

# CVaR Norm and Applications

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The talk considers a new norm in finite dimensional spaces, the CVaR norm. The CVaR norm is an average of several largest absolute components of a vector. CVaR norm is based on the Conditional Value-at-Risk (CVaR) risk measure, which is extensively used in risk management. CVaR norm is parameterized by a conservativeness parameter “alpha”. Similar to the standard  $L_p$  norm, the CVaR norm varies from  $L_1$  to  $L_\infty$  when parameter alpha varies from 0 to 1. Indeed,  $L_1$  norm is the average of all absolute values of components of the vector and  $L_\infty$  is the largest absolute value of the components. CVaR Norm is a piece-wise linear function. It can be used in various applications. It is especially convenient in optimization because it can be efficiently evaluated with convex and linear programming. Although the CVaR norm is a very simple concept, it was derived from a sophisticated risk management theory called Risk Quadrangle. The Risk Quadrangle defines five types of functionals: Risk, Deviation, Error, Regret, and Statistics. It can be shown, under some axiomatic assumptions, that from a Risk measure, it is possible to obtain a norm. In particular, the CVaR risk measure generates the CVaR norm.