

# Daniele Zuddas

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## Curriculum

I was born in Cagliari, Italy, in 11 May 1975 and I am a citizen of Italy.

### Research interests

My research interests are in geometric topology and related fields, including complex, contact and symplectic geometry. More specifically, I am focused on studying 4-manifolds by means of Lefschetz fibrations, branched covers and Kirby calculus. I am also interested in (non-Kähler) complex geometry, Engel structures on 4-manifolds and (possibly non-smoothable) topological 4-manifolds.

### Education

- 10/3/2008 **PhD in Mathematics**, *Scuola Normale Superiore*, Pisa, with honors. Thesis: "Branched coverings and 4-manifolds", supervisor: Prof. Riccardo Piergallini.
- 19/7/2000 **Laurea in Matematica**, *Università degli Studi di Camerino*, with honors.

### Qualifications

- Abilitazione Scientifica Nazionale per il settore concorsuale 01/A2 Geometria e Algebra (qualification for university associate professor of Geometry and Algebra in Italy), valid from 30 November 2017 to 30 November 2023.
- Qualification aux fonctions de maître de conférences, section 25 Mathématiques (qualification for university assistant professor of Mathematics in France), valid from 5 February 2014 to 31 December 2018.

### Current position

- 2017–2019 **ERC Research fellow in Mathematics**, *University of Bayreuth*.  
From 20 September 2017 to 31 March 2019.

### Previous positions

- 2013–2017 **Research fellow in Mathematics**, *Korea Institute for Advanced Study*, Seoul.  
From 20 November 2013 to 2 September 2017. Research project: Lefschetz fibrations on 4-manifolds.
- 2013 **Postdoctoral researcher**, *Max Planck Institute for Mathematics*, Bonn.  
Special semester on 4-manifolds and their combinatorial invariants, from 1 January 2013 to 30 June 2013.
- 2010–2012 **Research fellow in Mathematics**, *Università degli Studi di Cagliari*.  
From 31 May 2010 to 30 May 2012. Research project: Lefschetz fibrations on 4-manifolds.
- 2009–2010 **Research fellow in Mathematics**, *Università degli Studi di Cagliari*.  
From 30 January 2009 to 30 May 2010. Research project: Lefschetz fibrations on 4-manifolds.

2007–2008 **Research fellow in Mathematics**, *Scuola Normale Superiore*, Pisa.  
From 10 December 2007 to 9 December 2008. Research project: Lefschetz fibrations on 4-manifolds.

2001–2003 **Graduate student**, *Scuola Normale Superiore*, Pisa.  
From 1 January 2001 to 31 December 2003.

## Participation as scientific member in international research projects

2017–2019 2013 ERC Advanced Research Grant 340258 Topological, Algebraic, Differential Methods in Classification and Moduli Theory (TADMICAMT), Lehrstuhl Mathematik VIII, Mathematisches Institut, Universität Bayreuth, from 20 September 2017. Principal investigator: Prof. Fabrizio Catanese.

2010–2015 Research Networking Programme Contact and Symplectic Topology (CAST), European Science Foundation, from 27 January 2010 to 26 January 2015. Principal investigator: Prof. Frédéric Bourgeois.

## Funding

2013–2017 Research grants from Korea Institute for Advanced Study (€ 35.000).

2010–2012 Research grant from Regione Autonoma della Sardegna (FSE 2007–2013). Project: Lefschetz fibrations on 4-manifolds – CRP3\_43 (€ 70.000).

## Invited talks at international conferences

- *How to present all compact topological 4-manifolds*, 'Joint meeting of the Italian Mathematical Union, the Italian Society of Industrial and Applied Mathematics and the Polish Mathematical Society', 17-20 September 2018, Wrocław, Poland.
- *The smooth presentation of non-smoothable 4-manifolds*, 'Differential, Algebraic and Topological Methods in Complex Algebraic Geometry', 6-15 September 2018, Cetraro, Italy.
- *Branched coverings of 4-manifolds*, AIM Workshop 'Symplectic four-manifolds through branched coverings', 14-18 May 2018, American Institute of Mathematics, San Jose, CA, USA.
- *Branched covering representation of 4-manifolds and their submanifolds*, 2017 KIAS Research Station Busan, South Korea, on 'Self-distributive system and quandle (co)homology theory in algebra and low-dimensional topology', 12-16 June 2017, Busan, South Korea.
- *New holomorphic fillings in contact geometry*, '2<sup>nd</sup> KAST–Lincei Bilateral Symposium', 6/12/2016, KIAS, Seoul.
- *Topological 4-manifolds as branched covers of  $S^4$* , conference '4-Dimensional Topology', 21-23 November 2014, Osaka City University.
- *An equivalence theorem for Lefschetz fibrations over the disk*, 'OCAMI Workshop on Knots and Related Topics', 7-8 June 2014, Osaka City University.

