Lecture 35

1) Augmented Lagrangian (quickly)
   or Relax in ADC
2) QN meth. in Alg. Stochastic grad.

- Aim: SQP.
1) Use meth. for Stock. Stochastic ALM.
2) Use $\frac{1}{2}\|c(x)\|^2$ for penalty method?
3) Stock. meth. for multi-dim opt?
4) Opt a fixed no. Proj. direct. Solve Opt?

Rate? ✓
Imp. ✓
Eff. ✓ space
Accuracy —

QN.

Stochastic QN

replace

$B_{k+1} = (B_k + \text{update})$

Replace (B_k) = Gaussian noise Hessian

Should lead to robust transformation

$\lambda_k \to \frac{\lambda_k + \lambda_k^*}{2}$

AL method

Penalty method

reduces in Origin

min $f(x) - \lambda^T c(x) + \frac{\mu}{2}\|c(x)\|^2$

Lagrangian of Constraint Center

$g(x) = c(x)^T \lambda$

SQP vs. ALM

from QP approach End Step.

from Newton opt. meth. to approx. Solve.

QN method.

recall a class approx. Hessian ⊗

$O(n^2)$ storage ⊗

if $n = 166$

$O(N^{12})$ Steps for Hessian.

LP

min $c^T x \Rightarrow c_1 x_1 + c_2 x_2$

s.t. $A_{eq} x = b_{eq} \Rightarrow A_{eq} x_1 + A_{eq} x_2 = b_{eq}$

$x \geq 0 \Rightarrow x_1 \geq 0$

SQP

min $C \cdot X = \sum_{ij} c_{ij} x_{ij} \Rightarrow \sum_{ij} c_{ij} x_{ij} = \tilde{c}_{ij}$

s.t. $A_j \cdot X = b_j \Rightarrow \sum_{ij} A_{ij} x_{ij} = \tilde{b}_j$

$X \geq 0 \Rightarrow x_i \geq 0$ ✓

$(X = X^T)$

$O(N^4)$

CS 590 - Purdue University - Computer Science - David F. Gleich - 2022