's coordinates*, Abh. Math. Sem. Univ. Hamburg 74 (2004), 49-55.
73. (joint with C. Arezzo) *Moment maps, scalar curvature and quantization of Kähler manifolds*, Comm. Math. Phys. 243 (2004), 543-559.
74. *The Tian-Yau-Zelditch asymptotic expansion for real analytic Kähler metrics*, Int. J. Geom. Methods Mod. Phys. v. 1 No 3 (2004), 253-263.
75. (joint with G. D'Ambra) *Inducing connections on  $SU(2)$ -bundles*, JP J. Geom. Topol. 3 (1) (2003), 65-88.
76. (joint with C. Arezzo) *Quantization of Kähler manifolds and the asymptotic expansion of Tian-Yau-Zelditch*, J. Geom. Phys. 867 (2003), 1-13.
77. (joint with G. D'Ambra) *A symplectic version of Nash  $C^1$ -isometric embedding theorem*, Differential Geom. Appl. 16, no. 2 (2002), 167-179.
78. *Holomorphic maps of Hartogs domains in Complex Space forms*, Riv. Mat. Univ. Parma (7), vol. 1 (2002), 103-113.
79. (joint with R. Piergallini) *Compact Stein surfaces with boundary as branched covers of  $B^4$* , Invent. Math. 143 (2001), 325-348.
80. (joint with D. Zuddas) *Some remarks on Bergmann metrics*, Riv. Mat. Univ. Parma 6, no. 4 (2001), 71-86.
81. *The function epsilon for complex Tori and Riemann surfaces*, Bull. Belg. Math. Soc. Simon Stevin 7, no. 2 (2000), 229-236.
82. (joint with P. Sitzia) *Explicit formulas for geodesics of homogeneous  $SO(2)$ -isotropic three dimensional manifolds*, Adv. Math. 156 (2000), 1-22.
83. *Quantization of bounded domains*, J. Geom. Phys. 29 (1999), 1-4.

## Books

1. *Introduzione alla Topologia Generale*, Aracne Editrice (2013).
2. (joint with M. Zedda) *Kähler immersions of Kähler manifolds into complex space forms*, Lectures Notes of the Unione Matematica Italiana, Springer (2018).

## Teaching experience

- *Algebra 2 for the first degree in Mathematics and Differential Geometry (post-graduate level)*, University of Cagliari (2009-2020).



- *Topology for the first degree in Mathematics and Algebraic Topology (postgraduate level)*, University of Cagliari (2008-2013).
- *Linear Algebra and Geometry for Informaticians (undergraduate level)*, University of Cagliari (2002-2008).
- *Mathematics for biologists (undergraduate level)* University of Sassari (Italy) (1999-2001);
- *Mathematics for ambiental sciences (undergraduate level)*, University of Oristano and University of Nuoro (Italy) (1999-2011);
- Lectures on *Complex vector bundles* (for Ph.D. students), University of Camerino (Italy) (1997-98);
- Lectures and seminars on *Quantization of Kähler manifolds* (for Ph.D. students), University di Warwick (1996-97).
- Undergraduate example classes of the course *Geometry of Curves and Surfaces* (undergraduate level), University of Warwick (1995-96).

**Supervisor for 41 tesi di Laurea in Matematica (first degree in Mathematics) at Cagliari University.**

**Supervisor for 20 tesi di Laurea in Matematica (second degree) at Cagliari University.**

**Supervisor for the following Ph.D. dissertation**

- Filippo Salis, *The geometry of rotation invariant Kähler metrics (2018)*.
- Silvia Schirra, *Algebraic structural analysis of a vehicle routing problem of heterogeneous trucks. Identification of the properties allowing an exact approach (2017)*.
- Daria Uccheddu, *The vanishing of the log term of the Szego kernel and the Tian–Yau–Zelditch expansion (2014)*.
- Marianna Saba, *On the usage of the curvature for the comparison of planar curves (2014)*.
- Roberto Mossa, *Balanced metrics on complex vector bundles and the diastatic exponential of a symmetric space (2011)*.
- Michela Zedda, *Kähler immersions of Kähler–Einstein manifolds into infinite dimensional complex space forms (2010)*.

**Academic experiences**

- Erasmus Coordinator for the Mathematics at the Universtiy of Cagliari (2018-)
- Head of the Department of Mathematics and Computer Sciences, University of Cagliari (2015-18)

- Coordinator for the Mathematics (among which manager of the local funds for research and teaching) in the Faculties of Mathematics, Informatics and Engineering at the University of Cagliari (2010-2011).
- Erasmus Coordinator for the Mathematics at the University of Cagliari (2007-11)
- Member of the Council of the Ph.D. School in Mathematics at the University of Cagliari (2007-2010).
- Local Coordinator of a National Research Project (denominated PRIN) in the field of Geometry of Real and Complex Manifolds (2010).