Curriculum Vitae

Francesco Bonsante

Personal:	date of birth : 27.01.1978
	place of birth: Bari (Italy)
	office address : Dipartimento di Matematica, via Ferrata 1, 27100 PAVIA
	phone : 0039 0382 - 98 56 28
	e-mail : francesco.bonsante@unipv.it

Education and experience:

24 ott. 2000: *Laurea* (four year degree) in Mathematics at University of Pisa (cum Laude).

2001: *Diploma* in Mathematics of Scuola Normale Superiore (cum Laude).

2001-2003: Ph.D. student in Mathematics at Scuola Normale Superiore di Pisa.

2004: Research assistant (borsista) at Department of Mathematics of University of Pisa .

2005: Research assistant (borsista) at Department of Applied Mathematics of University of Pisa.

apr. 2005: defense of my Ph.D. (cum Laude). Dissertation with title "Deforming the Minkowskian cone of a closed hyperbolic manifold". Supervisor prof. R. Benedetti, referees prof. A. Zeghib, J.M. Montesinos.

sept. 2005-may 2006: I won a Marie Curie Intra European Fellowship at Laboratoire Picard of Toulouse.

may 2006- sept.2007: Research fellow (Ricercatore a tempo determinato) in geometry at Scuola Normale Superiore di Pisa.

oct.2007-march 2015 Lecturer (Ricercatore) at University of Pavia.

dec 2013 National habilitation as Associate and Full Professor (Settore concorsuale 01/A2 Geometria e Algebra).

apr. 2015-sept 2018 Associate professor at University of Pavia

oct 2018- present Full professor at University of Pavia

Areas of reserach

Teichmüller theory, hyperbolic geometry, Lorentzian geometry, geometric structures, cone singularities, global differential geometry.

Teaching

2001: Tutorials in "Differential geometry" (mathematics, 3rd year)

2002: Tutorials in "Matematica 3" (bachelor of engineering, 3rd year)

2004-05: Tutorials in Linear Algebra (computer science students, 1st year).

2005-06: Tutorials in Linear Algebra (bachelor of engineering, 1st year)

2006-07: Tutorials in "Matematica 1" (Calculus) at Scuola Normale Superiore (mathematics, 1st year)

2007-08: Linear Algebra (bachelor of engineering 1st year).

2008-09: - Linear Algebra (bachelor of engineering, 1st year)

- Geometria Superiore (master course, mathematics).

- Mean curvature flow (PhD course).

2009-10: Linear Algebra (bachelor of engineering, 1st year)

2010-11: Linear Algebra (bachelor of engineering, 1st year)

2011-12: - Linear Algebra (bachelor of engineering, 1st year).

- Riemann surfaces and algebraic curves (master course in mathematics)

2012-13: - Linear Algebra (bachelor of engineering, 1st year).

- Algebra (mathematics students, 2nd year)

2013-14: - Linear Algebra (bachelor of engineering, 1st year).

2014-15: - Linear Algebra (bachelor of engineering, 1st year).

- Algebra (mathematics students, 2nd year)

- Harmonic maps between surfaces (Ph.D. course)

2015-16: - Linear Algebra (bachelor of engineering, 1st year).

- Geometria 2 (mathematics students, 2nd year)

- Harmonic maps between surfaces (Ph.D. course)

2016-17: - Linear Algebra (bachelor of engineering, 1st year).

- Geometria 2 (bachelor of mathematics, 2nd year)

2017-18: - Linear Algebra (bachelor in engineer 1st year).

- Istituzioni di Geometria Superiore (master course in mathematics)

2018-19: - Linear Algebra (bachelor of engineering, 1st year).

- Istituzioni di Geometria Superiore (master course in mathematics)

- Symmetric spaces of non compact type (Phd course)

2020-21: - Linear Algebra (bachelor of engineering, 1st year).

- Istituzioni di Geometria Superiore (master course in mathematics)

2021-22: - Geometria 2 (bachelor in mathematics, 2nd year).

- Istituzioni di Geometria Superiore (master course in mathematics)

2022-23: - Linear Algebra (bachelor of engineering, 1st year).

- Istituzioni di Geometria Superiore (master course in mathematics)

2023-24: - Linear Algebra (bachelor of engineering, 1st year).

- Istituzioni di Geometria Superiore (master course in mathematics)

Invited talks and mini courses in International workshop

- *Wick Rotation in 3D gravity* (workshop *Towards the quantum geometry of hyperbolic 3-manifolds* Max Plank Institute, Golm, Potsdam, 2004).

- *(2+1)-spacetimes of constant curvature and projective structures* (workshop *Global geometric aspects of gravitation* École Normale Supérieure di Lyon, 2005).

