NEW REFINEMENTS OF GENERALIZED HÖLDER'S INEQUALITY AND THEIR APPLICATIONS

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Abstract. In this paper, we present a series of sharpened versions of generalized Hölder's inequality. As an application in information theory, we give a new refinement of Singh's inequality with respect to the 'useful' information of order α for the power distribution. The Singh's inequality include Shannon's inequality as a special case.

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REFERENCES

[1] S. ABRAMOVICH, J. PEČARIĆ AND S. VAROŠANEC, *Sharpening Hölder's and Popoviciu's inequalities via functionals*, Rocky Mt. J. Math., **34**, 3 (2004), 793–810.

[2] S. ABRAMOVICH, J. PEČARIĆ AND S. VAROŠANEC, *Continuous sharpening of Hölder's and Minkowski's inequalities*, Math. Inequal. Appl., **8**, 2 (2005), 179–190.

[3] H. AGAHI, Y. OUYANG, R. MESIAR, E. PAP AND M. ŠTRBOJA, *Hölder and Minkowski type inequalities for pseudo-integral*, Appl. Math. Comput., **217**, 21 (2011), 8630–8639.

[4] E. F. BECKENBACH AND R. BELLMAN, *Inequalities*, Springer-Verlag, Berlin, 1961.

[5] L. L. CAMPBELL, *A coding theorem and Rényi's entropy*, Inform. Contr., **8**, 65 (1965), 423–429.

[6] J. A. CARROLL, R. CORDNER AND C. J. A. EVELYN, *A new extension of Hölder's inequality*, Enseignement math., **16**, (1970), 69–71.

[7] A. FEINSTEIN, *Foundation of Information Theory*, McGraw-Hill, New York, 1958.

[8] J. L. W. V. JENSEN, *Sur les fonctions convexes et les inégalités entre les valeurs moyennes*, Acta Math., **30**, 1 (1906), 175–193.

[9] B. LIU, *Random fuzzy dependent-chance programming and its hybrid intelligent algorithm*, Inform. Sciences, **141**, 3 (2002), 259–271.

[10] J. MATKOWSKI, *A converse of the Hölder inequality theorem*, Math. Inequal. Appl., **13**, 1 (2009), 21–32.

[11] R. J. MCELIECE, *The Theory of Information and Coding*, Cambridge University Press, Cambridge, 2002.

[12] D. S. MITRINOVIĆ AND J. E. PEČARIĆ, *On an extension of Hölder's inequality*, Bollet. dell'Unione Mat. Italiana, **4**-A, 7 (1990), 405–408.

[13] D. S. MITRINOVIĆ, J. E. PEČARIĆ AND A. M. FINK, *Classical and New Inequalities in Analysis*, Kluwer Academic, Dordrecht, 1993.

[14] L. NIKOLOVA AND S. VAROŠANEC, *Refinements of Hölder's inequality derived from functions $\psi_{p,q,\lambda}$ and $\phi_{p,q,\lambda}$*, Ann. Funct. Anal., **2**, 1 (2011), 72–83.

[15] Y. OUYANG, R. MESIAR AND H. AGAHI, *An inequality related to Minkowski type for Sugeno integrals*, Inform. Sciences, **180**, 14 (2010), 2793–2801.

[16] A. RENYI, *On measures of entropy and information*, Proc. Fourth Berkeley Symp. on Math. Statist. and Prob., **1**, (1961), 547–561.

[17] C. E. SHANNON, *A mathematical theory of communication*, Bell System Technical Journal, **27**, 3 (1948), 379–423.

[18] R. P. SINGH, RAJEEV KUMAR AND R. K. TUTEJA, *Application of Hölder's inequality in information theory*, Inform. Sciences, **152**, (2003), 145–154.

[19] J.-F. TIAN, *Reversed version of a generalized Aczél's inequality and its application*, J. Inequal. Appl., **2012**, (2012), 202.

[20] J.-F. TIAN, *Property of a Hölder-type inequality and its application*, Math. Inequal. Appl., **16**, 3 (2013), 831–841.

[21] J.-F. TIAN AND X.-M. HU, *Refinements of generalized Hölder's inequality*, J. Math. Inequal., **7**, 4 (2013), 701–710.

[22] P. M. VASIĆ AND J. E. PEČARIĆ, *On the Jensen inequality for monotone functions*, An. Univ. Timişoara Ser. Şt. Matematice, **17**, 1 (1979), 95–104.

[23] S. WU AND L. DEBNATH, *Generalizations of Aczél's inequality and Popoviciu's inequality*, Indian J. Pure Ap. Mat., **36**, 2 (2005), 49–62.

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