



UNIVERSITÀ  
DI TRENTO

Dipartimento di  
Matematica

# DOTTORATO



CYCLE 34th  
ORAL DEFENCE OF THE PHD THESIS

**Wednesday 11 May 2022 – at 4:00 pm**  
**Seminar room “-1”**

The event will take place in presence and online through the ZOOM platform.  
To get the access codes please contact the secretary office

## Fares Essebei

PhD Student in Mathematics

### Variational problems for sub-Finsler metrics in Carnot groups and integral functionals depending on vector fields

#### Abstract:

This dissertation is devoted, on the one hand, to the study of geodesic distances defined on a subdomain of a Carnot group, which are bounded both from above and from below by fixed multiples of the Carnot–Carathéodory distance. It aims to show that the uniform convergence, on compact sets, of these distances can be equivalently characterized in terms of  $\Gamma$ -convergence of several kinds of variational problems. Moreover, it investigates the relation between the class of intrinsic distances, their metric derivatives and the sub-Finsler convex metrics defined on the horizontal bundle. On the other hand, this work focuses on the characterization of three classes of local functionals driven by a family of Lipschitz vector fields  $X = (X_1, \dots, X_m)$ , where it drops the assumption of translations-invariance. It sets out to show that these functionals, defined on first-order  $X$ -Sobolev spaces, admit an integral representation in terms of  $X$ . It then goes on to present some  $\Gamma$ -compactness results with respect to both the strong  $L^p$ -topology and the strong  $W_{X^1,p}$ -topology.

**Supervisors:** Francesco Serra Cassano – Andrea Pinamonti

#### CONTATTI

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