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Uniqueness and characteristic flow for a non strictly convex singular variational problem

Tuesday, 8 July 2025 09:00 (1 hour)

This talk addresses the question of uniqueness of the minimizers of a convex but not strictly convex integral functional with linear growth in a two-dimensional setting. The integrand - whose precise form derives directly from the theory of perfect plasticity - behaves quadratically close to the origin and grows linearly once a specific threshold is reached. We make use of spatial hyperbolic conservation laws hidden in the structure of the problem to tackle uniqueness. Our argument strongly relies on the regularity of a vector field - the Cauchy stress in the terminology of perfect plasticity - which allows us to define characteristic lines, and then to employ the method of characteristics. Using the detailed structure of the characteristic landscape, we show that this vector field is actually continuous, save for possibly two points. The different behaviors of the energy density at zero and at infinity imply an inequality constraint on the Cauchy stress. Under a barrier type convexity assumption on the set where the inequality constraint is saturated, we show that uniqueness holds for pure Dirichlet boundary data. This is a joint work with Gilles Francfort.

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