

Lab assignment 7

Optimization in ML (CSL4010)

Dr. Md Abu Talhamainuddin Ansary

Solve the following problems using subgradient descent method with (i) $\alpha_k = 1/5$ (ii) $\alpha_k = (1/(|r - 5| + k))$ r is last digit of your roll number. Use stopping criteria maximum 500 iterations. Plot (iteration, f_{best}).

1. $f(x) = \max\{(x_1 - 2)^2 + (x_2 + 2)^2, x_1^2 + 8x_2\}$
2. $f(x) = \max\{5x_1 + x_2, x_1^2 + x_2^2\}$
3. $f(x) = \max(x_1^2 + x_2^2 + x_3^2 - 1, x_1^2 + x_2^2 + (x_3 - 2)^2)$
4. $f(x) = \max(x_1 + x_2 + x_3 - 1, x_1 + x_2 - x_3 + 1)$
5. $f(x) = \max(2x_1^2 + 6x_2^2 + 2(5x_3 - x_1)^2, x_1^2 - 9x_3)$
6. $f(x) = \max\{g_{21}(x), g_{22}(x)\}$, $f(x) = \max\{g_{11}(x), g_{12}(x)\}$ where

$$g_{11}(x) = x_1^2 + x_2^2 + 2x_3^2 + x_4^2 - 5x_1 - 5x_2 - 21x_3 + 7x_4$$

$$g_{12}(x) = g_{11}(x) + 10(x_1^2 + x_2^2 + x_3^2 + x_4^2 + x_1 - x_2 + x_3 - x_4 - 8)$$

$$g_{21}(x) = g_{11}(x) + 10(x_1^2 + 2x_2^2 + x_3^2 + 2x_4^2 - x_1 - x_4 - 10)$$

$$g_{22}(x) = g_{11}(x) + 10(2x_1^2 + x_2^2 + x_3^2 + 2x_4^2 - x_1 - x_2 - x_4 - 5).$$