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## Contributed talks

- *Cobordisms of Lefschetz fibrations on 4-manifolds*, 'Knots and Low Dimensional Manifolds', a satellite conference of ICM 2014, 22-26 August 2014, Busan, South Korea.
- *Cobordisms of Lefschetz fibrations on 4-manifolds*, 'ICM 2014', 13-21 August 2014, Seoul, Corea del Sud.
- *Fibrazioni di Lefschetz universali*, Incontro del Progetto FIRB 2012 'Geometria Differenziale e Teoria Geometrica delle Funzioni', 23-25 October 2013, Università di Firenze.
- *Lefschetz fibration structures on 4-dimensional 2-handlebodies*, 'ICDG 2010', 6-10 September 2010, University of Veliko Tarnovo, Bulgaria.
- *Lefschetz fibration structures on 4-dimensional 2-handlebodies*, 'International Workshop on Global Analysis and PDE on Manifolds', 6-8 September 2010, Sofia.

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## Scientific stays

- Feb 2018 CIRM, Marseille. Special month on 'Low Dimensional Topology and Related Topics'.
- May 2017 Dipartimento di Matematica e Informatica, Università di Cagliari (Prof. Andrea Loi).
- 17-21 Apr 2017 Workshop 'Engel structures', American Institute of Mathematics, San Jose, CA, USA.
- Apr 2017 Instituto de Matemáticas, Universidad Nacional Autónoma de México (Prof. Alberto Verjovsky).
- Apr 2015 Dipartimento di Matematica e Informatica, Università di Cagliari (Prof. Andrea Loi).
- Jan-Mar 2015 Grey Fellowship, Department of Mathematical Sciences, Durham University.
- Nov 2014 Mathematics Department, Osaka City University (Prof. Seiichi Kamada).
- June 2014 Mathematics Department, Osaka City University (Prof. Seiichi Kamada).
- Apr 2014 Dipartimento di Matematica, Politecnico di Torino (Prof. Antonio J. Di Scala).
- June 2011 Mathematics Department, City University of New York (Prof. Nikos Apostolakis).

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## Teaching and seminars

- Apr-May 2011 Algebraic topology (24 hours course supervised by Prof. Andrea Loi), Corso di Laurea Magistrale in Matematica, Università degli Studi di Cagliari.
- May-June 2009 Homology theory (22 hours course) for the Dottorato in Matematica e Calcolo Scientifico, Scuola di Dottorato di Ricerca in Scienze Matematiche e Informatiche, Università degli Studi di Cagliari.
- 2007 Teaching assistant of Geometry (supervised by Prof. Ignazio Leurini), March-May 2007, Corso di Laurea Triennale in Informatica, Facoltà di Scienze MM.FF.NN., Università degli Studi di Cagliari.
- 2004-2005 Teaching assistant of Linear algebra (supervised by Prof. Andrea Loi), from October 2004 to January 2005, Corso di Laurea Triennale in Informatica, Facoltà di Scienze MM.FF.NN., Università degli Studi di Cagliari.

- Special moves for open book decompositions of 3-manifolds (after J. Harer, E. Giroux and N. Goodman), 8/5/2018, University of Munich.
- Special moves for open book decompositions of 3-manifolds (after J. Harer, E. Giroux and N. Goodman), 25/4/2018, University of Regensburg.
- Series of three seminars from the book 'Équations différentielles à points singuliers réguliers' by Pierre Deligne, November-December 2017, University of Bayreuth.
- Branched coverings of  $CP^2$ , 15/11/2017, University of Bayreuth.
- A complex 4-ball with non-standard contact boundary sphere, 1/2/2017, Politecnico di Torino.
- Topological 4-manifolds and branched coverings, 12/11/2015, Università di Cagliari.
- New complex structures on  $R^4$ , 7/10/2015, Politecnico di Torino.
- Strutture complesse su  $R^4$  di tipo Calabi-Eckmann, 25/9/2015, Università di Parma.
- New complex structures on  $R^4$ , 15/4/2015, Università di Cagliari.
- A non-standard complex structure on  $R^4$  of Calabi-Eckmann type, 2/3/2015, University of Glasgow.
- Topological 4-manifolds as branched covers of  $S^4$  (four talks), January-March 2015, Durham University.
- Cobordism groups of Lefschetz fibrations, 'N-KOOK Seminar', 14/6/2014, Osaka City University.
- An equivalence theorem for Lefschetz fibrations over the disk, 'Friday Seminar on Knot Theory', 13/6/2014, Osaka City University.
- Cobordismi tra fibrazioni di Lefschetz, 9/4/2014, Università di Pisa.
- Lefschetz fibrations and branched coverings, 19/2/2014, Korea Institute for Advanced Study, Seoul.
- Two-dimensional open book decompositions of 4-manifolds, 17/2/2014, Korea Institute for Advanced Study, Seoul.
- Lefschetz fibrations on 4-manifolds, branched coverings, and related topics (three talks), 27-28 January 2014, Seoul National University e Sungshin Women's University, Seoul.
- Geometria di contatto e applicazioni stabili, 25/10/2011, Università di Cagliari.
- Rivestimenti ramificati e strutture simplettiche, 25/3/2010, Università di Cagliari.
- Fibrazioni di Lefschetz nelle 4-varietà, 18/4/2008, Scuola Normale Superiore di Pisa.
- Strutture di contatto, December 2004, Università di Cagliari.
- Lectures on Kirby calculus (12 hours), September-October 2003, Imperial College, London.

