INFORMATIONS FOR THE PARTICIPATION AT THE ACT2019 SCHOOL

MATTIA GALEOTTI

Background: During my PhD thesis I worked on moduli spaces of curves with spin and principal bundles. To study the birational geometry of these spaces, there are several modern techniques involving stack theory, in particular by putting a Deligne-Mumford stack structure on the nodes of stable curves. This was in fact the front door to stack theory, and more generally to geometric applications of category theory, in my career. During my PhD, I also started a joint project with Sara Perna on the moduli spaces of Kummer varieties, from the double point of view of abstract Kummer varieties (quotients of abelian varieties) and embedded Kummer varieties (via the natural embedding induced by a principal abelian variety): this work allowed me to deepen my knowledge of stack theory, in particular by analyzing the relation between the moduli stacks of specific objects and the automorphism groups of particular isomorphism classes of these objects. In my post-doc I am focusing on topos theory, in particular analyzing the relations between the spaces of points of the topoi associated to different topologies on schemes. This allowed me to deepen the study of the geometrical-logical double interpretation of topoi: as geometric categories of sheaves, and as classifying spaces for models of theories.

PhD: I obtained my PhD the 30-11-2017 with a thesis on the moduli stacks of curves equipped with a G-bundle, for any finite group G. In particular, I developed an analysis of the birational geometry of the moduli space associated to the stack of curves with an S_3-bundle.

Order of project preferences:

(1) Toward a mathematical foundation for autopoiesis;
(2) Complexity classes, computation, and Turing categories;
(3) Formal and experimental methods to reason about dialogue and discourse using categorical models of vector spaces;
(4) Simplifying quantum circuits using the ZX-calculus;
(5) Partial evaluations, the bar construction, and second-order stochastic dominance
(6) Traversal optics and profunctors.

I can surely come to Oxford

STATEMENT FOR THE PARTICIPATION AT THE ACT2019 SCHOOL

MATTIA GALEOTTI

I am very interested in the ACT2019 School because in my mathematical career I am deepening the study of category theory, with a particular focus on topos theory, and I am exploring the many ramifications of this subject, the rich applications to different scientific fields. My main research subject are the spaces of points of specific topoi, and the relations between them. In carrying this analysis I found particularly useful the interplay between geometrical aspects and logic constructions, a duality which is allowed by the categorical construction of topoi. I hope to deepen my knowledge about these subjects by participating in the School and through the collaboration with other researchers in these fields.

Furthermore, in the prosecution of my career I would like to explore the applications and implications of category theory in other scientific fields, and therefore I think the School could be very important for me. In particular I think topos theory is a powerful tool to explore conceptual dualities, such as local-global and intrinsic-extrinsic, appearing in different natural and social sciences, and to work on important notion of modern sciences such as complexity, language, autopoiesis and computation. I hope that this school can help me develop my knowledge in some interdisciplinary research fields at the frontier between pure mathematics and natural or social sciences, where my geometrical and categorical background could be useful and productive.

Mattia Galeotti

Curriculum Vitæ

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✉ *mattia.galeotti@unitn.it*
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Personal profile

Born April 27, 1989

Birthplace Barga (LU) – ITALY

Current position Post-doc at Università degli Studi di Trento, Italy

Education

2014-2017 **PhD student in mathematics**, *Université Pierre et Marie Curie, Paris, Institut de Mathématiques de Jussieu.*

9/2013 **Master's Degree in mathematics**, *Université Pierre et Marie Curie, Paris, Mention "Très Bien" (Very Good).*
Supervisor: Alessandro Chiodo

2011-2014 **Student in mathematics**, *Ecole Normale Supérieure, Paris.*

9/2011 **Admitted at the International Selection**, *Ecole Normale Supérieure, Paris*, class of Sciences.

7/2011 **Laurea Triennale - Bachelor equivalent**, *Università di Pisa, 110/110 cum laude.*
Supervisor: Angelo Vistoli

2008-2011 **Student in mathematics**, *Scuola Normale Superiore, Pisa.*

2008-2011 **Student in mathematics**, *Università di Pisa.*

9/2008 **Admitted at the SNS**, *Scuola Normale Superiore, Pisa*, fourth in the class of Sciences.

PhD Thesis, (Institut de Mathématiques de Jussieu- Paris Rive Gauce)

Title ***Moduli of curves with principal and spin bundles: singularities and global geometry***.

Supervisor **Alessandro Chiodo**.

Defense **November 30, 2017**.

Papers

Singularities of moduli of curves with a universal root, Published on Documenta Mathematica, n.22 (2017).

Moduli spaces of abstract and embedded Kummer varieties, *joint work with Sara Perna*, arXiv: 1806.00267, under review.

Discrimination and algorithms. Encounters and confrontations between different definitions of fairness (in italian), under review.

Other Works

9/2013 **Extension of pluri-canonical forms on the singularities of moduli of curves**, *Master's research project*, under the direction of Alessandro Chiodo, Université Pierre et Marie Curie, Paris.

5/2012 **Hyperbolicity and the Yau-Schwarz lemma**, *Magister's project*, in couple with Kevin Boucher, under the direction of Henri Guenancia, Ecole Normale Supérieure, Paris.

7/2011 **Representations of the General Linear group**, *Bachelor's project*, under the direction of Angelo Vistoli, Università di Pisa.

