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First-order evolution PDEs under density constraints

vendredi 17 mars 2023 11:50 (50 minutes)

I will present a class of evolution equations which are characterized by the presence of an upper density constraint and of the gradient of an unknown, scalar, pressure affecting the drift in order to enforce such a density constraint. We studied these PDEs, in a series of papers in collaboration with Bertrand Maury and other co-authors, motivated by their applications to crowd motion models, but they have also been studied by other communities in connection with the Hele-Shaw flow and/or of the mesa problem for porous media or tumor growth models. These equations can be seen as a gradient flow of a very singular functional in the Wasserstein space, which is useful for some existence and for the easiest uniqueness results, but can also be seen as the limit of porous medium evolution when the exponent tends to infinity, which has been used by other authors (Noemi David and Markus Schmidtchen, in particular), to obtain new integrability estimates.
The goal of the talk will be to introduce the main questions and results, with a particular emphasis to the most recent ones, and the connections with other problems.

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