17. Reduced Gradient

- Newton's method for linear constraint.

Previous lecture

Sufficient condition for optimality of x^* for

$$\min_{x \in \mathbb{R}^n} f(x) \quad \text{s.t. } Ax = b.$$

f - smooth, $A \in \mathbb{R}^{m \times n}$, $m \leq n$

Equality constrained with quadratic min.

$$\min_{x \in \mathbb{R}^n} \frac{1}{2} x^T P x + q^T x + r \quad \text{s.t.} \quad Ax = b ,$$

Equality constrained with quadratic min. (contd.)

Newton's method for equality constraint:

Consider

$$\min_{x \in \mathbb{R}^n} f(x) \quad \text{s.t.} \quad Ax = b.$$

Quadratic approximation at $\bar{x}$:

We can solve:

Newton direction:

Algorithm

Example

$$\min_{x \in \mathbb{R}^n} \; f(x) \quad \text{subject to} \quad Ax = b. \quad \text{—— } ①$$

- An approach to solving ① is to solve the system of equations corresponding to optimality condition (KKT system)

- Algorithm approach:

  1.

  2.

Basis of Null (A)

① Using QR-decomposition :

Basis of Null(A)

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