Léo Brunswic

Curriculum Vitae

Education

2014-2017 **PhD (Mathematics)**, *Université d'Avignon (UAPV)*, Avignon, France.
Title : Polyhedral Cauchy-surfaces of singular flat spacetimes. Defended December 22nd 2017, scientific level : exceptionnal.

2011–2012 **Agregation (Mathematics)**, *Ecole Normale superieure de Lyon (ENSL)* , Lyon, France.
Nationwide competitive examination for highest teaching certification, final rank : 10th

2009–2011 **Masters of Science (Mathematics)**, *ENSL*, Lyon, France.
Speciality : Number Theory

2008–2009 **Bachelor of Science (Mathematics)**, *ENSL*, Lyon, France.

2006–2008 **Classe Préparatoire aux Grandes Ecoles MP***, *Lycée Louis Le Grand*, Paris, France.

Master Thesis

Title *Deformation space of galoisian representations*

Supervisor Professor Laurent Berger

Laboratory UMPA, Lyon, France

Description An ingredient of the proof of Shimura-Taniyama-Wiles conjecture is the study of representations of absolute galois groups p-adic vector spaces. More precisely, let p be a prime numbe, a finite extension K of $\mathbb{Q}_p$, $\mathcal{O}$ its ring of integers and k the field $\mathcal{O}/\mathfrak{m}$ where $\mathfrak{m}$ is the maximal ideal of $\mathcal{O}$. Let $\pi : \mathcal{O} \to k$ be the natural projection. Given a map $\overline{\rho} : \mathrm{Gal}(\overline{\mathbb{Q}_p}/K) \to \mathrm{GL}(n,k)$ we can consider maps $\rho : \mathrm{Gal}(\overline{\mathbb{Q}_p}/K) \to \mathrm{GL}(n,\mathcal{O})$ such that $\pi \circ \rho = \overline{\rho}$. This thesis presents a proof of the representability of the functor associating to $\overline{\rho}$ the set of representation ρ such that $\pi \circ \rho = \overline{\rho}$ as well as fundamental properties of the universal representation .

Internship Thesis

Title *Gauss-Bonnet-Chern Theorem and applications to Closure of Buchert Equations*

Supervisor Professor Thomas Buchert

Laboratory	CRAL, Lyon, France
Description	Used as a fitting model, the standard model of cosmology with postulated Dark Energy and Dark Matter sources agrees to a large extent with observational data. However, this model leave unanswered "What is Dark Energy/Matter?". A seminal work of Buchert and others try to answer this question within the Einstein Theory of Gravitation through estimations of the standard model's bias induced by the assumption of a homogeneous universe. This internship contributed to the framework by generalising to dimension 3+1 an estimate based on the Gauss-Bonnet-Chern Theorem obtained by Magni for dimension 2+1 dust universe model.

Experience

2018–present **Post-doctoral position**, Centre Recherche Astrophysique de Lyon, Lyon, France, ERC grant ARThUs supervised by Pr. Thomas Buchert.

2017–present **CTO**, France1900.com, Paris, France, A web company on old postcards.

2014–2017 **PhD student**, Laboratoire de Mathematiques d'Avignon, UAPV, Avignon, France, supervised by Pr. Thierry Barbot.
Contributions to the theory of Globally hyperbolic Cauchy-complete singular flat spacetimes of dimension 3 and its interaction with Teichmüller Theory

Detailed achievements:
- Classification of singular spacetimes
  - Definition and description of BTZ-extension of a singular spacetimes with application to the extension of Mess Theorem to Cauchy-compact flat spacetimes with BTZ.
  - Definition of the concept of BTZ-extension. Proof of fundamental properties and application to the aforementioned Mess Theorem.
- Convex polyhedral Cauchy-surfaces in singular spacetimes.
  - Construction of a Penner-Epstein Cauchy-Surface in Cauchy-compact flat spacetimes with BTZ.
  - Parametrisation of Polyhedral surfaces of given topology by Penner's decorated Teichmüller space via linear spacetimes with BTZ.
- Lectures and seminar (see below)
- Mathematics teaching at undergraduate level
  - Course "Mathematics softwares for teaching" (3rd year)
    · curriculum definition
    · course material conception
    · lectures and tutorial classes
  - Course "Introduction to numerical analysis" (3rd year)
    · course material conception
    · tutorial classes
  - Probability and statistics (1st year)
    · tutorial classes

2013–2014 **Mathematics Teacher**, Lycée Colbert, Lyon,France.
Mathematics Teacher in 10th grade, 12 hours a week.

2009–2013 **Oral examiner**, Lycée du Parc and Lycee la Martiniere monplaisir, Lyon,France.
Hour-long weekly oral examination for second year undergraduate students in French "classe preparatoire" (2 hours/week).

2011–2012 **Intern**, Centre de Recherche Astronomique de Lyon, Lyon.
Contribution to the theory of averaged cosmology.

Lectures

- Title: Decorated Teichmüller space, polyhedral surfaces and spacetimes with BTZ(60min);
Places: Geometry seminar of Caltech and Luxembourg, Heidelberg, EPFL (Lausanne), Paris Rive-gauche, Monptellier, Avignon and Marseilles universities. Cycle of lectures "Paroles aux jeunes chercheur" in Strasbourg.
- Title: Constructions of polyhedral Cauchy-surfaces in singular spacetimes(60min);
Places: Workshop "Teichmüller Theory and geometric structures on 3-dimensional manifolds" in Luxemburg, Workshop "International Workshop on Geometry, Dynamics and Anosov Representations" in Santigao (Chile).
- Title: "Cauchy-compact flat singular spacetimes" (2x45min);
Place : CIRM in Luminy (France) "Séminaire Commun d'Analyse Géométrique".
- Title: "Alexandrov Theorem for singular spacetimes" (25min);
Place : "Junior Gear Retreat 2017" in Stanford,CA (USA).

Computer skills

Advanced	python,C++,Linux, LaTeX, Sage, Geogebra, Scilab/ Matlab
Intermediate	html, javascript, Coq, OpenOffice, Microsoft Windows
Basic	Visual Basic, Caml, PIC16 assembly language, LAMP

Languages

French	**Mothertongue**	
English	**Intermediate**	*fluent*
German	**Basic**	*Basic words and phrases only*

Interests

- Piano
- Cooking
- Metal bands...
- Chess
- Poker