Federico Bambozzi

Personal information

- *Data and place of birth:* July 9, 1985, Loreto (AN), Italy.
- *Nationality:* Italian.
- *Residence:* Scharnhorststrasse 31, 93049, Regensburg, Germany.
- *Place of Work:* Fakultät für Mathematik Universität Regensburg, Regensburg, Germany.
- *Current Position:* DFG fellow with the project BA 6560 /1-2 entitled “Derived geometry and arithmetic" .
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Academic achievements

- 04/2014: Ph.D. in Mathematics at “Università degli studi di Padova” under the supervision of prof. Francesco Baldassarri, with thesis entitled “*On a generalization of affinoid varieties*”.
- 07/2010: Master’s degree in Mathematics at “Università degli studi di Torino” with thesis entitled “*Fourier analysis in L-function theory*”, supervisor Prof. Andrea Mori.
- 07/2007: Bachelor degree in Electronic Engineering at “Università politecnica delle Marche”, with thesis entitled “*On a Family of Circulant Matrices for QC-LDPC Codes*”, supervisor Prof. Franco Chiaraluce.

Professional activities

- from 05/2021 to 11/2021: DFG fellow University of Regensburg with the return grant of the project BA 6560 /1-1 entitled “Derived geometry and arithmetic";
- from 12/2018 to 05/2021: DFG fellow at the Mathematical Institute of the University of Oxford with the project BA 6560 /1-1 entitled “Derived geometry and arithmetic";
- from 01/2017 to 09/2018: Post-doc fellowship at the University of Regensburg supported by the DFG funded CRC 1085 “Higher Invariants. Interactions between Arithmetic Geometry and Global Analysis", with advisor Prof. Denis-Charles Cisinski;

- from 10/2014 to 11/2016: Post-doc fellowship at the University of Regensburg supported by the DFG funded CRC 1085 "Higher Invariants. Interactions between Arithmetic Geometry and Global Analysis", with advisors Prof. Walter Gubler and Prof. Klaus Künnemann;
- form 05/2014 to 09/2014: "Assegno di ricerca" (Italian equivalent of a post-doc fellowship) at University of Padova , founded by MIUR PRIN2010-11 "Arithmetic Algebraic Geometry and Number Theory", under the supervision of Prof. Bruno Chiarellotto.

Awards

- 24/05/2021: Awarded with the Italian national scientific qualification ("Abilitazione Scientifica Nazionale") as Associate Professor of Geometry and Algebra (SSD MAT 01/A2, Geometria e Algebra).
- 11/2018: Granted with the DFG postdoctoral fellowship for the project BA 6560 /1-1 entitled "Derived geometry and arithmetic". Two years fellowship that has been extended by 6 months due to covid pandemic.

Publications

- F. Bambozzi, S. Murro, N. Pinamonti "*Invariant states on noncommutative tori*", International Mathematics Research Notices 2021.5, March 2021, pp. 3299-3313.
- F. Bambozzi, S. Murro "*On the uniqueness of invariant states*", Advances in Mathematics, Volume 376, 6 January 2021.
- F. Bambozzi, O. Ben-Bassat, K. Kremnizer "*Analytic Geometry over $\mathbb{F}_1$ and the Fargues-Fontaine curve*", Advances in Mathematics, Volume 356, 7 November 2019.
- F. Bambozzi, A. Vezzani "*Rigidity for rigid analytic motives*", Journal of the Institute of Mathematics of Jussieu, 2019, pp. 1-29.
- F. Bambozzi "*Theorems A and B for dagger quasi-Stein spaces*", The Quarterly Journal of Mathematics, Volume 70, Issue 2, June 2019, pp. 703–735.
- F. Bambozzi, O. Ben-Bassat, K. Kremnizer "*Stein domains in Banach algebraic geometry*", Journal of Functional Analysis, Volume 274, Issue 7, 1 April 2018, pp. 1865-1927.
- F. Bambozzi "*Closed graph theorems for bornological spaces*", Khayyam Journal of Mathematics, Volume 2, Issue 1, 2016, pp. 81-111.
- F. Bambozzi, O. Ben-Bassat "*Dagger Geometry as Banach Algebraic Geometry*", Journal of Number Theory 162, 2016, pp. 391-462.
- M. Baldi, F. Bambozzi, F. Chiaraluce "*On a Family of Circulant Matrices for Quasi-Cyclic Low-Density Generator Matrix Codes*", IEEE transactions on Information Theory, September 2011, volume 57, number 9. Available at http://arxiv.org/pdf/1309.1286.pdf

- M. Baldi, F. Bambozzi, F. Chiaraluce "*A class of invertible circulant matrices for QC-LDPC code*". Proc. International Symposium on Information Theory and its Applications, ISITA 2008, Auckland, New Zealand, 7-10 December 2008, pp. 223-228, ISBN: 978-1-4244-2069-8, DOI: 10.1109/ISITA.2008.4895413.

