

STSM by Lorenzo Lamberti (University of Salerno, Fisciano, Italy)

**Variational coarse graining analysis of Ising-type lattice models on non-flat manifolds**

at Technische Universität München (TUM), Germany (1 October to 24 October 2021)

The main purpose of this STSM was to take a visit at the Department of Mathematics of the Technische Universität München (Munich) in Germany in order to work and set up a collaboration with the host, Prof. Dr. Marco Cicalese, and the research group.

Primarily my aim was to become familiar with some new techniques related to  $\Gamma$ -convergence, referring especially to the abstract methods of  $\Gamma$ -convergence and their application in the analysis of lattice systems as a tool to obtain integral representation results in Sobolev and BV spaces.

Secondly I studied a variational problem related to the energy per particle of a one-dimensional ferromagnetic/antiferromagnetic frustrated spin chain with nearest and next-to-nearest interactions close to the helimagnet/ferromagnet transition point as the number of particles diverges. A new variable of magnetic anisotropy has been introduced. At the moment, the preliminary analysis has been developed only in dimension one and some partial results have been obtained. The purpose of subsequent research will be the study of chirality and magnetic anisotropy transitions in multiple scales, possibly in higher dimension and in non-flat setting, which make the modelling and the mathematical techniques more involved. I will continue working on this generalization with Prof. Dr. Marco Cicalese and Dr. Andrea Kubin.