MARCO RAMPAZZO

PERSONAL INFORMATION

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ACADEMIC ACTIVITY

Current position

Postdoctoral researcher, University of Antwerp — February 2025 – now

Previous positions

Postdoctoral researcher, University of Bologna — February 2021 – January 2025
Teaching assistant, University of Bologna — October 2021 – January 2022
Teaching assistant, University of Stavanger — October 2020 – December 2020
PhD student in mathematics, University of Stavanger — September 2016 – September 2020

Long term visits

Guest of the Paul Sabatier University, Toulouse — February 2019 – May 2019
Funding: Norwegian Research Council mobility grant

Short term visits

Guest of Imperial College London, London — May 19 – November 23 2025
Funding: Imperial College London

Guest of the Institute of Basic Science, Pohang — April 7 – November 11 2025
Funding: Institute of Basic Science

Guest of the University of Antwerp, Antwerp — November 21 – November 23 2024
Funding: University of Antwerp

Guest of the Jagiellonian University, Kraków — May 06 – May 17 2024
Funding: INdAM – GNSAGA, Jagielloinan University

Guest of the Chinese University of Hong Kong, Hong Kong — March 08 – March 13 2024
Funding: The Chinese University of Hong Kong

Guest of the Max Planck institute for Mathematics in the Sciences, Leipzig — June 22, 2022 – June 24, 2022
Funding: MPS MiS

Guest of the Univeristy of Augsburg, Augsburg — December 28, 2023 – December 01, 2023
Funding: University of Augsburg

Guest of the Jagiellonian University, Kraków — February 05, 2024 – February 09, 2024
Funding: Jagiellonian University

OTHER COLLABORATIONS

Algoretico s.r.l.s.
https://www.algoretico.it — January 2022 – June 2023
Topics: recommendation systems, reinforced learning, rectification problems in multiview geometry.

Hello Human s.r.l.
https://www.hellohuman.it — July 2023 – Dec 2024
Topics: natural language processing, LLM-based approach to recommendation systems, feature extraction, sentiment analysis.

Humanos s.r.l.
https://humanos.it — Dec 2024 – Sep 2025
Topics: retrieval-augmented generation on graph databases, LLM-based recommendation systems, multi-agent LLM-based virtual assistants.

EDUCATION

PhD in Mathematics — May 2021
University of Stavanger
Supervisor: Michał Kapustka
Thesis: "Equivalences between Calabi–Yau mainfolds and roofs of projective bundles"

Master's degree in Physics — July 2016
University of Milan

Bachelor's degree in Physics — December 2013
University of Milan

RESEARCH INTERESTS

My research interests are centered on complex algebraic geometry, with a particular focus on the following areas.

- **Derived categories and semiorthogonal decompositions:** Exceptional collections, semiorthogonal decompositions and mutations provide powerful tools to understand derived categories of coherent sheaves and categorical resolutions of singularities, and to investigate the geometric information that they carry.
- **Birational equivalences, K-equivalence, and the DK conjecture:** While the derived category is known to be an invariant up to isomorphism for smooth Fano and general type varieties, its behavior as a birational invariant in broader settings remains the subject of open conjectures. In particular, there is substantial evidence suggesting that certain birational transformations, known as K-equivalences, should induce equivalences at the level of derived categories.
- **Gauged linear sigma models, phase transitions, mathematical physics:** In physics, gauged linear sigma models are supersymmetric gauge theories that exhibit multiple phases. Unlike the original abelian models, non-abelian GLSMs can have several geometric phases, each corresponding to the geometry of a smooth projective variety. Conjecturally, the physical relationship between these phases is reflected mathematically by Fourier–Mukai functors inducing equivalences, or embeddings, between the derived categories of the associated varieties.

- **Varieties with two projective bundle structures:** The classification of simple K-equivalences, i.e. K-equivalences which are resolved by single smooth blowups, is closely related to the classification of special Fano varieties called *roofs*. These are varieties of Picard rank two, whose extremal contractions are projective bundles, and such that there is a line bundle which restricts to $\mathcal{O}(1)$ on the fibers of both contractions. Despite being a roof is a rather restrictive condition, the latter classification is still an open problem.

INVITED SPEAKER

Workshop "Semiorthogonal decompositions for representations of algebraic groups".
Full exceptional collections on G/B — Bielefeld, September 3 2025

MAGIC Seminar.
Derived categories and nodal Gushel–Mukai fourfolds — London, May 19 2025

Algebraic Geometry Seminar.
Gushel–Mukai fourfolds and flops — Pohang, April 08 2025

Number Theory and Algebraic Geometry Seminar.
Derived categories and flops — Leuven, April 02 2025

Analysis & Geometry Seminar.
Exceptional collections for algebraic varieties — Antwerp, February 26 2025

Algebra, Geometry and Number Theory Seminar.
Derived categories and birational transformations — Antwerp, November 22 2024

IMPAN colloquium.
An introduction to derived categories of homogeneous varieties — Kraków, May 16 2024

IMPANGA seminar.
Derived categories of generalized Grassmannians — Warsaw, May 11 2024

MIST workshop on Derived Categories
Generalized Grassmann flips vs pushforwards of hyperplane sections — Hong Kong, March 9 2024

Seminar of Algebraic Geometry of the University of Kraków.
DK conjecture for generalized grassmann flips — Kraków, February 9 2024

