VARIATIONAL CONVERGENCES FOR FUNCTIONALS AND DIFFERENTIAL OPERATORS DEPENDING ON VECTOR FIELDS

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In this talk I present results concerning variational convergences for functionals and differential operators depending on a family of Lipschitz continuous vector fields X, that may not satisfy the so-called Hörmander condition. This setting, introduced by Folland and Stein, founds numerous applications in the literature and classic examples of such families are the Euclidean gradient, the Grushin vector fields and the Heisenberg vector fields (as prototype of vector fields generating Carnot group).

The convergences taken into account date back to the 70's and are the Γ-convergence, which deals with functions and functionals and was introduced by De Giorgi and Franzoni, and the G-convergence, or H-convergence, whose theory was initiated by De Giorgi and Spagnolo and later developed by Murat and Tartar. This last convergence deals with differential operators.

The main result presented today is a Γ-compactness theorem, which ensures that sequences of integral functionals depending on X, with standard regularity and growth conditions, Γ-converge in an appropriate topology to a functional belonging to the same class, that is, satisfying the same regularity and growth conditions and still representable in an integral form.

As an interesting consequence of the previous result, I finally show that the class of linear differential operators in X-divergence form is closed in the topology of the H-convergence. The variational technique adopted to this aim relies on a new approach, introduced by Ansini, Dal Maso and Zeppieri.

This research is done in collaboration with Andrea Pinamonti and Francesco Serra Cassano (University of Trento), Fabio Paronetto (University of Padova) and Eugenio Vecchi (University of Bologna).

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