Lecture: On the Pervasiveness of Difference-Convexity in Optimization and Statistics

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Abstract:

With the increasing interest in applying the methodology of difference-of-convex (dc) optimization to diverse problems in engineering and statistics, we show that many well-known functions arising therein can be represented as the difference of two convex functions. These include a univariate folded concave function commonly employed in statistical learning, the value function of a copositive recourse function in two-stage stochastic programming, and many composite statistical functions in risk analysis, such as the value-at-risk (VaR), conditional value-at-risk (CVaR), expectation-based, VaR-based, and CVaR-based random deviation functionals.

We also discuss decomposition methods for computing directional stationary points of a class of nonsmooth, nonconvex dc programs that combined the Gauss-Seidel idea, the alternating direction method of multipliers (ADMM), and a special technique to handle the negative of a pointwise max function.

This talk is based on joint work with graduate student Mahed Nouiehed and Professor Meisam Razaviyayn both at the University of Southern California, on classes of difference-convex functions, and with Tao Min (visitor from Nanjing University, China) on the ADMM work.