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*Gradient flow structures and functional inequalities for quantum evolution equations with detailed balance*

**Abstract**

We present a new class of transport metrics for density matrices, which can be viewed as non-commutative analogues of the 2-Wasserstein metric. With respect to these metrics, we show that dissipative quantum systems can be formulated as gradient flows for the von Neumann entropy under a detailed balance assumption. We also present geodesic convexity results for the von Neumann entropy in several interesting situations. These results rely on an intertwining approach for the semigroup combined with suitable matrix trace inequalities. This is joint work with Eric Carlen.