Foundations of Optimizations

References

1. Optimization: insights and Application
   J.Brinkhuis and V.Tikhomirov
   Princeton University Press: 2005

2. Foundations of Optimization:
   Osman Guler
   Springer- 2010

3. Practical Methods of Optimization:
   R.Flectcher
   John wiley, 1987

4. Numerical Optimization
   J.Nocedal & Stephen.J.Wright
   Springer

FAQS in Optimization

1. Are most optimization problems solvable exactly?
   General Rule: optimization problems are in general not solvable exactly.

2. What does optimization algorithms return to us?
   They return a point generated by an iterative process and we choose the point which first satisfies a pre-set stopping criteria.

3. What is the difference between local and global convergence of optimization algorithms.
   Local convergence: If $\{x_k\}$ is a sequence of iterates generated by an algorithms, then x_k will converge to a local solution if x_o the initial point or starting point is near the solution point. (Newton's method has local convergence)
   Global Convergence: Start from anywhere……

4. Important Algorithm for unconstrained optimization
    A. Newton's Method
    B. Quasi-Newton Methods
    C. Trust-region Methods
    D. Conjugate gradients Method
    E. Derivative free techniques
5. Why are convex functions and convex sets important in optimization
   If we minimize a convex function over a convex set every minimum is a global minimum.

6. Are convex functions differentiable?
   No, they are differentiable everywhere except over a set of measure zero. (See the discussion on sub gradients in the lecture)

7. What are the important algorithms for solving constrained optimization problems?

    A) Simplex method for linear programming problems.
    B) Interior point methods for convex programming problems (e.g. karmarkar's algorithm)
    C) Penalty Function method
    D) Sequential Quadratic programming techniques.
    E) Sub gradients methods for convex optimization.

8. Current hot research areas in optimization
    A) Polynomial Optimization & Semi definite Programming
    B) Algebraic techniques in discrete optimization
    C) Variantional Analysis
    D) MPEC Problems, Bi-level problems and Variational in equality
    E) Stochastic Optimization
    F) Vector optimization