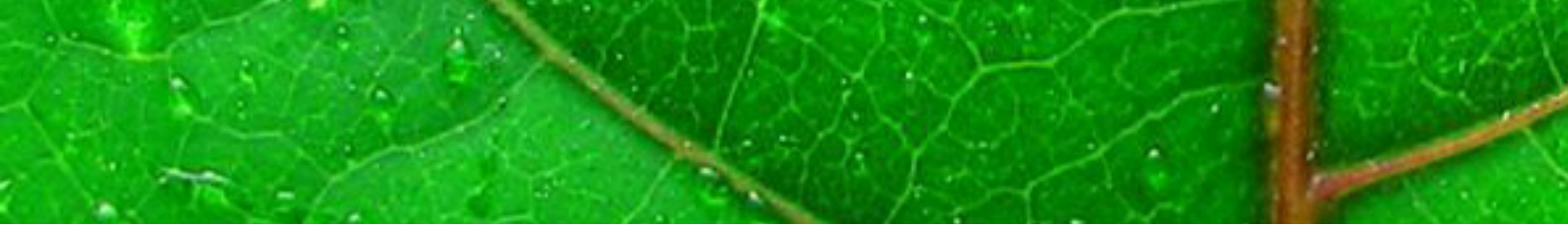

Analysis, geometry and applications

The “Analysis, geometry and applications” team works on two main lines of research.

Analysis of PDE and optimization

- Mathematical analysis of nonlinear degenerate elliptic or parabolic equation problems, hyperbolic conservation law problems with possible parabolic/hyperbolic coupled systems along an interface, deterministic versions of pseudo-parabolic equation problems. Study of singular solutions and qualitative behavior of the solutions to quasi-linear elliptic problems.
- Mathematical analysis of certain equations resulting from fluid mechanics (Navier Stokes, Stokes, Oseen).
- Problems related to dynamic systems in biomathematics, applied to medicine in particular: study of new mathematical models of leukemia.
- Optimization - Calculus of variations: nonsmooth analysis, calculus of variations. Problems related to nonsmooth analysis (optimality conditions, sub-gradients, generalized Hessian). Existence of and at extremal properties in the case of singularity functions. A second theme concerns problems posed by generalized calculus of variations (stochastic, fractional, non-differentiable, singular).

Algebraic geometry of projective spaces and low-dimensional topology

- Arrangement of hyperplanes.
- Complex plane algebraic curves, topological invariants of their embedding potential (fundamental group, characteristic varieties, Alexander modules).

- Logarithmic bundles and derivation modules associated with an arrangement.
- Derived categories and their uses in moduli spaces of bundles.
- Knot theory, braid groups and their representations.
- Determinantal varieties, Cohen-Macaulay and Ulrich modules.