Preprints

- F. Bambozzi, T. Mihara "*Homotopy Epimorphisms and Derived Tate's Acyclicity for Commutative C*-algebras*", March 2021, available at https://arxiv.org/abs/2103.11722
- F. Bambozzi, K. Kremnizer "*On the Sheafyness Property of Spectra of Banach Rings*", September 2020, preprint available at https://arxiv.org/pdf/2009.13926.pdf
- From June 2016 a new version of my Ph.D. thesis is available on arXiv at the link http://arxiv.org/pdf/1401.5702.pdf

Teachings

- Part C/OMMS supervisor for master students of the University of Oxford with a dissertation on Berkovich spaces.
- Teaching for a cycle of student seminars entitled "Non-Archimedean analysis" at Universität Regensburg in the winter term of 2014/2015, for 20 hours of teaching.
- Tutoring for the course of Mathematics of the Bachelor in "Facoltà di Agraria" of "Università degli studi di Padova"(20 hours of tutoring) in 2013.

Talks

Invitation to conferences

- -/09/2021: Invited speaker at "Intercity seminar on Arakelov geometry" in Regensburg with a talk entitled "*The sheafyness problem for Banach rings*".
- 13/09/2019: Invited speaker at "Intercity seminar on Arakelov geometry" in Kyoto with a talk entitled "*Analytic motivic sheaves over* $\mathbb{Z}$".
- 06/06/2019: Speaker at the "INdAM Program on Serre Conjectures and the p-adic local Langlands program" in Padova with a talk entitled "*A global perspective on Hodge Theory*". Video available at https://mediaspace.unipd.it/playlist/dedicated/119214951/1_d8zm99gi/1_4p4763qu
- 08/09/2017: Invited speaker at "Intercity seminar on Arakelov geometry" in Beijing with a talk entitled "*Analytic geometry over* $\mathbb{F}_1$ *and applications*".
- 31/07/2017: Invited speaker at the workshop entitled "Non-Archimedean and Tropical Geometry", at Univerität Regensburg, with an introductory lecture on Berkovich Spaces.

- from 13/12/2015 to 19/12/2015: participation at the workshop 1551 of the Mathematisches Forschungsinstitut of Oberwolfach, entitled "*Non-Archimedean Geometry and Applications*".
- 23/06/2015: Speaker at the workshop entitled "Analytic and Arithmetic Geometry", held at the Mathematical Institute of the University of Oxford with a talk entitled "*Quasi-abelian categories in analytic geometry*".
- 10/09/2014: Invited speaker at "Intercity seminar on Arakelov geometry" in Rome, with a talk entitled "*Dagger analytic geometry*".

Other talks

- 03/2021-04/2021: Two lectures at the series of online lectures "*Derived Bornological and Analytic Geometry*", one entitled "*Homological Bornological Algebra*" and the other "*Sheafyness of Banach Ring Spectra*". More information and recordings at https://sites.google.com/tcd.ie/hmispringlectureseries2021/home
- 11/02/2020: Seminar at the University of Warwick entitled "*Analytic spaces over Banach rings*".
- 16/05/2019: Seminar at the Institut Fourier in Grenoble entitled "*Analytic spaces over $\mathbb{Z}$ and Hodge Theory*".
- 06/07/2018: Seminar at the Mathematisches Institut of Universität Freiburg with the title "*The Rigidity Theorem for motives of non-Archimedean analytic spaces*".
- 23/02/2018: Seminar at the Mathematical Institute of the University of Oxford with the title "*Derived analytic geometry over $\mathbb{F}_1$ and p-adic Hodge Theory*".
- 24/04/2017: Seminar at Institut de Mathematiques Jussieu with the title "*Analytic geometry over $\mathbb{F}_1$ and applications*" in the cycle of seminars of Algebraic analysis.
- 07/01/2016: Talk at the "Oberseminar Arithmetische Geometrie" at Universität Regensburg with the title "*Foundations of derived analytic geometry*".
- 09/06/2015: Seminar at Universität Regensburg with the title "*Quasi-abelian categories in analytic geometry*".
- 09/03/2015: Seminar at the University of Padova with the title "*Dagger Geometry as Banach Algebraic Geometry*".
- 10/12/2014: Seminar at the Humboldt University of Berlin with title "*Analytic spaces and relative algebraic geometry on quasi-abelian categories*".
- 17/11/2014: Seminar at the Institut de Mathematiques Jussieu with title "*Dagger analytic geometry*" in the cycle of seminars of Algebraic analysis.
- 15/04/2014: Seminar at Universität Regensburg with title "*Dagger geometry*".

