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How to reach the ENS

The simplest way to reach the ENS is to use the metro. The closest metro station is Debourg (indicated by an M on the enclosed map), situated on line B which is readily accessible if you arrive at the Part-Dieu trainstation.

If you arrive at the airport, there is a very convenient shuttle "Satobus" to the Part-Dieu station every twenty minutes. If you arrive at the older Perrache trainstation, you can either take the metro (two changes), or take the bus 32 or 96 and leave at the "Halle Tony Garnier" stop.

Beware there are two buildings called ENS nearby: one devoted to Arts and Social sciences (ENS-LSH) just in front of the Debourg metro station, and the other one (ENS Sciences) a little bit further (5 min walk). The conference is held at the ENS Sciences. Beware, the sign in the metro leads to the ENS-LSH. The detailed map below describes how to reach the correct ENS from the metro station.

Participants arriving on Wednesday evening should go to the ENS front desk. They will be required to present an identification document (ID card or passport) in order to be given the key to their room.

Organization

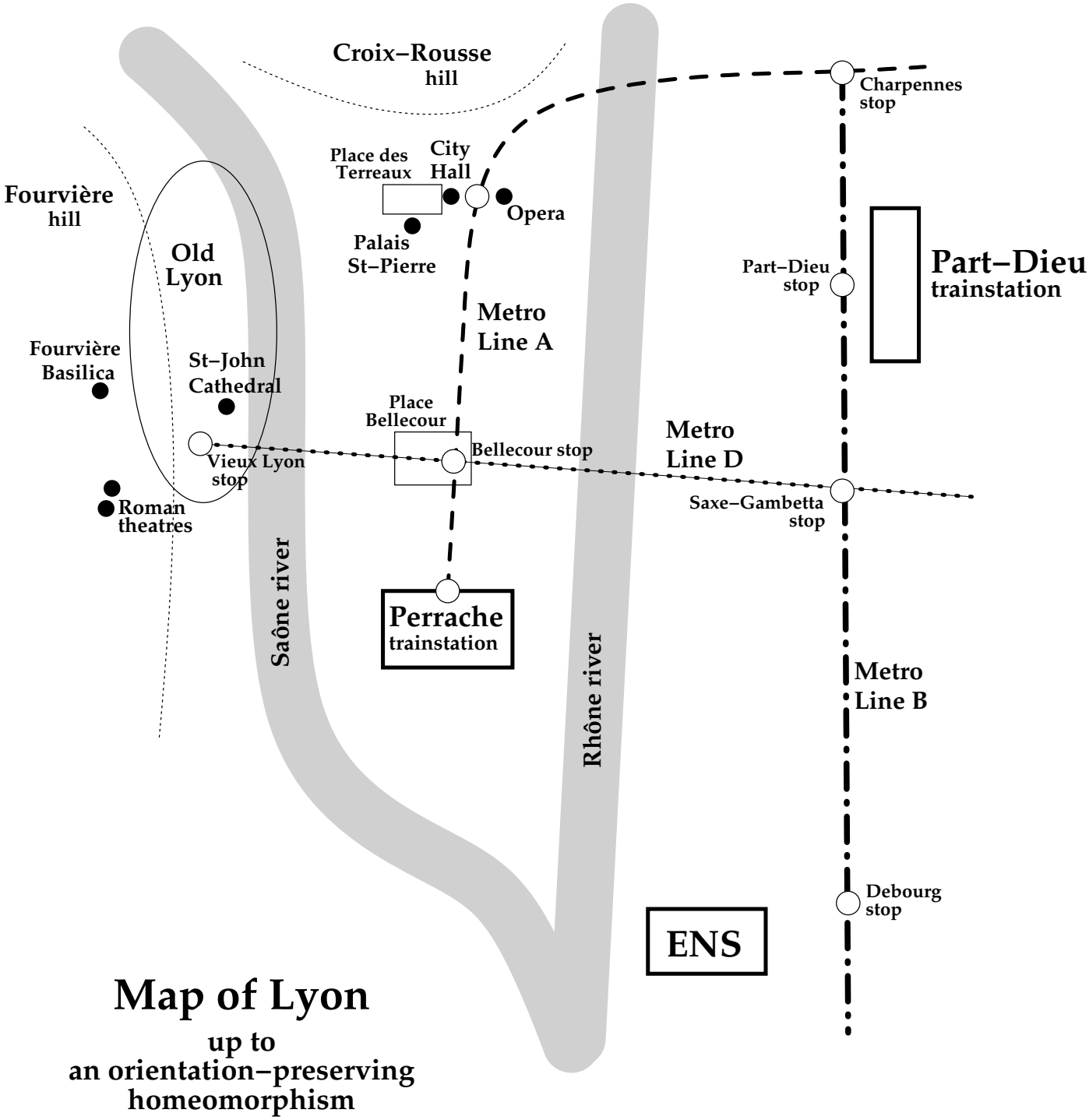
The conference room is located in the UNESCO building adjacent to the ENS. Registration and tea breaks will be held in the entrance hall of the ENS (near the front desk). See enclosed map.

