Optimization Methods for Computer Vision Applications (CS6777)

Software Assignment - 1

August 15, 2017

1 Problem Statement

- Given a random (non-singular) matrix A and a random vector X s.t $X \in \mathbf{R}^N$, the following equation holds good

$$AX = B \tag{1}$$

- Construct A' from A by (either)
  1. eliminating few rows
  2. concatenating few additional rows
- Now, form B' as

$$A'X = B' \tag{2}$$

- Solve the following optimization problem

$$\tilde{X} = \underset{X}{\text{minimize}} \, ||AX - B'||_F \tag{3}$$

  Use the following optimization algorithms
  1. Adaptive gradient descent
  2. Co-ordinate descent
  3. Conjugate gradient
  4. Quasi-Newton
  5. Gauss-Newton

  Equation 3 gives the optimum value of X ($\tilde{X}$) which minimizes $||AX - B'||_F$, where $||.||_F$ denotes the Frobenius norm.
- Plot $||X - \hat{X}||_2$ v/s %-of rows removed (or added) for different optimization algorithms (in a single plot), where $||.||_2$ denotes the $L2$-norm.
- Perform 5-fold study of this optimization problem.
- Repeat this experiment for $N = 10, 50$ and 100.

2 Algorithm Allotment

Name	Algorithm-1	Algorithm-2
Avishek Bhattacharjee	Gauss-Newton	Co-ordinate descent
Saptakatha Adak	Quasi-Newton	Conjugate Gradient
Sandeep NP	Adaptive gradient Descent	Quasi-Newton
Sayanti Bardhan	Conjugate Gradient	Adaptive gradient Descent

3 Instruction

There is no restriction on the usage of any programming language.