Logarithmic Sobolev Capacities

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Abstract We introduce and study the capacities generated by the logarithmic Sobolev space $W_p^{\log,\gamma}$ with $(p,\gamma) \in [1,\infty) \times (0,\infty)$. The comparisons between this logarithmic Sobolev capacity and the logarithmic Hausdorff capacity, and the continuously sharp embedding property of $W_p^{\log,\gamma}$ into certain logarithmic weighted Lebesgue space are given. We also use the logarithmic perimeter and the Lebesgue measure to reformulate the $W_1^{\log,\gamma}$-capacity and then study the first variation of the logarithmic perimeter via the corresponding logarithmic mean curvature, thereby characterizing the surface of a constant logarithmic mean curvature.