For breakfast, croissants and the like will be provided to the participants in the ENS entrance hall.

Lunch is *not* provided, but there are numerous small restaurants in the area, some simple, some of them quite renowned (the place was formerly a cattle market). A list is included with the map.

Internet access

A WIFI connection will be accessible inside the ENS building where the breaks will take place (but not in the UNESCO building). The login and password will be delivered on request.



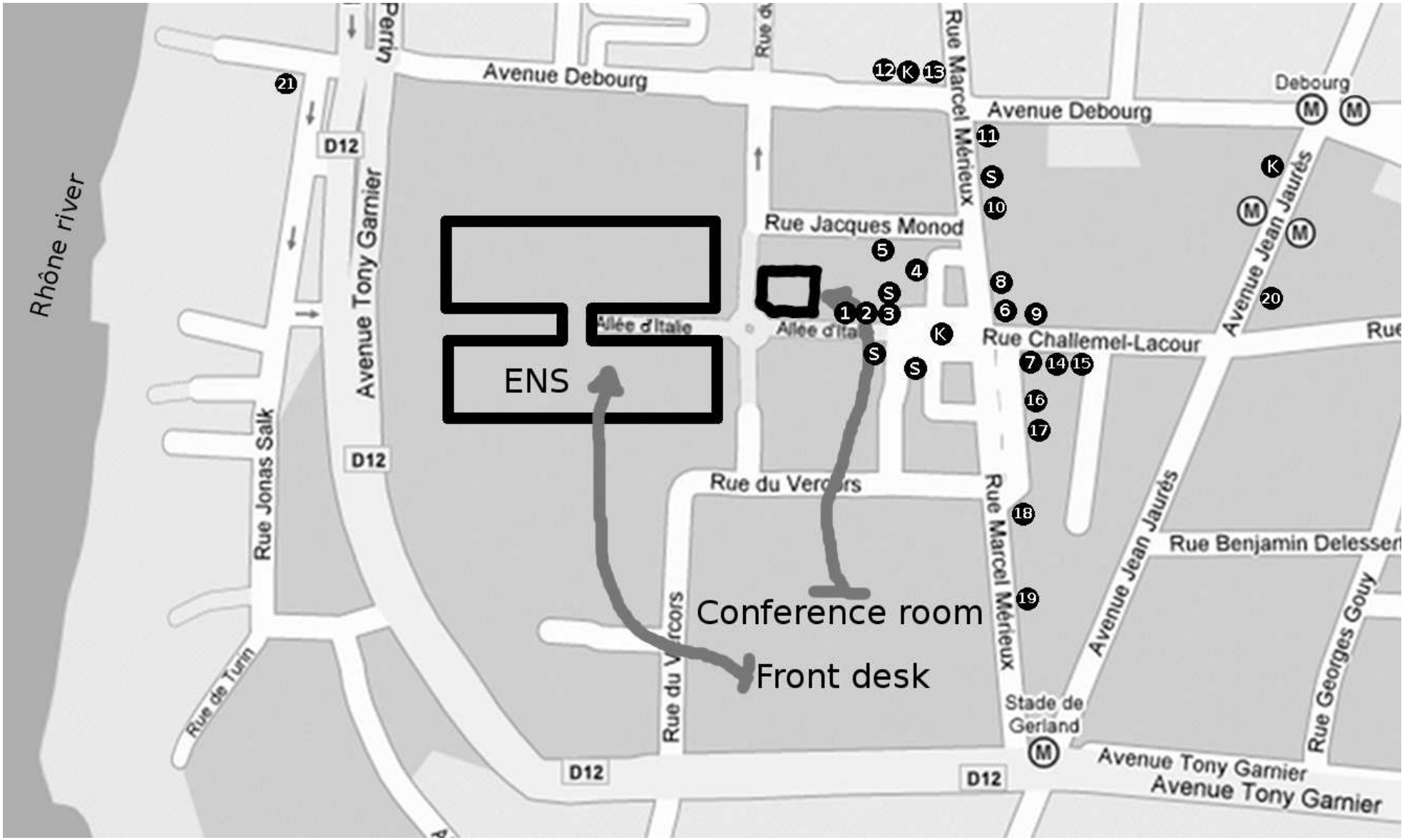
Map of Lyon

**up to
an orientation–preserving
homeomorphism**

Sightseeing in Lyon

Lyon is a renowned cultural city. The main sights include:

- The Roman theatres on the Fourvière hill, together with a very nice Roman museum inside the hill.
- The Old Lyon with its late Gothic and Renaissance buildings, the St-John cathedral, and its narrow pedestrian streets.
- The Fourvière basilica on top of the hill, with its Disney-movie-like exterior, its rich interior decorations and its dominating view on the city.
- The "traboules", a kind of public indoor passageway between streets in the Old Lyon and Croix-Rousse districts.
- The twelfth-century austere Romanesque St-Martin-d'Ainay basilica (north of Perrache trainstation).
- The Rhône left bank, a very nice walk ranging from the southern-most part of the city (where the ENS is located) to the northern Parc de la Tête-d'Or and beyond. It takes roughly one hour to walk from the ENS to the city centre (45 minutes to Perrache trainstation).
- The Place des Terreaux (Hôtel de Ville metro station), on which are situated the city hall and the Palais St-Pierre which houses a large museum and a very refreshing public garden.
- The Opera building, near the Place des Terreaux.


Rhône river
Avenue Debourg
D12
Avenue Tony Garnier
Rue Jonas Salk
Rue de Turin
Rue Jacques Monod
Allée d'Italie
ENS
Conference room
Front desk
Rue du Vercors
Rue Marcel Mérieux
Rue Challemel-Lacour
Avenue Jean Jaurès
Rue Benjamin Delessert
Rue Georges Gouy
Stade de Gerland
Debourg
Avenue Tony Garnier

Restaurants around the ENS

(S) Sandwiches

(K) Kebab

(1) Le Croque Café (*Salads, dish of the day, sandwiches*)

(2) Pizza Delice (*Pizzas, salads*)

(3) Le Métropole (*Dish of the day*)

(4) Apsara (*Chinese food*)

(5) Le Farfalla (*Salads, dish of the day*)

(6) La Terrasse de Gerland (*Dish of the day, Lyon specialties*)

(7) Pizza Latino (*Italian food*)

(8) Maison Gamboni (*French food—expensive*)

(9) Maison Watami (*Japanese-Chinese food*)

(10) Le Venezia (*Italian food*)

(11) Brasserie des deux avenues (*Dish of the day*)

(12) La Storia (*Italian food*)

(13) Brasserie Debourg (*Dish of the day*)

(14) La Pataterie (*Potatoe restaurant*)

(15) Tigerwok (*Wok restaurant*)

(16) Bar L'Huîtrier (*Oyster, seafood*)

(17) Mon Brésilien (*Bazilian food—expensive*)

(18) Carnegie Hall (*Steakhouse—expensive*)

(19) Ninkasi (*Salads, buffet, burgers*)

(20) Jols (*Fish, seafood—expensive*)

(21) Maison Borie (*French food—very fancy*)

Downtown restaurants

Here are a few suggestions of restaurants in the center of Lyon. This list reflects nothing more than the personal taste and habits of the organizers. Prices are in the range 20–40 Euros.

On Friday and Saturday evenings, you may want to make a phone call in advance.

For vegetarians, Lyon can be quite a difficult city to live in. Our best advice is to go to some exotic restaurant e.g. Indian.

Also note that in the main tourist streets, a significant number of so-called "bouchons" serving traditional Lyon food tend to be disappointing.