- *Canonical Wick Rotation in 3D-gravity* (workshop *Classical and quantum gravity in dimension 3* Centro De Giorgi di Pisa, 2005).

- *Wick Rotation in 3D-gravity* (workshop *Teichmüller theory (classical and quantum)* Oberwolfach, 2006).

- *Earthquakes on surfaces with geodesic boundary* (Dipartimento di Matematica Università di Milano).

- *Earthquakes on hyperbolic surfaces with geodesic boundary and multi black holes* (Joint Meeting AMS-MAA, San Diego, 2008).

- *Canonical Time in 3d-gravity* (workshop *Geodicauserie I*, IHP, Paris, 2008).

- *Mean curvature flow in Anti de Sitter spacetime* (workshop *Geometric Flows and Geometric Operators* Centro de Giorgi, Pisa, 2009).

- *Earthquake theorem for surfaces with small cone angles* (workshop *Geodicuaserie II*, Avignon, 2009).

- *Quasi-conformal minimal Lagrangian maps of the hyperbolic plane* (workshop *Geometric structures in 2 and 3 dimensions*, Autrans, 2010)

- *Minimal Lagrangian maps of the hyperbolic disc* (final workshop of the ANR program GeomEinstein, Montpellier, 2010).

- *Maximal graphs in Anti de Sitter space* (workshop *Geometry and Analysis in Lorentzian manifolds*, École Normale Lyon, 2010).
- *Fixed points of the composition of earthquakes* (workshop *Geometry, topology and Dynamics of Character Varieties*, NUS Singapore, 2010).
- *Maximal surfaces in Anti de Sitter space* (workshop *Geometric evolutions and minimal surafces in Lorentzian manifolds*, Centro De Giorgi Pisa 2010).
- *AdS geometry in dimension 3* 6h Minicourse (trimester "Geometry and analysis of surface group representations" Institut Henri Poincare, Paris, 2012).
- *A cyclic flow on Teichmüller space* (Conference "Rigidity and flexibility in dimensions 2,3 and 4" for the 60th birthday of Steven Kerckhoff, Luminy, 2012).
- *An L^1-energy for maps between manifolds* ("A geometry day in Como", Como, 2014)
- 3h mini course on AdS geometry at the meeting "Regards croises sur les structures geomtriques et la geometrie lorentzienne", Avignon, September 2014.
-*Convex surfaces with constant curvature in Minkowski space*, UMI meeting, special session "Topologia e geometria differenziale", Siena 2015.
- *Isometric immersions of the hyperbolic plane into the Minkowski space* (international workshop "3 dimensional geometric structures, representations of surface groups and related topics", Luxembourg, 2015)
- *Teichmüller theory in 3d gravity* (international workshop "Current problems in Theoretical Physics", parallel session "Quantum fields and gravity", Vietri sul Mare 7-11 Aprile 2017)
- *The volume of the convex core of globally hyperbolic AdS space-times* (international workshop "99e rencontre entre mathématiciens et physicien théoriciens", IRMA, Strasbourg, 2017)
- *3d gravity and Teichmüller theory* (international workshop "Geometry of Moduli Space for Low Dimensional Manifolds", RIMS, Kyoto, 2017)
- *Equivariant immersions of surfaces into SL(2,C) and complex metrics on surafces* (international workshop "Higs bundles and Harmonic maps of Riemann surfaces", Oaxaca 2018)
- *Unbounded convex sets in hyperbolic space* (workshop "Geometric analysis, submanifolds and geometry of PDE's", Torino 2019)
-*An introduction to AdS geometry* (Minicourse in the International workshop on "topics and interface of low dimensional group actions and geometric structures", Nus, Singapore 2021)
- *Isometric embeddings of the hyperbolic plane in Minkowski space* (workshop "Geometry winter in Luxembourg", Luxembourg 2022)
- *The asymptotic Plateau problem in Minkowski space for CMC surfaces and for surfaces of constant Gaussian curvature* (workshop "Minimal surfaces in Symmetric spaces", Granada 2023)
- *Projective geometry for circle packings* (workshop "Beyond Riemann: Curvature and Rigidity", Erwin Schrödinger International Institute, Vienna, 2023)

Thesis supervision

I have been advisor of 7 among bachelor and master thesis.
I have supervised 4 PhD students: Andrea Seppi (defended December 2015), Daniele Rosmondi (defended March 2017), Christian El Emam (defended December 2020), Agnese Janigro (defended November 2022)
I am currently the advisor Enrico Trebeschi (third year PhD student) with Andrea Seppi as co-advisor. I am co-advisor of Timothé Lemistre (first year PhD student) with Jérémy Toulisse as advisor.

