K-Approximate Convexity and Its Applications

by

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Abstract:

In practice, managers face challenges of incomplete demand information and nonlinear production cost. We develop a new concept named K-approximate convexity, which is shown to be a generalization of K-convexity, to address these challenges. The idea is applied to obtain well-structured heuristic policies for two operations management problems, the joint pricing and inventory control problem with incomplete demand information and the periodic review inventory control problem with nonlinear production cost. We establish worst-case performance bounds on the heuristic policies in both problems. In a numerical study on a joint pricing and inventory control problem where demand is driven from real sales data, we find that the average gap between the profits of our heuristic policy and the optimal policy is only 0.27%, and the worst gap is 4.6%. In an extensive numerical study that is designed to reflect a practical inventory control application, the average gap between the costs of our heuristic policy and the optimal policy is only 0.11%, and the worst gap is just 1.81%.

Bio:

Dr. Ye Lu is an associate professor of management sciences and college director of PhD programs at City University of Hong Kong. He received a PhD in operations research from MIT in 2009, a PhD in mathematics from the University of Notre Dame in 2006 and a Bachelor of Science degree in applied math from Tsinghua University in 2002. His research interest includes operations management and nonlinear optimization. He has published in leading journals such as operations research, production and operations management, and SIAM Journal on optimization. He received a finalist award in 2009 INFORMS George E. Nicholson Student Paper Competition, a third prize in best paper competition of the seventh International Conference of Chinese Scholars Association for Management Science and Engineering in 2014, research excellence award by college of business in 2015 and President's award at City University of Hong Kong in 2017.

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All are welcome!