La Boname de Bruno — 5 grande rue des Feuillants, 1st district — Metro: Hôtel de Ville — 04 78 30 83 93. *Imaginative French food*

La Meunière — 11 rue Neuve, 1st district — Metro: Hôtel de Ville — 04 78 28 62 91. *Traditional food from Lyon*

La Mâchonnerie — 36 rue Tramassac, 5th district — Metro: Vieux Lyon St-Jean — 04 78 42 24 62. *Traditional French food*

Le Pailleron — 9 rue du Pailleron, 4th district — Metro: Croix-Rousse — 04 78 39 65 65. *Abundant food from southwestern France*

Le Bouchon des filles — 20 rue du Sergent Blandan, 1st district — Metro: Hôtel de Ville — 04 78 30 40 44. *Food from Lyon*

Le Pavillon — 14 rue Royale, first district — Metro: Hôtel de Ville — 04 72 00 01 72. *French food*

L'Étage — 4 place des Terreaux, 1st district — Metro: Hôtel de Ville — 04 78 28 19 59. *French food, fancier*

Le Petit Persan — 8 rue Longue, 1st district — Metro: Hôtel de Ville — 04 78 28 26 50. *Persian food*

Bangkok Royal — 40 rue du Sergent Blandan, 1st district — Metro: Hôtel de Ville — 04 78 28 19 83. *Thai food*

La Mamounia — 2 rue de la Bourse — Metro: Hôtel de Ville — 04 78 28 68 44. *Moroccan food*

Raj Mahal — 10 rue Saint-Jean, 5th district — Metro: Vieux Lyon St-Jean — 04 72 41 01 90. *Indian and Pakistani food*

Il Palio — 2 rue Duhamel, 2nd district — Metro: Perrache — 04 78 38 05 25. *Italian food*

Program

Thursday, May 15

9:30 Registration and breakfast

10:30 Opening, practical information

10:40 Piotr Chrusciel

"Angular-momentum inequalities in General Relativity"

While the notion of mass is well understood in mathematical general relativity (positive mass theorem, Penrose inequality, etc.), that of angular momentum seems to be considerably less so. In this talk I will review the definition of the total angular momentum J of an initial data set, and outline proofs of inequalities involving J that have been proved recently: Dain's angular momentum bound for axisymmetric space-times (arXiv:0707.3118 [gr-qc], arXiv:0712.4064 [gr-qc]), Maerten's angular momentum bound for space-times with a cosmological constant (see, e.g., gr-qc/0606064), and the surprising role of J for non-existence of constant mean curvature hypersurfaces with large mean curvature (PTC, Tod: arXiv:0706.4057 [gr-qc]).

Lunch Break

14:00 Anton Thalmaier

"Gradient bounds and a priori estimates for heat flows by Stochastic Analysis"

The effect of curvature on the behaviour of solutions of the heat equation on a Riemannian manifold is a classical problem. A quantitative measurement of this behaviour is encoded most directly in terms of gradient estimates and Harnack inequalities involving constants depending only on lower Ricci curvature bounds and the dimension of the manifold. In this talk we focus on localized versions of such estimates (linear and nonlinear) and show that Brownian motion on a Riemannian manifold may serve as a unifying tool. The talk is based on joined work with Marc Arnaudon, Bruce Driver and Feng-Yu Wang.

15:15 Misha Gromov

TBA

Tea Break

17:00 Yann Ollivier

"Discrete Ricci curvature and Markov chains"

We introduce a notion of Ricci curvature "at a given scale" valid on any metric space, inspired by ideas of Dobrushin about Markov chains. The notion states that balls are closer, in transportation distance, than their centers are. It is simple to test on concrete examples such as graphs or Riemannian manifolds, and consistent with Bakry-Émery theory. Positive Ricci curvature in this sense allows to prove analogues of the Lichnerowicz spectral gap theorem, of the Lévy-Gromov concentration of measure theorem, and of the Bakry-Émery log-Sobolev inequality.

Friday, May 16

9:00 Breakfast

9:30 Stefan Wenger

"Isoperimetric inequalities and non-positive curvature"

This talk is concerned with the relationship between isoperimetric inequalities and notions of non-positive and negative curvature for (singular) metric spaces. We first give an optimal characterization of Gromov hyperbolicity via isoperimetric and filling radius inequalites for curves, generalizing and strengthening results of Gromov. We then focus on higher dimensional isoperimetric inequalities in the setting of metric spaces of non-positive curvature in a weak sense (including non-positively curved spaces in the sense of Busemann) and show that they detect the asymptotic rank of such spaces. Among other things, this allows to prove higher rank analogs of well-known results from hyperbolic geometry such as for example the stability of quasigeodesics. Such analogs were exhibited by B. Kleiner and U. Lang.

10:45 Guy David

"On Jean Taylor's regularity theorem for soap films"

The main theme of the lecture should be J. Taylor's regularity theorem for Almgren almost-minimal sets of dimension 2 in 3-space, which says that they are locally C^1-equivalent to one of the three possible minimal cones (the ones that are easily seen in soap films). I will try to discuss some motivations and simple topologial arguments in the proof.

