



**Topics at the Interface of Low Dimensional
Group Actions and Geometric Structures
(4 - 15 Jan 2021)**

Introductory School
(4 - 8 Jan 2021)



**ORGANIZING
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Topics at the Interface of Low Dimensional Group Actions and Geometric Structures

Introductory School: 4 - 8 January 2021

Warning: the day is indicated with respect to GMT, please adjust for your time zone

Monday, 04 Jan 2021		
GMT Time	Title	Speaker
Asia & America		
0200 - 0230	Welcome tour in Gathertown	Organizers
0230 - 0330	D Lecture Part 1 Introduction to the Large Scale Geometry of Nilpotent and Solvable Lie Groups	Tullia Dymarz University of Wisconsin, Madison, USA
0300 - 0500	D1a Problem session	
Asia & Europe		
0830 - 0900	Welcome tour in Gathertown	Organizers
0900 - 1000	D Lecture Part 1 Introduction to the Large Scale Geometry of Nilpotent and Solvable Lie Groups	Tullia Dymarz University of Wisconsin, Madison, USA
1000 - 1130	D1b Problem session	
1145 - 1245	G Lecture Part 1 From Ping-pong in the Grassmannian to Anosov Representations (I)	François Guéritaud Université de Strasbourg, France
1245 - 1415	G1a Problem Session	
Europe & Asia		
1500 - 1530	Welcome tour in Gathertown	Organizers
1530 - 1630	M Lecture Part 1 Hyperbolicity & Mapping Class Groups	Yair Minsky Yale University, USA
1630 - 1800	M1a Problem Session	
1800 - 1830	<i>Break</i>	
1830 - 1930	B Lecture Part 1 An Introduction to AdS Geometry	Francesco Bonsante Università degli Studi di Pavia, Italy
1930 - 2100	B1a Problem Session	

Monday, 04 Jan 2021		
GMT Time	Title	Speaker
Asia & America		
2345 - 0045	G Lecture Part 1 From Ping-pong in the Grassmannian to Anosov Representations (I)	François Guéritaud Université de Strasbourg, France
0045 - 0215	G1b Problem Session	
Tuesday, 05 Jan 2021		
GMT Time	Title	Speaker
Asia & America		
0230 - 0330	B Lecture Part 1 An Introduction to AdS Geometry	Francesco Bonsante Università degli Studi di Pavia, Italy
0330 - 0500	B1b Problem Session	
Asia & Europe		
0900 - 1000	D Lecture Part 2 Quasi-isometries & Geometry of Nilpotent Lie Groups	Tullia Dymarz University of Wisconsin, Madison, USA
1000 - 1130	D2a Problem Session	
1130 - 1145	<i>Break</i>	
1145 - 1245	G Lecture Part 2 From Ping-pong in the Grassmannian to Anosov Representations (II)	François Guéritaud Université de Strasbourg, France
1245 - 1415	G2a Problem Session	
Europe & America		
1530 - 1630	D Lecture Part 2 Quasi-isometries & Geometry of Nilpotent Lie Groups	Tullia Dymarz University of Wisconsin, Madison, USA
1630 - 1800	D2b Problem Session	
1800 - 1830	<i>Break</i>	
1830 - 1930	G Lecture Part 2 From Ping-pong in the Grassmannian to Anosov Representations (II)	François Guéritaud Université de Strasbourg, France
1930 - 2100	G2b Problem Session	
Asia & America		
2345 - 0045	M Lecture Part 1 Hyperbolicity & Mapping Class Groups	Yair Minsky Yale University, USA
0045 - 0215	M1b Problem Session	

Wednesday, 06 Jan 2021		
GMT Time	Title	Speaker
Asia & America		
0230 - 0330	M Lecture Part 2 The Hierarchical Structure of Mod(S)	Yair Minsky Yale University, USA
0330 - 0500	M2a Problem Session	
Asia & Europe		
0900 - 1000	M Lecture Part 2 The Hierarchical Structure of Mod(S)	Yair Minsky Yale University, USA
1000 - 1130	M2b Problem Session	
1130 - 1145	<i>Break</i>	
1145 - 1245	B Lecture Part 2 Mess' Classification of MGH AdS Spacetimes	Francesco Bonsante Università degli Studi di Pavia, Italy
1245 - 1415	B2a Problem Session	
Europe & America		
1530 - 1630	D Lecture Part 3 Quasi-isometries & Geometry of Solvable Lie Groups	Tullia Dymarz University of Wisconsin, Madison, USA
1630 - 1800	D3a Problem Session	
1800 - 1830	<i>Break</i>	
1830 - 1930	G Lecture Part 3 From Ping-pong in the Grassmannian to Anosov Representations (III)	François Guéritaud Université de Strasbourg, France
1930 - 2100	G3a Problem Session	
Asia & America		
2345 - 0045	B Lecture Part 2 Mess' Classification of MGH AdS Spacetimes	Francesco Bonsante Università degli Studi di Pavia, Italy
0045 - 0215	B2b Problem Session	Francesco Bonsante Università degli Studi di Pavia, Italy

