

Some characterizations of the operator perspective

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Abstract

In the first part of this talk, we present a new characterization of the operator perspective of a continuous real-valued function defined on an interval under suitable assumptions. This result generalizes a non-commutative analogue of the arithmetic-geometric mean inequality and extends existing characterizations of the geometric operator mean. We further provide analogous characterizations for other operator means, in particular the harmonic and arithmetic operator means.

In the second part, we establish the information monotonicity of the operator perspective and derive a complementary inequality involving positive linear maps. We illustrate these information monotonicity properties and their complementary forms for several operator means and operator entropies.

In the third part, we obtain a general formulation of the Jensen operator inequality for convex regular mappings and unital fields of completely positive linear mappings. We introduce the notion of non-commutative F-divergence operators associated with regular operator mappings and continuous fields of Hilbert space operators, and we derive relations between the operator perspective of a convex regular mapping and a corresponding non-commutative F-divergence operator. Finally, we provide refinements of both the general Jensen operator inequality and the extended Choi-Davis-Jensen inequality.