Lunch Break

14:00 Dmitri Burago

"Boundary rigidity of metrics closed to flat ones"

A compact Riemannian manifold with boundary is said to be boundary rigid if its metric is uniquely determined (up to a isometry) by distances between boundary points.

To visualize that, imagine that one wants to find out what the Earth is made of. More generally, one wants to find out what is inside a solid body made of different materials (in other words, properties of the medium change from point to point). The speed of sound depends on the material. One can "tap" at some points of the surface of the body and "listen when the sound gets to other points". The question is if this information is enough to determine what is inside.

This problem has been studied a lot, mainly from the PDE viewpoint. We suggest a completely different approach based on "minimality". As a matter of fact, we embed our manifolds into a certain normed space and show that they happen to be minimal surfaces, and then prove certain uniqueness results for such surfaces.

We say that a metric d on a manifold with boundary is a "minimal filling" if every manifold with the same boundary and such that all distances between boundary points are greater than or equal to those of d has volume no less than that of d.

We will discuss the following result: Euclidean regions with Riemannian metrics sufficiently close to a Euclidean one are minimal fillings and boundary rigid. This is the first result in dim>2 showing the boundary rigidity of metrics other than extremely special ones (products and symmetric spaces). The talk is based on a joint work with S. Ivanov.

15:15 Francesco Maggi

"Symmetrization, optimal transport and quantitative isoperimetric inequalities"

Symmetrization inequalities and optimal transport methods are used in the proof of many geometric-functional inequalities in sharp form. Sharp quantitative refinements of several isoperimetric principles, including the Euclidean and Gaussian isoperimetric inequalities, as well as the Wulff theorem and the Brunn-Minkowski inequality on convex sets, can be attacked on starting from these methods. The content of this talk originates from a series of joint works with A. Cianchi (U. Firenze), A. Figalli (U. Nice), N. Fusco (U. Napoli) and A. Pratelli (U. Pavia).

Tea Break

17:00 Michel Boileau

"Collapsing and Geometrization in dimension 3"

We will discuss an alternative approach to Perelman's collapsing theorem which is the last step of his proof of the geometrization conjecture for aspherical 3-manifolds.

Saturday, May 17

9:00 Breakfast

9:30 Lei Ni

"Applications of Ricci flow singularity analysis"

Analyzing the singularities can be useful in applying Ricci flow to study the geometry of manifolds. We shall report on several results in this direction.

10:45 Karl-Theodor Sturm

"Singular Spaces with generalized lower Ricci bounds – Geometric and analytic aspects"

We give a brief survey on the geometry of metric measure spaces (M,d,m) satisfying a generalized lower Ricci bound. This notion of curvature bound, independently developed by Lott/Villani and Sturm, is based on convexity properties of the relative entropy regarded as a function on the L2-Wasserstein space of probability measures. One of the main results is that this lower curvature bound is stable under convergence.

Furthermore, we introduce a (more restrictive) curvature-dimension condition CD(K,N) which implies sharp versions of the Brunn-Minkowski inequality, of the Bishop-Gromov volume comparison theorem and of the Bonnet-Myers theorem.

Moreover, we present some recent developments in the analysis on singular spaces with lower Ricci bounds. For Finsler spaces we analyze the heat flow, defined as the gradient flow on L2(M,m) for the energy – or equivalently as the gradient flow on the Wasserstein space for the relative entropy. In all non-riemannian cases, the heat flow is non-linear and non-smooth. Nevertheless, under appropriate N-Ricci bounds we deduce Bochner inequalities, Bakry-Emery gradient estimates and Li-Yau Harnack inequalities.

Tea break

12:15 Claude Viterbo

"Symplectic Homogenization"

We show that for $H(q,p)$ a Hamiltonien on the torus cotangent bundle $T^n \times \mathbb{R}^n$ the sequence $H(k \cdot q, p)$ converges to the "effective Hamiltonian". The convergence is in fact a convergence of the corresponding flows for a metric defined on the group of Hamiltonian maps. The proof uses some new estimate of the "symplectic size" of a Lagrangian contained in a tube. We shall present some of the many applications, that range from extending classical results in the convex case (i.e.for H convex in p) about Hamilton-Jacobi equations, Mather theory, etc. to new unexpected results, like the symplectic invariance of the effective Hamiltonian.

13:15 Buffet