



UNIVERSITÀ
DI TRENTO

Dipartimento di
Matematica

DOTTORATO



CYCLE 37th
ORAL DEFENCE OF THE PHD THESIS

Wednesday 17th December 2025 – 11.00 am

Department of Mathematics
Seminars Room - Povo 0

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

Gabriele Morselli

PhD Student in Mathematics

The Q-closeness technique

**An application to isoperimetric inequalities in 2-d lattices
and to the Faber-Krahn inequality**

Abstract:

Variational problems and their quantitative stability in the continuous setting are a classical topic in mathematical analysis and calculus of variations. In recent years, however, increasing attention has been devoted to the challenges arising when extending these problems to discrete settings, motivated by material science and crystallisation theory. In the thesis, we establish maximal fluctuation estimates for minimizers of two variational problems on periodic lattices, by exploiting the Q-closeness technique introduced by Cicalese and Leonardi, which enables us to link discrete problems to the continuous framework by associating suitable domains to configurations of points. In particular, we focus on the edge-isoperimetric problem and we propose a more canonical construction of the associated map for the d-dimensional square lattice, the honeycomb lattice and the triangular lattice; moreover, we briefly discuss the difficulties of extending this approach to other lattices. Finally, in the third chapter, we study a discrete Faber-Krahn inequality on \mathbb{Z}^d and we provide quantitative estimates for almost minimizers among configurations of fixed cardinality.

Supervisor: Gian Paolo Leonardi

CONTATTI

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