Daniel Perez

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Contact

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Education

2019-2022 **PhD. in mathematics, École normale supérieure, Paris, France**

- Thesis title : Barcodes in Riemannian geometry and probability.
- Supervisors : Pierre Pansu and Claude Viterbo.

2018-2019 **M2 Arithmetic, analysis and Geometry (AAG), Université Paris-Saclay, France**

- GPA of 14/20 and master thesis grade of 16/20.

2017-2018 **M1 High Energy Physics (HEP), École Polytechnique, France**

- GPA of 16/20 and best M1 thesis, with a grade of 17.5/20

2017 **Summer School in Particle and Astroparticle Physics of Annecy-le-Vieux**

2016-2017 **M1 Physics at Université Pierre-et-Marie-Curie Paris 6, France**

- GPA of 15/20 and best M1 thesis, with a grade of 17/20

2013–2017 **Hons BSc. in physics-mathematics,** *summa cum laude*, **University of Ottawa, Canada**

- Graduated with a CGPA of 9.8/10.0

2014 **Internationale Bodenseehochschule, Universität Konstanz, Germany**

2010-2013 **Cisco Certified Entry Networking Technician (CCENT), Canada**

2008-2013 **Diplôme d'études secondaires, Collège Durocher Saint-Lambert, Canada**

Languages

Français	CEFR C2
Anglais	CEFR C2
Espagnol	CEFR C2
Allemand	CEFR C1

`Python`	`Mathematica`
`Yorick`	`Java`
`Bash`	LaTeX
	MS Office

Work and Research Experience

2019-Present **PhD. in mathematics**

- Study of the superlevel sets of a function and their topology by means of trees and their relation with barcodes.
- Study of the persistence modules of almost surely continuous stochastic processes in dimension 1.
- Introduction of the local and global ζ-functions that can be associated to the barcode of a random process and study of their properties.
- Introduction of a new statistical test using topological properties of the superlevel sets of processes in the framework of α-stable processes.
- Study of the non-linear Schrödinger equation in the framework of Gaussian random initial data.

2019-2021 **Teacher assistant, Université Paris-Saclay**

— M191 : Mathematics of modelling (Fall 2019)
— M259 : Linear Algebra for Physicists (Fall 2019 and 2020)
— M302 : Integration (Fall 2020)
— M252 : Linear Algebra 2 (Winter 2020)

2019 **M2 Internship, Laboratoire de Mathématiques d'Orsay (LMO)**

— Studied persistence modules and their application to topological data analysis (TDA) and geometry.
— Provided explicit examples of data geometries for which persistent homology depends on the base field.

2018 **M1 Internship, Centre de Physique Théorique (CPHT)**

— Derivation of the Dirac equation in curved space based on the partition of the covariant derivative into irreducible representations of a Cartan geometry modelled on $(\mathfrak{iso}(\mathbb{K}^n, Q), \mathfrak{so}(\mathbb{K}^n, Q))$.
— Introduction of a graphical method for the computation of traces of γ-matrices.
— Study of the Einstein-Cartan theory of gravitation.
— Proof of the spontaneous symmetry breaking of the Higgs mechanism in a gauge invariant manner.

2017 **M1 Internship, Laboratoire de Physique Théorique et Hautes Énergies (LPTHE)**

— Introduction to modern computational methods for multi-loop calculations of a ϕ^4-theory and their applications.
— Calculation of the β-function and the two-loop critical exponents of a ϕ^4-theory.
— Study of the applicability of the above results based on symmetry classes and in particular to the Ising model.

2014-2016 **Shape Memory Alloy (SMA) Research, University of Ottawa**

— Acquired programming skills in Yorick.
— Analysis of hysteresis and avalanche measurements in CuAlNi and self-organisation of martensitic variants during thermal cycling by X-ray photon correlation spectroscopy (XPCS).
— Study of the time memory effect (TME) in SMAs and review of the literature concerning this and other related effects such as the Hammer effect and the micromemory of stress-induced martensitic transformations.
— Wrote an informal review on the TME as well as an introduction to the Phenomenological theory of Martensite
— Linked the literature on the TME in SMAs to the data that was collected by the research group at the Argonne National Laboratory
— Presented the research at the March 2016 American Physical Society (APS) meeting, the 2014 and 2015 CUPC, and the 2015 Undergraduate Research Opportunity Program (UROP) poster presentation hosted by the University of Ottawa.

2015 **Summer Undergraduate International Research Internship (SIRI), Université Claude-Bernard, Lyon 1**

— A study of basic model theory, elementary extension theorems, compactness theorems, quantifier elimination and countable models.
— Proved the downwards direction of Morley's theorem under the context of gaining insight on $\aleph_1$-categorical theories.

Été 2015 **Three UK, London, United Kingdom**

— Worked as a salesperson, developing sales and interpersonal skills.
— Received formal sales training, and gained knowledge of the mobile phone and broadband markets.