Seminar of Algebra and Number Theory of the University of Augsburg.
Full exceptional collections for homogeneous varieties — Augsburg, November 30 2023

Conference "Modern Perspectives on Birational Geometry".
Simple K-equivalence and semiorthogonal decompositions — Taipei, July 29 – August 4 2023

Workshop "Derived categories and birational geometry".
K-equivalence and derived categories — Milan, June 30 – July 1 2022

SAXAG seminar. *Derived categories and GLSM phase transitions* — Leipzig, June 23 2022

IMPANGA seminar. *Homogeneous roofs of projective bundles and semiorthogonal decompositions* — Warsaw, June 3 2022

Workshop "Grothendieck ring and derived category: a gathering".
$\mathbb{L}$-equivalence for Calabi-Yau pairs in generalized Grassmannians — Turin, April 27–28 2022

Seminar of Algebra and Geometry of the University of Bologna.

Semiorthogonal decompositons and homogeneous varieties — Bologna, June 15 2021

Seminar of Algebra of the Jagellonian University. *Computing Hodge numbers of Calabi–Yau varieties in Grassmannians* — Kraków, April 11 2019

Workshop "Motives of Calabi–Yau manifolds". *A gauged linear sigma model description for a pair of non birational Calabi–Yau threefolds* — Kraków, May 19–21 2018

CONTRIBUTED TALKS

Conference "Recent advances in classical algebraic geometry. *Hodge structures and derived categories of Fano varieties in Grassmannians.* — Kraków, June 27 – July 2 2022

Workshop "Algebraic Geometry days". *Mukai roofs and K3 surfaces* — Stavanger, November 25–26 2019

Conference "Nasjonalt Algebramøte 2019". *Derived equivalence of Mukai roofs: the case of K3 surfaces of degree 12* — Oslo, November 7–8 2019

Conference "Nasjonalt Matematikermøte 2018, PhD day". *A GLSM description for a pair of non birational Calabi–Yau threefolds* — Bergen, September 12 2018

SEMINARS AND COURSES

PhD course: *Derived categories of rational homogeneous varieties* — Bologna, March – April 2024
18 hours. Organizer and speaker

Seminar: *Bridgeland stability conditions* — Bologna – Chemnitz – Nancy, fall 2021
Organizer together with Simone Billi, Francesco Denisi, Franco Giovenzana, Annalisa Grossi, Mihai–Cosmin Pavel.
Homepage: https://marcorampazzo.github.io/bridgeland

Seminar: *The mathematics of gauged linear sigma models* — Toulouse, spring 2019
Organizer and speaker

TEACHING

Courses:

Linear algebra	fall 2019

Exercise classes / tutoring:

Linear Algebra	fall 2021
Discrete Mathematics, Linear Algebra	fall 2020
Probability and Statistics	spring 2020
Linear algebra	fall 2018
Linear algebra	fall 2017

PUBLICATIONS AND PREPRINTS

1. *PhD Thesis:* Marco Rampazzo. *Equivalences between Calabi–Yau manifolds and roofs of projective bundles*. (2021). https://doi.org/10.31265/usps.78
   Available online at https://ebooks.uis.no/index.php/USPS/catalog/book/78
2. *Publication:* Marco Rampazzo. *Fano fibrations and DK conjecture for relative Grassmann flips*. (2024). Accepted by Publications of RIMS. Available at https://arxiv.org/abs/2403.10393

3. *Publication:* Riccardo Moschetti and Marco Rampazzo. *Fullness of the Kuznetsov-Polishchuk exceptional collection for the spinor tenfold*. (2024). Algebras and Representation Theory. https://doi.org/10.1007/s10468-023-10246-6

4. *Publication:* Marco Rampazzo. *New counterexamples to the birational Torelli theorem for Calabi–Yau manifolds*. (2024). Proceedings of the American Mathematical Society. https://doi.org/10.1090/proc/16745

5. *Publication:* Enrico Fatighenti, Michał Kapustka, Giovanni Mongardi, Marco Rampazzo. *The generalized roof $F(1,2,n)$: Hodge structures and derived categories*. Algebras and Representation Theory 26, 2313–2342 (2023). https://doi.org/10.1007/s10468-022-10173-y

6. *Publication:* Michał Kapustka, Marco Rampazzo. *Mukai duality via roofs of projective bundles*. Bull. Lond. Math. Soc. (2022). https://doi.org/10.1112/blms.12597

7. *Publication:* Michał Kapustka, Marco Rampazzo. *Torelli problem for Calabi-Yau threefolds with GLSM description*. Communications in Number Theory and Physics, Volume 13, No. 4 (2019). https://dx.doi.org/10.4310/CNTP.2019.v13.n4.a2

8. *Preprint:* Will Donovan, Wahei Hara, Michał Kapustka, Marco Rampazzo. *Window categories for a simple 9-fold flop of Grassmannian type*. (2025). Available at https://arxiv.org/abs/2510.06184

9. *Preprint:* Marco Rampazzo, Ying Xie. *Derived equivalence for the simple flop of type $D5$*. (2024). Available at https://arxiv.org/abs/2410.20446

10. *Preprint:* Marco Rampazzo. *Calabi–Yau fibrations, simple K-equivalence and mutations*. (2020). Available at https://arxiv.org/abs/2006.06330