Attended Conferences

7-11/1/2019 **A Journey Through Projective and Birational Geometry**, *Università degli Studi di Trento*, Trento.

20-21/12/2018 **Aeneas Conference: Migrating Algebraic Geometry**, *Università di Roma Tre*, Roma.

11-15/7/2018 **Topological Data Analysis and Persistent Homology**, *CIRM - Università di Trento - Università di Milano*, Levico Terme.

27-30/3/2017 **Cycles and Moduli**, *ETH*, Zürich.

23-27/1/2017 **Annual meeting of the research group GAGC-Algebraic Geometry and Complex Geometry**, *CIRM*, Marseille.

11-13/7/2017 **Conference on Complex networks: from theory to interdisciplinary applications**, Marseille.

22-24/3/2016 **CIMPA-CIMAT-ICTP School on Moduli of Curves**, *Cimat*, Guanajuato.

22/6-10/7/2015 **Pragmatic 2015 - Moduli of Curves and Line Bundles**, *Università di Catania*, Catania.

1-5/6/2015 **GAeL XXIII**, *KU*, Leuven.

25-31/5/2015 **Intensive research period: Algebraic Varieties and their Moduli**, *Centro Ennio de Giorgi*, Pisa.

4/2015 **Thematic Program on Algebraic Geometry**, *IMPA*, Rio de Janeiro.

28-30/4/2014 **Mirror Symmetry and Spin Curves**, Palazzone di Cortona, Italy.

Talks and Posters

26/04/2018 **Pure Mathematics Seminar**, *University of Liverpool*, presented talk: "Singularities and global geometry of moduli of curves with spin and principal bundles".

13/03/2018 **Complex Geometry Seminar**, *Institut de Mathématiques de Marseille*, presented talk: "Moduli of curves with principal and spin bundles : the singular locus via graph theory".

6/03/2018 **Algebraic Geometry Seminar**, *IMAG Montpellier*, presented talk: "Moduli of curves with principal and spin bundles: singularities and global geometry".

26/10/2017 **Geometry Seminar**, *Università di Roma 3*, presented talk: "Moduli of curves with principal and spin bundles: singularities and global geometry".

11/10/2017 **Geometry Seminar**, *Università di Pisa*, presented talk: "Moduli of curves with principal and spin bundles: singularities and global geometry".

24/5/2017 **Seminar of young researchers in geometry**, *Université de Rennes 1*, presented talk: "Curves with a root bundle and their ghost automorphisms".

27-30/3/2017 **Cycles and Moduli**, *ETH*, Zürich, presented poster: "Moduli of curves with a root via graph theory".

28/1/2016 **PhD students' seminar**, *IMJ - Paris 6*, presented talk: "Deligne Mumford border of the moduli space of curves".

1-5/6/2015 **GAeL XXIII**, *KU*, Leuven, presented poster: "Singularities of moduli of curves via graphs".

22/4/2015 **UFF Algebraic Geometry Seminar**, *UFF*, Nitéroi, presented talk: "On the singularities of $\overline{\mathcal{R}}^k_{g,\ell}$".

15/4/2015 **IMPA Algebraic Geometry Seminar**, *IMPA*, Rio de Janeiro, presented talk: "On the singularities of $\overline{\mathcal{R}}^k_{g,\ell}$".

26/2/2015 **Work group "Moduli Spaces"**, *IMJ - Paris 6*, presented talk: "Curves r-spin, natural covering morphisms, classification of singularities".

Teaching

9-12/2016 **Teaching assistant for "Eléments de Mathématiques"**, *L1 at UPMC*, Paris, in progress.

9-12/2015 **Teaching assistant for "Probabilités Elémentaires"**, *L3 at UPMC*, Paris.

9-12/2015 **Teaching assistant for "Eléments de Mathématiques"**, *L1 at UPMC*, Paris.

1-4/2015 **Teaching assistant for "Suites et Intégrales, Algèbre Linéaire"**, *L1 at UPMC*, Paris.

9-11/2014 **Teaching assistant for "Eléments de Mathématiques"**, *L1 at UPMC*, Paris.

Other

3/2017 **I attended the course "Introduction to statistical machine learning for physicists"**, *organized by the "École Doctorale Physique en Île-de-France"*, IHP, Paris.

7/2008 **Participation at the International Mathematical Olympiads**, *Madrid, Spain*, bronze medal.

7/2007 **Participation at the International Mathematical Olympiads**, *Hanoi, Vietnam*, bronze medal.

UNIVERSITÀ DEGLI STUDI
DI TRENTO

Dipartimento di Matematica

To the kind attention of the Scientific Organizers of the school ACT 2019

I am writing to you in order to support the application of Mattia Galeotti, who is a post-doc fellow in our algebraic geometry group in Trento. During his PhD in Paris Mattia investigated the geometry of moduli spaces of curves by adopting the categorical point of view of stacks and he is now mainly interested in topos theory. I can witness both his ability to quickly master new fields of abstract mathematics and his curiosity for interdisciplinary applications. I believe that Mattia is strongly motivated in attending your school, which could be a great opportunity for his career, and that his brilliant skills would allow him an active and successful participation.

With my best regards,

Claudio Fontanari

Department of Mathematics
University of Trento
http://www.science.unitn.it/~fontanar/