2013 **International Summer School for Young Physicists (ISSYP)**

— Published an article in Phys13 News on the compactification of Kaluza-Klein dimensions and the unification of gravity and electromagnetism in a 5D spacetime.

2012–2013 **Students on the Beamline (SotB), Canadian Light Source (CLS)**

— X-ray diffraction and spectroscopy (XRD, XAS) experiments on the use of hydroxyapatite and α-TCP as biomaterials for bone reconstruction were carried out.
— Second place at the CLS student project fair.

Volunteering and Extracurriculars

2020-Present **Voices of nuclear**

— Head of analysis and outlook : work on the energy scenario of the Voices of Nuclear and participation in the public consultation of the RTE report as an analyst for the Voices.
— Attended COP26 as an ambassador for the Voices of nuclear.
— Community Manager on Twitter and Facebook during the Fukushima campaign.
— Responsible for advertising campaigns on Facebook, Twitter and LinkedIn.
— Developed several videos in 7 languages to popularise nuclear issues.
— Raising public awareness and running the climate tent at Stand Up for Nuclear in Paris in 2020 and in Paris and Lyon in 2021.

2010-2016 **Tutoring**

— Tutoring in physics, mathematics, chemistry, English, programming and economics at undergraduate and graduate levels.

2013 **Anne Frank Museum visiting exposition guide**

— Guided a tour of the Dutch Anne Frank Museum in Montreal which received over 2000 visitors ;
— Explained Anne Frank's life and raised guided over 100 people through the visitng exposition, raising awareness about the relevance of the Holocaust and the Second World War today ;
— Received an honourable mention for commitment.

2013 **Learning for a Sustainable Future (LSF-LST)**

— Gave a talk at the 2013 LSF-LST Ontario symposium on the importance of extracurricular activities in students' lives.
— Discussed issues relevant to today's education system, proposed and drafted resolutions to be presented to local governments and policymakers.

2011-2013 **UNESCO**

— Raised awareness and funds for issues such as poverty, child soldiers and lack of water ;
— Helped organise and participate in more than five active campaigns per year.

2011-2013 **Amnesty International**

— Helped organise and work out the logistics of a writing marathon for political prisoners.
— Sent over 3000 letters written during the writing marathon in two years of work with my colleagues.

2011-2013 **Free the Children**

— As part of the Vow of Silence campaign, raised over 8000 CAD with the organisation, which was used to build a small school in Sierra Leone.
— Raised 5000 CAD to build a tank next to the school in Sierra Leone in 2013.

Publications, Forthcoming Publications and Dissertations

Mathematics

— *On C^0-persistent homology and trees*, Daniel Perez, arXiv: 2012.02634, 2020.
— *On the persistent homology of almost surely C^0-stochastic processes*, Daniel Perez, arXiv: 2012.09459, 2020.
— *ζ-functions and the topology of superlevel sets of stochastic processes*, Daniel Perez, arXiv: 2110.10982, 2021.
— *Local ζ-functions in stochastic persistent homology*, Daniel Perez, à paraître.

Energy policy

— *On Sovacool's et al. study on the differences in carbon emissions reduction between countries pursuing renewable electricity versus nuclear power*, Daniel Perez, HAL: 03170325, 2021.
— *RE : Response to Daniel Perez's Matters Arising*, Daniel Perez, Sussex Energy Group at SPRU, 2021.

Physics

— *A Geometrical Overview of Results in Theoretical Physics*, Daniel Perez.
— *Introduction to the Critical Properties of the ϕ^4-model* , Daniel Perez.

Awards, Distinctions and Certificates

2019-2022	Doctoral contract MESRI
2017-2019	Université Paris-Saclay Scholarship (monetary award of 21600 EUR over two years)
2016-2017	Erasmus+ Scholarship (monetary award of 8470 EUR)
2016-2017	University of Ottawa Mobility Scholarship (monetary award of 3000 CAD)
2014-2016	Faculty of Science Dean's Honours List (thrice)
2014-2015	Faculty of Science "Perfect 10" Award (twice) (monetary award of 2000 CAD)
2015	SIRI Scholarship (monetary award of 3000 CAD)
2015	NSERC Undergraduate Student Research Award (monetary award of 4500 CAD)
2014	UROP (monetary award of 1000 CAD)
2011-2013	Excellence, Eulalie-Durocher and Liliane Grégoire-Gaudreau Prizes
2012–2013	Cisco Certified Network Associate I and II with recommendation from John T. Chambers

References

Pierre Pansu	pierre.pansu@math.u-psud.fr
Claude Viterbo	claude.viterbo@ens.fr
Cédric Lorcé	cedric.lorce@polytechnique.edu
Sofian Teber	teber@lpthe.jussieu.fr