Visiting periods

- Visit at the Mathematisches Institut Universität Freiburg, invited by Simone Murro from 14/10/2018 to 03/11/2018.
- Long Visit at the Institute of Mathematics of the University of Oxford. Invited by Prof. Yakov Kremnizer from 01/02/2017 to 31/03/2017.
- In several occasions I have been invited by Prof. Yakov Kremnizer at the Institute of Mathematics of the University of Oxford for short visits: from 17/09/2018 to 29/09/2018, from 18/02/2018 to 03/03/2018 24/09/2017, from 24/09/2017 to 14/10/2017, from 18/09/2016 to 01/10/2016, from 13/03/2016 to 19/03/2016 and from 11/06/2015 to 25/06/2015.

Organization of conferences

- Organization of the workshop entitled “Algebraic and Geometric aspects in Quantum Field Theory", 16-18 April 2019, Universität Freiburg.

Peer-review activity

I am or I have been active as referee for following journals:

- Algebra and Number Theory;
- the Journal of Number Theory;
- the Quarterly Journal of Mathematics;
- Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas
- Advances in Operator Theory;
- Rendiconti del Seminario Matematico della Universitá di Padova;
- Operators and matrices;
- FILOMAT;
- Annals of Mathematics and Physics;
- Mathematical and Computational Applications;
- Far East Journal of Mathematical Sciences.

Scientific activity

Research interests

- Berkovich, Huber analytic spaces and the global analytic spaces of Poineau.
- Stein and compact Stein spaces in complex and non-Archimedean geometry and related notions.
- Bornological algebraic structures and their use in geometry and functional analysis.
- Derived geometry in broad sense, both algebraic and analytic.
- Exact categories and in particular quasi-Abelian categories.
- Geometry over $\mathbb{F}_1$ and its applications to arithmetic, to L-function theory and Langlands program.
- Tropical geometry and its relations with analytic geometry.
- Homotopy theory and Ayoub motives in non-Archimedean Geometry.
- Rigid cohomology and p-adic differential equations.
- Non-commutative geometry and $*$-algebras.

Activity as reviewer

I am active as reviewer for the online database zbMath.org.

Current research projects

My current research is focused on three main collaborations plus some projects in which I am planning to develop by myself.

Analytic motivic sheaves and motives

In my collaboration with prof. Kobi Kremnizer I am studying motivic sheaves over analytic spaces in the broad sense we previously defined. We are defining the categories of motivic sheaves $\mathbf{DA}_{\mathbb{A}^1_S}(S,\Lambda)$ for any analytic space and any coefficient ring Λ. The new categories we are defining give rise to new variations of motivic cohomologies that we think are related to semi-topological K-theory and Deligne cohomology.
In parallel, we are studying the p-adic realizations of motives of arithmetic varieties from a global perspective using a global version of the Robba ring.

C^*-algebras and bornological geometry

In my collaboration with Tomoki Mihara I am applying ideas from derived geometry to C^*-algebras and algebras of continuous functions on compact Hausdorff spaces with values on non-Archimedean valued fields. In particular, we have given a new characterization of the spectral topology of these spaces using the theory of quasi-abelian categories and applied this to prove effective descent for Banach modules and effective derived descent for complexes of Banach modules. We are planning to extend these results in several directions.

Global analytic spaces and analytic quasi-coherent sheaves

The new way of thinking to analytic spaces we developed in our previous works leads to new way of thinking to quasi-coherent sheaves and to more general analytification functors. In particular, we can introduce a new notion of quasi-coherent sheaf over analytic spaces that fixes the problems that previous (unsatisfying) proposed notions have. Also, having at our disposal a notion of analytification functor for any bornological ring, it is natural to ask if the GAGA principle still holds in this more general setting. I think to be able to prove a broad generalization of the known GAGA theorems.

Non-commutative geometry and arithmetic

In collaboration with Simone Murro I am able to describe some C^*-dynamical systems whose partition function is the Hasse-Weil zeta function of an arithmetic scheme. This generalizes the notion of Bost-Connes system, that only works in the case where the arithmetic scheme is zero dimensional.