Scientific visit

I visited and gave a talk (under invitation) the following Departments:
- in Italy: Genova, Milano Bicocca, Pisa, Roma "La Sapienza", Trento, Bologna, Napoli, Torino.
- out of Italy: Lyon (Ecole Normale), Grenoble, Toulouse, Hamburg, Paris (Institut Poincaré), Luxembourg, Osaka University.
I had a one-month invitation in Toulouse in 2007-2008-2009-2010-2011-2012.

Events

I was in the organizing committee of the following workshops, schools or intensive periods
- "Giornata di Geometria 3", Pavia 2012.
- INdAM meeting " Geometric topology in Cortona", Cortona 2013.
- Intensive research period 'Teichmüller theory and surfaces in 3-manifolds", 26 May-20 June 2014 Centro di Ricerca Matematica "Ennio De Giorgi", Pisa.
- INdAM Workshop 'Chromatic and colored structures in geometry and statistical physics" which will be held in Cortona (Italy) from 24 to 30 May 2015
- INdAM meeting "Geometric topology in Cortona", 4-6 June 2017
- lnternational workshop "Teichmüller theory and geometric structures on 3-dimensional manifolds", Luxembourg 12-14 June 2017
- Scientific meeting "Higher Teichmüller theory and related topics", Pavia 2019
- Special session of Topology and Differential Geometry, XXI Convegno dell'UMI, Pavia 2019
- workshop "Geometric structures and higher Teichmüller theory", Pavia 2024
- conference "Moving to higher rank: from hyperbolic to Anosov", Cetraro (expected July 2024)

Journals

Referee for:
Geometriae Dedicata, Transaction of AMS, Proceeding of AMS, Commentarii Mathematici Helvetici, Annales de l'Institut Fourier, Annali SNS, IMRN, Journal of Topology, Invent. Math, Annals of Math., Duke Math. J., Math. Annalen, GAFA, JEMS, Ann. ENS.

Founded Projects

- Member of the PRIN 2005 project "Proprietà geometriche delle varietà reali e complesse".
- Member of the PRIN 2007 project "Moduli, strutture geometriche e loro applicazioni".
- Member of the PRIN 2009 project "Moduli strutture geometriche e loro applicazioni"
- Member of A.N.R. program GEODYCOS 2007-10 "geometrical and dynamical cosmology"
- Local coordinator of the del project **FIRB2010** "Geometria e topologia delle varietà in dimensione bassa".
- PI of the Pavia University peer reviewed project **Blue Sky research 2017** "Analytic and geometric properties of low-dimensional manifolds".
- Local coordinator of the PRIN 2022 project "Geometry and topology of manifolds".

Services

- Member of "Collegio Docenti del Dottorato Consortile in matematica di Pavia e Bicocca" since 2015.
-Member of "Commissione risorse e terza missione" of Department of Mathematics since 2020

- Presidente del Consiglio Didattico di Matematica (Teaching coordinator) 2020-2023.
- Presidente della Commissione di Tutorato del Dipartimento di Matematica (dal 2023).
- Referee of the PhD thesis of: Clara Rossi Salvemini (Universite d'Avignon e des Pais de Vaucluse), Boubacar Diallo (Universite de Toulouse), Lilia Mehidi (Universite de Bordeaux), Rym Smai (Universite d'Avignon e des Pais de Vaucluse).
-Member of the CET (Comite d'Encadrement de These), of the following PhD Students: Andrea Tamburelli (Luxemborug) Abderrahim Mesbah (Luxembourg), Viola Giovannini (Luxembourg)
- Member of the PhD Defence committee (Toulouse 2013, Pisa 2016, Luxembourg 2018, 2020, Pisa 2021, Sissa 2023).
- Member of the Habilitation committe Nice 2023.
- Member of hiring committee (Pavia 2018 PA, Pavia 2019 RTD/B, Bari 2019 PA, La Sapienza Roma 2020 RTD/B, L'Aquila 2020, Pisa 2020 PA, Milano Bicocca 2023 PA).

