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A unified approach to ABP and optimal transport proofs of isoperimetric inequalities

Of the many proofs of the isoperimetric inequality, the two based on the Alexandrov-Bakelman-Pucci technique and optimal transportation share remarkably similar features. We connect these approaches through a one-parameter family of optimal transportation problems that interpolates between the ABP and Brenier potentials. Each solution gives an elementary proof of the isoperimetric inequality. The method extends to weighted anisotropic isoperimetric inequalities in convex cones, yielding the Wulff and Lions-Pacella inequalities as in [Cabré–Ros-Oton–Serra '16]. In the classical case, we show the two potentials coincide precisely when the domain is a ball.