Entropy methods, functional inequalities and applications

ECTS : 6

Volume horaire : 24

Description du contenu de l'enseignement :

Various functional inequalities are classically seen from a variational point of view in nonlinear analysis. They also have important consequences for evolution problems. For instance, entropy estimates are standard tools for relating rates of convergence towards asymptotic regimes in time-dependent equations with optimal constants of various functional inequalities. This point of view applies to linear diffusionsand will be illustrated by some results on the Fokker-Planck equation based on the "carré du champ" method introduced by D. Bakry and M. Emery. In the recent years,the method has been extended from linear to nonlinear diffusions. This aspect will be illustrated by results on Gagliardo-Nirenberg-Sobolev inequalities on the sphere and on the Euclidean space. Even the evolution equations can be used as a tool for the study of detailed properties of optimal functions in inequalities and their refinements. There are also applications to other equations than pure diffusions: hypocoercivity in kinetic equations is one of them. In any case, the notion of entropy has deep roots in statistical mechanics, with applications in various areas of science ranging from mathematical physics to models in biology. A special emphasis will be put during the course on the corresponding models which offer many directions for new research development.