Papers

- *Flat Spacetimes with Compact Hyperbolic Cauchy Surface.* Journ. Diff. Geom. **69**(2005), 441–521.
- *Canonical Wick Rotation in 3-dimensional gravity* in collaborazione con R. Benedetti Mem. Amer. Math, Soc **198**(2009) 1–164. .
- *Costant curvature (2+1)-spacetimes and projective surfaces* survey per *Actes du Seminaire de Theorie Spectrale et Geometrie* dell'Institut Fourier di Grenoble.
- *Notes on a Paper of Mess*, with A.Andersson, T.Barbot,R. Benedetti, W. Goldam, F. Labourie, K.Scannell, J.M. Schlenker, Geom. Ded.**126**(2007)47–70.
- *AdS Manidolds with particles and earthquakes on singular surfaces* with J.M. Schlenker, Geom. Func. Anal. **19**(2009), 41–82.
- *Multi Black Holes and earthquakes on Riemann surfaces with boundaries* in collaborazione con K. Krassnov e J.M. Schlenker, Int. Math. Res. Not IMRN **2011**, 487–552.
- *(2+1)-Einstein spacetimes of finite type* with R. Benedetti *Handbook in Teichmuller theory* (Papadopoulos ed.), vol II, EMS Publishing House, Zurich 2009.
- *Maximal surfaces and the universal Teichmüller space* with J.-M. Schlenker, Invent. Math. **182**(2010), page 279-333.
- *Collisions of particles in locally AdS spacetimes I. Local description and local examples* with T. Barbot e J.-M. Schlenker, Comm Math. Phys. **308**(2011), 147–200.
- *Fixed points of composition of earthquakes* with J.-M. Schlenker, Duke Math. J. **161**(2012) 1011–1054.
- *A cyclic extension of the earthquake flow* with G. Mondello e J.-M. Schlenker, Geometry&Topology **17**(2013) 157-234.
- *Collisions of particles in locally AdS spacetimes II. Moduli of globally hyperbolic spaces* with T. Barbot e J.-M. Schlenker, Comm. Math. Phys. 327(2014) 691-735.
- *Recovering the geometry of flat space-time from background radiation* joint with Meusburger and Schlenker, Ann. Henri Poincare, 15(2014), 1733-1799.
- *A cyclic extension of the earthquake flow II*, with G. Mondello e J.-M. Schlenker, Ann. Sci. Éc. Norm. Supér. 48(2015), 811–859.
- *On Codazzi tensors on a hyperbolic surafce and flat Lorentzian geometry*, joint with A. Seppi, IMRN 2016, 343–417.
- *Spacelike convex surfaces with prescribed curvature in* $(2+1)$*-Minkowski space*, with A. Seppi, Adv. Math. 304(2017), 434–493.

- *The equivariant Minkowski problem in Minkowski space*, with F. Fillastre, Ann. Ist. Fourier (Grenoble), 67(2017), 1035–1113.
- *On the volume of anti-de Sitter maximal globally hyperbolic three manifolds*, with A. Seppi and A. Tamburelli, Geom. Funct. Anal. 27(2017), 1106–1160.
- *Area-preserving diffeomorphisms of the hyperbolic plane and K-surfaces in Anti-de Sitter space*, with A. Seppi, J. of Topology 11 (2018), 420-468
- *Equivariant maps into Anti-de Sitter space and the symplectic geometry of $\mathbb{H}^2 \times \mathbb{H}^2$*, with A. Seppi, Trans. Amer. Math. Soc. (2019), 5433-5459
- *Entire surfaces of constant curvature in Minkowski 3-space* with Andrea Seppi and Peter Smillie, Math Ann 374(2019), 1261-1309
- *Anti de Sitter geometry and Teichmüller theory* with Andrea Seppi, chapter of the book *In tradition of Thurston*, 545-643, Springer, 2020
- *Quasicircles and width of Jordan curves in CP1*, with J. Danciger, S.Maloni, J.-M. Schlenker, Bull. Lond. Math. Soc. 53 (2021), 507- 523
- *The induced metric of the boundary of the convex hull of quasi-circles in hyperbolic and Anti de Sitter geometry* with J. Danciger, S.Maloni, J.-M. Schlenker. Geometry&Topology 25(2021), 2827-2911
- *On immersions of surfaces into SL(2,C) and geometric consequences* , with C. El Emam, Int. Math. Res. Not IMRN(2022), 8803-8864
- *Minimizing immersions of a hyperbolic surface in a hyperbolic 3 manifold*, with G. Mondello and J.-M. Schlenker, Amer. J. Math 145(2023), 995-1049

Preprints

- *Some open questions on anti-de Sitter geometry*, with T. Barbot, J. Danciger, W. M. Goldman, F. Gueritaud, F. Kassel, K. Krasnov, J.-M. Schlenker, A. Zeghib, arXiv:1205.6103
- *Complete CMC hypersurfaces in Minkowski (n+1)-space* with A. Seppi, P. Smillie arxiv:1912.05477 (accepted for publication in Comm. Anal. Geom.)
- *Completeness of convex entire surfaces in Minkowski 3-space* with A. Seppi and P. Smillie, arxiv:2207.10019
- *Projective rigidity of circle packings*, with Michael Wolf, arxiv:2307.08972