

ESTIMATES FOR TSALLIS RELATIVE OPERATOR ENTROPY

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Abstract. We give the tight bounds of Tsallis relative operator entropy by using Hermite-Hadamard's inequality. Some reverse inequalities related to Young's inequality are also given. In addition, operator inequalities for normalized positive linear map with Tsallis relative operator entropy are given.

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REFERENCES

- [1] S. ABE, *Monotonic decrease of the quantum non-additive divergence by projective measurements*, Phys. Lett. A., **312** (5–6) (2003), 336–338.
- [2] Y. AL-MANASRAH, F. KITTANEH, *A generalization of two refined Young inequalities*, Positivity., **19** (4) (2015), 757–768.
- [3] T. ANDO, *Concavity of certain maps on positive definite matrices and applications to Hadamard products*, Linear Algebra Appl., **26** (1979), 203–241.
- [4] J. C. BOURIN, E.-Y. LEE, M. FUJII, Y. SEO, *A matrix reverse Holder inequality*, Linear Algebra Appl., **431** (11) (2009), 2154–2159.
- [5] J. I. FUJII, E. KAMEI, *Relative operator entropy in non-commutative information theory*, Math. Japon., **34** (1989), 341–348.
- [6] S. FURUICHI, *Inequalities for Tsallis relative entropy and generalized skew information*, Linear Multilinear Algebra., **59** (10) (2011), 1143–1158.
- [7] S. FURUICHI, N. MINCULETE, *Alternative reverse inequalities for Young's inequality*, J. Math. Inequal., **5** (4) (2011), 595–600.
- [8] S. FURUICHI, *Precise estimates of bounds on relative operator entropies*, Math. Inequal. Appl., **18** (3) (2015), 869–877.
- [9] S. FURUICHI, K. YANAGI AND K. KURIYAMA, *A note on operator inequalities of Tsallis relative operator entropy*, Linear Algebra Appl., **407** (2005), 19–31.
- [10] S. FURUICHI, K. YANAGI, K. KURIYAMA, *Fundamental properties of Tsallis relative entropy*, J. Math. Phys., **45** (2004), 4868–4877.
- [11] S. FURUICHI, N. MINCULETE, F. C. MITROI, *Some inequalities on generalized entropies*, J. Inequal. Appl., **1** (2012), 226.
- [12] T. FURUTA, *Basic properties of the generalized Kantorovich constant $K(p) = \frac{h^p - h}{(p-1)(h-1)} \cdot \left(\frac{p-1}{p} \frac{h^p - 1}{h^p - h}\right)^p$* , Acta Sci. Math. (Szeged), **70** (2004), 319–337.
- [13] T. FURUTA, *Two reverse inequalities associated with Tsallis relative operator entropy via generalized Kantorovich constant and their applications*, Linear Algebra Appl., **412** (2) (2006), 526–537.
- [14] F. KITTANEH AND Y. MANASRAH, *Improved Young and Heinz inequalities for matrix*, J. Math. Anal. Appl., **361** (2010), 262–269.
- [15] F. KITTANEH AND Y. MANASRAH, *Reverse Young and Heinz inequalities for matrices*, Linear Multilinear Algebra., **59** (2011), 1031–1037.
- [16] E.-Y. LEE, *A matrix reverse Cauchy-schwarz inequality*, Linear Algebra Appl., **430** (2) (2009), 805–810.

- [17] W. LIAO, J. WU, J. ZHAO, *New versions of reverse Young and Heinz mean inequalities with the Kantorovich constant*, Taiwanese J. Math., **19** (2) (2015), 467–479.
- [18] C. P. NICULESCU, L. E. PERSSON, *Old and new on the Hermite-Hadamard inequality*, Real Anal. Exchange., **29** (2) (2004), 663–686.
- [19] K. YANAGI, K. KURIYAMA, S. FURUICHI, *Generalized Shannon inequalities based on Tsallis relative operator entropy*, Linear Algebra Appl., **394** (2005), 109–118.
- [20] L. ZOU, *Operator inequalities associated with Tsallis relative operator entropy*, Math. Inequal. Appl., **18** (2) (2015), 401–406.
- [21] H. ZUO, G. SHI, M. FUJII, *Refined Young inequality with Kantorovich constant*, J. Math. Inequal., **5** (4) (2011), 551–556.