

# Federico Bambozzi

## Personal informations

- *Data and place of birth:* July 9, 1985, Loreto (AN), Italy.
- *Nationality:* Italian.
- *Residence:* via Bramante 43, 60025 Loreto (AN), Italy.
- *Place of Work:* Fakultät für Mathematik, Universität Regensburg, in Regensburg, Germany.
- *Current Position:* Post-doc fellow in the DFG funded CRC 1085 "Higher Invariants. Interactions between Arithmetic Geometry and Global Analysis".
- *Phone at work:* +49 941435810.
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## Academic achievements

- 04/2014: Ph.D. in Mathematics at the "Università degli studi di Padova" under the supervision of prof. Francesco Baldassarri, with thesis titled "*On a generalization of affinoid varieties*".
- 07/2010: Master's degree in Mathematics at the "Università degli studi di Torino" with final score 109/110, with thesis titled "*Fourier analysis in L-function theory*", supervisor Prof. Andrea Mori.
- 07/2007: Bachelor degree in Electronic Engineering at the "Università politecnica delle Marche", with thesis titled "*On a Family of Circulant Matrices for QC-LDPC Codes*", supervisor Prof. Franco Chiaraluce.

## Professional activities

- from 01/2017 to 12/2017: 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, funded by MIUR PRIN2010-11 “Arithmetic Algebraic Geometry and Number Theory”, under the supervision of Prof. Bruno Chiarellotto.

## Publications

- F. Bambozzi, “Closed graph theorems for bornological spaces”, the Khayyam Journal of Mathematics (2016).
- F. Bambozzi, O. Ben-Bassat, “Dagger Geometry as Banach Algebraic Geometry”, Journal of Number Theory 162 (2016): 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, O. Ben-Bassat, K. Kremnizer “Analytic Geometry over  $\mathbb{F}_1$  and the Fargues-Fontaine curve”, November 2017, available at <https://arxiv.org/pdf/1711.04885.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> and it has been submitted for publication as monography.
- F. Bambozzi “Theorems A and B for dagger quasi-Stein spaces”, February 2016, available at <http://arxiv.org/pdf/1602.04388.pdf>
- F. Bambozzi, O. Ben-Bassat, K. Kremnizer “Stein domains in Banach algebraic geometry”, November 2015, available at <http://arxiv.org/pdf/1511.09045.pdf>

## Teachings

- 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*

- 08/09/2017: Invited speaker at “Intercity seminar on Arakelov geometry” in Beijing.
- 31/07/2017: Invited speaker at the workshop entitled “Non-Archimedean and Tropical Geometry”, at Universität 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*”.

### *Talks in Universities*

- 24/04/2017: Seminar at Institut de Mathematiques Jussieu with 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 University of Regensburg with the title “*Foundations of derived analytic geometry*”.
- 09/06/2015: Seminar at University of Regensburg with the title “*Quasi-abelian categories in analytic geometry*”.
- 09/03/2015: Seminar at University of Padova with the title “*Dagger Geometry as Banach Algebraic Geometry*”.
- 10/12/2014: Seminar at Humboldt University of Berlin with title “*Analytic spaces and relative algebraic geometry on quasi-abelian categories*”.
- 17/11/2014: Seminar at Institut de Mathematiques Jussieu with title “*Dagger analytic geometry*” in the cycle of seminars of Algebraic analysis.
- 15/04/2014: Seminar at Regensburg University with title “*Dagger geometry*”.

### Visiting periods

- Short visit at the Institute of Mathematics of the University of Oxford. Invited by Prof. Yakov Kremnizer from 24/09/2017 to 14/10/2017.
- Visit at the Institute of Mathematics of the University of Oxford. Invited by Prof. Yakov Kremnizer from 01/02/2017 to 31/03/2017.

- Short visit at the Institute of Mathematics of the University of Oxford. Invited by Prof. Yakov Kremnizer from 18/09/2016 to 01/10/2016.
- Short visit at the Institute of Mathematics of the University of Oxford. Invited by Prof. Yakov Kremnizer from 13/03/2016 to 19/03/2016.
- Short visit at the Institute of Mathematics of the University of Oxford. Invited by Prof. Yakov Kremnizer from 11/06/2015 to 25/06/2015.

## Peer-review activity

I am active as referee for following journals:

- the Journal of Number Theory;
- the Quarterly Journal of Mathematics;
- Advances in Operator Theory;
- FILOMAT;
- Mathematical and Computational Applications.

## 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 and with mirror symmetry.
- Homotopy theory and Ayoub motives in non-Archimedean Geometry.
- Rigid cohomology and  $p$ -adic differential equations.

### *Current research projects*

My current research is focused on three main projects.

### Collaboration with prof. Kobi Kremnizer and Adam Topaz

My collaboration with prof. Kobi Kremnizer and Adam Topaz aims to further our previous work on the derived analytic geometry over  $\mathbb{F}_1$  and its applications to arithmetic. In our previous work we showed how simple analytic stacks over  $\mathbb{F}_1$  can be seen as analogues of the Fargues-Fontaine curve and how this analogy unveil a deep connection between the exponential sequence and the Fargues-Fontaine curve. For trying to go at the bottom of these issues and others that we met during our work we need to develop a homotopy theory of normed/bornological sets. This theory would rely on the the methods developed so far, *i.e.* it is a suitable stabilization of the model categories we have already defined. In this settings we envision generalized cohomology theories provided with the enriched structure of Banach groups which could lead to some new computation of THH and TC.

### Project with prof. Denis-Charles Cisinski

My project with professor Cisinski is about étale realizations of Ayoub's mixed motives of rigid analytic varieties. The main goal is to prove a rigidity theorem, analogous to Suslin and Voevodsky's rigidity theorem for a complete non-archimedean valued field  $K$ , and for any commutative ring  $\Lambda$  of positive characteristic  $n$ , with  $n$  invertible in the residue field of  $K$ . In modern language, we aim to produce an equivalence of triangulated categories

$$D(K, \Lambda) \cong \mathbf{RigDM}(K, \Lambda)$$

where the left hand side stands for the (unbounded) derived category of the category of sheaves of  $\Lambda$ -modules on the small étale site of the valuated field  $K$ , while the right hand side is Ayoub's category of rigid motives. Recall that, for any field  $k$  such that  $n$  is invertible in  $k$ , we also have an equivalence of triangulated categories

$$D(k, \Lambda) \cong \mathbf{DM}_h(k, \Lambda)$$

where the left hand side stands for the (unbounded) derived category of the category of sheaves of  $\Lambda$ -modules on the small étale site of the field  $k$ , and the right hand side is the  $\Lambda$ -linear version of Voevodsky's triangulated category of étale motives over  $k$ .

A further step might be to check that these equivalences are compatible with the nearby cycles functors as considered by Berkovich and by Ayoub in the contexts of étale sheaves over rigid varieties and in the context of motives of schemes. This will prove that the computations of the motivic nearby cycles functors in terms of the analytic Milnor fiber produced by Ayoub-Ivorra-Sebag is compatible with its analog in the context of étale sheaves, as provided by Berkovich's construction.

### References

- Francesco Baldassarri (Ph.D. advisor)  
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- Walter Gubler (former Post-doc mentor)  
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- Klaus Künnemann (former Post-doc mentor)  
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- Denis-Charles Cisinski (current Post-doc mentor)  
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