The optimal compliance problem for thin elastic torsion rods

We consider the variational problem which consists in minimizing the compliance of a prescribed amount of elastic material, placed into a given design region, and submitted to an exterior balanced load.

We discuss the asymptotic analysis of this problem when the design region is a cylinder of infinitesimal section and the loads are such that they only tend to twist the rod.

The optimality conditions are made explicit and some examples of optimal sections are obtained numerically.

We also show that, when the amount of material placed in the design region tends to zero (i.e. for small filling ratio), the material tends to concentrate on a particular surface: the boundary of the Cheeger set of the design region.

These results have been obtained in collaboration with Guy Bouchitté and Ilaria Fragalà.