## Other information

- Co-organizer of the KIAS Topology Seminar (with Min Hoon Kim, Kyungbae Park e Hyung-Seok Shin), Korea Institute for Advanced Study, Seoul.
- Reviewer for Mathematical Reviews (MathSciNet) and Zentralblatt MATH.

- Referee for several mathematics journals, including *Advances in Mathematics*, *Journal of Geometry and Physics*, *L'Enseignement Mathématique*.
- Member of the GNSAGA of INdAM.

## Language skills

Italian	Native speaker
English	Proficient user (C1 level of CEFR)
French	Basic user

## Publications

1. M. Freedman and D. Zuddas, *Certifying a compact topological 4-manifold*, *Mathematical Research Letters* (in press), arXiv:1810.05988.
2. R. Piergallini and D. Zuddas, *On branched covering representation of 4-manifolds*, *Journal of the London Mathematical Society* (in press), DOI: 10.1112/jlms.12187.
3. R. Piergallini and D. Zuddas, *Special moves for open book decompositions of 3-manifolds*, *Journal of Knot Theory and Its Ramifications* 27, No. 11 (2018) 1843008, DOI: 10.1142/S0218216518430083.
4. A. J. Di Scala, N. Kasuya and D. Zuddas, *Non-Kähler complex structures on  $R^4$ , II*, *Journal of Symplectic Geometry* 16, No. 3 (2018), 631–644, DOI: 10.4310/JSG.2018.v16.n3.a2.
5. B. Cappelletti–Montano, A. Loi and D. Zuddas, *On codimension-1 submanifolds of the real and complex projective space*, *Topology and its Applications* 232 (2017), 237–241, DOI: 10.1016/j.topol.2017.10.015.
6. A. J. Di Scala, N. Kasuya and D. Zuddas, *Non-Kähler complex structures on  $R^4$* , *Geometry & Topology* 21 (2017) n. 4, 2461–2473, DOI: 10.2140/gt.2017.21.2461.
7. A. J. Di Scala, N. Kasuya and D. Zuddas, *On embeddings of almost complex manifolds in almost complex Euclidean spaces*, *Journal of Geometry and Physics* 101 (2016), 19–26, DOI: 10.1016/j.geomphys.2015.11.008.
8. D. Zuddas, *Universal Lefschetz fibrations and Lefschetz cobordisms*, *Geometry & Topology Monographs* 19 (2015), 125–144, DOI: 10.2140/gtm.2015.19.125.
9. N. Apostolakis, R. Piergallini and D. Zuddas, *Lefschetz fibrations over the disc*, *Proceedings of the London Mathematical Society* 107 (2013), 340–390, DOI: 10.1112/plms/pds078.
10. D. Zuddas, *Universal Lefschetz fibrations over bounded surfaces*, *Algebraic & Geometric Topology* 12 (2012), 1811–1829, DOI: 10.2140/agt.2012.12.1811.
11. A. J. Di Scala and D. Zuddas, *Embedding almost-complex manifolds in almost-complex euclidean spaces*, *Journal of Geometry and Physics* 61 (2011), 1928–1931, DOI: 10.1016/j.geomphys.2011.05.002.
12. D. Zuddas, *Representing Dehn twists with branched coverings*, *International Mathematics Research Notices* 2009 (2009), 387–413, DOI: 10.1093/imrn/rnn134.
13. D. Zuddas, *Branched coverings and 4-manifolds*, PhD thesis, Scuola Normale Superiore, Pisa, 2008. Available at <http://www.danielezuddas.eu/pdf/tesi.pdf>.
14. R. Piergallini and D. Zuddas, *A universal ribbon surface in  $B^4$* , *Proceedings of the London Mathematical Society* 90 (2005), 763–782, DOI: 10.1112/S0024611504015072.
15. A. Loi and D. Zuddas, *Some remarks on Bergmann metrics*, *Rivista di Matematica della Università di Parma* 4 (2001), 71–86.
16. R. Piergallini and D. Zuddas, *Braiding non-orientable surfaces in  $S^4$* , *Atti del Seminario Mate-*

matico e Fisico dell'Università di Modena e Reggio Emilia, supplemento al volume IL (2001), 229–239.

## Preprints

1. R. Piergallini and D. Zuddas, *Branched coverings of  $CP^2$  and other basic 4-manifolds*, arXiv:1707.03667 (2017), submitted.
2. N. Kasuya and D. Zuddas, *A concave holomorphic filling of an overtwisted contact 3-sphere*, arXiv:1711.07429 (2017), submitted.

## Papers in preparation

1. D. Zuddas, *Two-dimensional open book decompositions of 4-manifolds*.
2. D. Zuddas, *Sections of Lefschetz fibrations*.
3. S. Carter, S. Kamada, R. Piergallini and D. Zuddas, *Braided embeddings of 4-manifolds*.

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