Thursday, 07 Jan 2021

GMT Time	Title	Speaker
Asia & America		
0230 - 0330	G Lecture Part 3 From Ping-pong in the Grassmannian to Anosov Representations (III)	François Guéritaud Université de Strasbourg, France
0330 - 0500	G3b Problem Session	
Asia & Europe		
0900 - 1000	M Lecture Part 3 Hulls & Cubical Structure	Yair Minsky Yale University, USA
1000 - 1130	M3a Problem Session	
1130 - 1145	<i>Break</i>	
1145 - 1245	B Lecture Part 3 Applications to Hyperbolic Geometry	Francesco Bonsante Università degli Studi di Pavia, Italy
1245 - 1415	B3a Problem Session	
Europe & America		
1530 - 1630	M Lecture Part 3 Hulls & Cubical Structure	Yair Minsky Yale University, USA
1630 - 1800	M3b Problem Session	
1800 - 1830	<i>Break</i>	
1830 - 1930	B Lecture Part 3 Applications to Hyperbolic Geometry	Francesco Bonsante Università degli Studi di Pavia, Italy
1930 - 2100	B3b Problem Session	
Asia & America		
2345 - 0045	D Lecture Part 3 Quasi-isometries & Geometry of Solvable Lie Groups	Tullia Dymarz University of Wisconsin, Madison, USA
0045 - 0215	D3b Problem Session	

Friday, 08 Jan 2021		
GMT Time	Title	Speaker
Asia & America		
0245 - 0330	M Q&A Session	Yair Minsky Yale University, USA
0330 - 0415	D Q&A Session	Tullia Dymarz University of Wisconsin, Madison, USA
Asia & Europe		
1100 - 1145	B Q&A Session	Francesco Bonsante Università degli Studi di Pavia, Italy
1145 - 1230	G Q&A Session	François Guéritaud Université de Strasbourg, France
Europe & America		
1900 - 1945	G Q&A Session	François Guéritaud Université de Strasbourg, France
1945 - 2030	B Q&A Session	Francesco Bonsante Università degli Studi di Pavia, Italy
2030 - 2115	D Q&A Session	Tullia Dymarz University of Wisconsin, Madison, USA
2115 - 2200	M Q&A Session	Yair Minsky Yale University, USA

An introduction to AdS geometry

FRANCESCO BONSANTE

Università degli Studi di Pavia, Italy

ABSTRACT

AdS geometry is the analog of hyperbolic geometry in Lorentzian setting. Many deep connections with hyperbolic geometry and Teichmüller theory are known in low dimension. We will provide a brief introduction on the subject highlighting those connections. More precisely in the first lecture we will introduce the model and its isometry group. In the second lecture I will talk about Mess' classification of the so called Maximal Globally Hyperbolic AdS spacetimes in dimension 3. Those spaces, which are somehow analogue of quasi-Fuchsian manifolds, plays an important role in the theory. Finally in the last lecture I will introduce a Gauss map, which is a sort of bridge between the Lorentzian manifold and the symmetric space associated to its isometry group. As an application, following Mess, we will give a Lorentzian proof of the celebrated Thurston's Earthquake theorem.

Introduction to the large scale geometry of nilpotent and solvable Lie groups

TULLIA DYMARZ

University of Wisconsin, Madison, USA

ABSTRACT

The goal of these talks is to introduce students to the basics of large scale geometry and metric structures of nilpotent and solvable Lie groups. The first lecture will review the notion of quasi-isometry and gives basics of nilpotent and solvable groups. The second will focus on aspects of the metric geometry of nilpotent Lie groups. The third will look at the metric geometry of certain family of solvable Lie groups. We will assume some familiarity with Riemannian geometry and the basic definitions of Lie groups and Lie algebras.

From ping-pong in the Grassmannian to Anosov representations

FRANÇOIS GUÉRITAUD

Université de Strasbourg, France

ABSTRACT

This series of lectures is intended as a gentle introduction to the Anosov property. Anosov-ness is a family of dynamical conditions for representations of word-hyperbolic groups into PGL_n (or more generally, into a semi-simple Lie group). Anosov-ness is stable under small deformations; it can be seen as a higher-rank analogue and generalization of convex-cocompactness.

The first lecture will focus on Schottky groups and their actions on the hyperbolic plane, which satisfy a “ping-pong” property governing the dynamics. In the second lecture I will describe how to define analogous conditions for a free group acting on the Grassmannian of k -planes in R^d . The main tool will be the Cartan decomposition (principal directions, principal values) and its “generic” behavior under composition of maps. This will count as motivation for the general Anosov condition, discussed in the 3rd talk, which can be seen as a kind of “diffuse” ping-pong behavior when moving on from free groups to word hyperbolic groups.

Beyond basic linear algebra I will only assume some working familiarity with coarse hyperbolic geometry; in particular, no dynamical or Lie-theoretic background is required.

Hyperbolicity and mapping class groups

YAIR MINSKY

Yale University, USA

ABSTRACT

The coarse structure of the mapping class group of a surface can be understood in terms of its action on a family of hyperbolic spaces called curve complexes. This is a fundamental example of the notion of a hierarchically hyperbolic group. We will develop some of the basic tools for analyzing and using this kind of structure, focusing on a “Realization Theorem”, and its application to understanding some of the coarse cubical structure of the group.