CS227 Assignment (15/11/23)

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1. Q. Minimize 3x2 – 13xy + 7y 2 by SD Method with Initial Point (1,1)

/MATLAB Drive/untitled2.m

```
syms x1 x2
%nagesh desai
%2201cs50
function_1 = 3*x1^2 - 13*x1*x2 +7*x2^2 ;
%the function we need to minimize funcx inline (function_1); %making this function operable
funcx = inline(function_1) ;
funcobjec = @(x) funcx(x(:,1), x(:,2));
grad = gradient(function_1);
gradfuncx =inline(grad);
Hess1= hessian (function_1);
Hessx=inline (Hess1);
x0 = [1 1]; % initial value
maxiter =3; % maximum number of iterations
tolerance = 5e-3; %tolerance to check
iterator =0;
X=[]; %vector to save next data
gradx= @(x) gradfuncx(x(:,1), x(:,2));
while norm (gradx(x0)) > tolerance && iterator< maxiter
X= [X;x0];
Step_length = -gradx(x0);
H = Hessx(x0);
lambda = Step_length' *Step_length./(Step_length'*H*Step_length); %getting the optimum lambda
Xnew = x0+ lambda.*Step_length';
x0 =Xnew;
iterator = iterator +1; %looping
end
fprintf("The optimum Solution is = [%f, %f] \n", x0(1), x0(2));
fprintf("The optimum value of f(x) is= %f \n", funcobjec (x0));
```

```
The optimum Solution is = [3.172012, 1.661530]
The optimum value of f(x) is= -19.005354
```

2. Q. Minimize 8x - y + 5x ^2 + 22xy + y^ 2 by SD Method with Initial Point (0,0)

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untitled2.m

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```
%nagesh desai
%2201cs50
function_1 = 8*x1 - x2 +5*x1^2 +22*x1*x2 +x2^2 ;
%the function we need to minimize funcx inline (function_1); %making this function
funcx = inline(function_1) ;
funcobjec = @(x) funcx(x(:,1), x(:,2));
grad = gradient(function_1);
gradfuncx =inline(grad);
Hess1= hessian (function_1);
Hessx=inline (Hess1);
x0 = [1 1]; % initial value
maxiter =3; % maximum number of iterations
tolerance = 5e-3; %tolerance to check
iterator =0;
X=[]; %vector to save next data
gradx= @(x) gradfuncx(x(:,1), x(:,2));
while norm (gradx(x0)) > tolerance && iterator< maxiter
X= [X;x0];
Step_length = -gradx(x0);
H = Hessx(x0);
lambda = Step_length' *Step_length./(Step_length'*H*Step_length); %getting the opti
Xnew = x0+ lambda.*Step_length';
x0 =Xnew;
iterator = iterator +1; %looping
end
fprintf("The optimum Solution is = [%f, %f] \n", x0(1), x0(2));
fprintf("The optimum value of f(x) is= %f \n", funcobjec (x0));
```

```
>> untitled2
The optimum Solution is = [0.162041, -0.479276]
The optimum value of f(x) is= 0.428024
```

```
X =

    1.0000    1.0000
   -0.4801    0.1490
   -0.0490   -0.6006
```