

# Mathieu Ballandras

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## Education

2017-2021 **Université de Paris / SISSA, Trieste**: PhD about *Weyl Group actions on the cohomology of character and quiver varieties*, under the supervision of Emmanuel Letellier and Fernando Rodriguez Villegas.

2016-2017 **Université Pierre et Marie Curie, Paris**: Master 2 in mathematics, obtained with high honours

2015-2016 **École Normale Supérieure, Paris**: Master 2 in physics, obtained with high honours

2013-2015 **École Polytechnique, Palaiseau**: Studying engineering at Ecole Polytechnique, focusing mainly on mathematics, physics and computer science

2010-2012 **Lycée Louis-Le-Grand, Paris**: Preparatory classes in Mathematics and Physics

## Work experience

2021(-2023) **ICMAT, Madrid**: Postdoctoral researcher, in collaboration with Oscar García-Prada, I study intersection cohomology of certain moduli spaces.

2017-2021 **Université de Paris**: Teaching assistant in calculus and linear algebra, supervision of a research internship for 1st and 2nd year undergraduate students, math support course for biologists.

January-April 2016 **Laboratoire MSC, Université Paris Diderot**: Research internship in physics for neurosciences

2015-2017 **Lycée Carnot, Lycée Buffon, Paris**: Examiner in preparatory classes, in physics.

March-July 2015 **Institut für Theoretische Physik, Leipzig**: Research internship in quantum field theory on curved spacetime. I studied the Schwinger effect in de Sitter space.

Summer 2014 **Solent, Nanterre**: 2-month internship in an IT company. I developed a program to simulate wave movement at the surface of the sea and the behavior of a boat. This is leading to the further development of a smartphone application to help sailors.

2012-2013 **French Air Force**: 6-month internship as an officer managing an IT project. I developed a program to help share data between different departments.

## Publications

### Physics

***Understanding the Generation of Network Bursts by Adaptive Oscillatory Neurons.***  
Fardet, Bottani, Ballandras, Metens, Monceau. **Frontiers in Neurosciences, 2018 .**

### Mathematics

***Trivializations of moment maps,*** *arXiv:2010.08294* (to appear in Annales de l'Institut Fourier) Proof of technical result about quiver varieties important for the remaining of the thesis.

***Intersection cohomology of character varieties,*** **Journal de l'École polytechnique — Mathématiques, Tome 10 (2023)**

Main result of the thesis, proof of the Poincaré polynomial specialization of a conjecture from Letellier about intersection cohomology of character varieties.

***Comet-shaped quiver varieties, Weyl group actions, and modified Kostka polynomials,*** *arXiv:2301.03434* A combinatorial result related to intersection cohomology of comet-shaped quiver varieties.

## Special skills

**Languages:** French (mother tongue), English (highly proficient), Spanish (advanced)

**IT:** Good skills with C++ and Lisp