

7th Swiss Graduate Colloquium

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Abstracts.

-**Régis Straubhaar**: *Numerical Optimization of a Laplacian-Dirichlet's eigenvalue with respect to the domain*
[Numerical Analysis | [Abstract](#)]

Given a bounded planar domain, we consider the eigenvalues of the Laplacian with Dirichlet boundary conditions. The question to know which shape (if any !) minimizes a given eigenvalue is an old one : it was conjecture in 1877 by Rayleigh (and proved in 1923 by Faber and Krahn) that the disc is the unique minimizer for the first eigenvalue. Shortly after this, Krahn and Szegő proved that the second eigenvalue is minimized by the union of two identical discs. However, for all other eigenvalues of the Dirichlet-Laplacian, the minimizer is unknown. This naturally leads to the use of finite element methods to approximate a minimizing domain.

-**Nicolai Hähnle**: *Efficiency of Linear Programming and the polynomial Hirsch conjecture*
[Discrete Optimization | [Abstract](#)]

Linear programming is the problem of finding the maximum of a linear function over a polyhedron. It is widely used in practice and has been very successfully applied in solving combinatorial optimization problems as well as in approximation algorithms. The Simplex method for linear programming proceeds by walking from vertex to vertex of the polyhedron, thus connecting questions about the efficiency of linear programming to questions about the geometry of polyhedra. The polynomial Hirsch conjecture claims that the diameter of the vertex-edge graph is bounded by a polynomial in the number of defining inequalities and the dimension. I will report recent results on both the efficiency of the simplex method as well as the polynomial Hirsch conjecture.

-**Georges Klein**: *Linear barycentric rational interpolation from equispaced samples and applications*
[Numerical Analysis | [Abstract](#)]

Efficient linear and infinitely smooth approximation of functions from equispaced samples is an important problem in practice. Runge showed in 1901 that it is not delivered by the interpolating polynomial. In 2007, Floater and Hormann have introduced a family of linear barycentric rational interpolants which extend a construction by Berrut from 1988. These interpolants yield high theoretical rates of convergence, which depend on the smoothness of the approximated function. We will present these rational interpolants as well as a further extension and look at their condition and some of their applications to differentiation and integration.

-**David Frenkel**: *Symplectic embedding problems and Gromov's non-squeezing theorem*
[Symplectic Topology | [Abstract](#)]

We will talk about the problem of embedding symplectically an open set of an Euclidean space of even dimension into another one. In particular, we will present Gromov's non-squeezing theorem, that gives a necessary and sufficient condition to embed symplectically a ball in a symplectic cylinder. Finally, we will try to give an idea of the proof of the theorem using some symplectic invariants, called symplectic capacities.

-**Kristin Shaw**: *Obstructions to lifting tropical curves in complements of hyperplane arrangements*
[Tropical Geometry | [Abstract](#)]

The tropicalisations of complements of hyperplane arrangements are known as Bergman fans and have a very combinatorial description. In this talk I will study tropical curves contained in these fans. First I will show how to intersect curves and explain how this relates to the intersection product of actual complex curves. Finally, I will present some obstruction theorems to lifting tropical curves in surfaces that arise from this intersection product. This talk is based on joint work in progress with Erwan Brugallé.

-**Rafael Andrist**: *Stein Manifolds Characterized by their Endomorphisms*
[Complex Geometry | [Abstract](#)]

Stein manifolds admitting a proper holomorphic embedding of the complex line are characterized, among all complex manifolds, by their holomorphic endomorphism semigroup in the sense that any semigroup isomorphism induces either a biholomorphic or an antibiholomorphic map between them. Several classes of Stein manifolds admitting a proper holomorphic embedding of the complex line are described.

-**Bruno Duchesne**: *Dynamics of isometries of nonpositively curved spaces*
[Geometric Group Theory | [Abstract](#)]

A nonpositively curved space is a geodesic metric space such that any triangle is thinner than an euclidean one. Simply connected riemannian manifolds provide a large class of examples. We will aim to understand the dynamical behaviour of isometries of such spaces. A lot of examples will be described to improve our intuition. Moreover, we will pay our attention on the differences between finite dimensional case and infinite dimensional case.

Participating Universities

Bâle,
Berne,
EPFL
Fribourg,
Genève
Neuchâtel

ORGANIZATION

[Daniel Moldovan](#) [MATHGEOM / CSAG]
[Caroline Lassueur](#) [MATHGEOM / CTG]

DETAILED INFORMATION

<http://alg-geo.epfl.ch/~moldovan/GradColloq2011.html>

REGISTRATIONS

For organizational purposes participants are kindly asked to **REGISTER ONLINE** via our registration forms.

TALK SIGN UP needs to be done before **Tuesday, 1st of February 2011**.

COLLOQUIUM DINNER

A Colloquium Dinner will take place on Thursday, 17th of February at the restaurant [Le Milan](#).

Ph.D. Students and Faculty Members from the participating universities are all welcome.

If you would like to come please e-mail the organizers before Monday, 7th of February.

FINANCIAL SUPPORT

The Graduate Colloquium is an activity of the [Swiss Doctoral Program in Mathematics](#).