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Isoperimetric problem and higher-order Sobolev embeddings

We consider dimension-free isoperimetric inequalities for product probability measures on \mathbb{R}^n between the exponential measure and the Gaussian measure. We develop a general method for obtaining optimal embeddings of Sobolev-type spaces built upon rearrangement-invariant spaces of any order. The method is based on iteration of first-order embedding results that are optimal within the context of rearrangement-invariant spaces. The main underlying technical background is based on a reduction theorem stating equivalence of a first-order Sobolev-type embedding and boundedness of an appropriate one-dimensional integral operator between corresponding representation spaces. Although the main motivation stems from studying the product probability spaces, the method applies also to the Euclidean–Sobolev embeddings on possibly irregular domains of a known isoperimetric profile, and also to the higher-order trace embeddings.