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Second order finite differencing is a technique to approximate the Hessian of a function when the gradient vector is not available. The method approximates the Hessian matrix only by using function values.

According to the lecture slides, by applying forward differencing to finite difference of a function, we get:

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The mentioned formula is used to approximate the Hessian of a function. The implemented function for approximating is called SOFD(second order finite differencing)

Then we modify the newton method to use the mentioned function .As the problem requirement is to only use the objective function to solve the minimization problem, newton function and Armijo function should also be modified to use forward differencing to approximate the gradient of the functions instead of taking the derivative as input. The function fdiff is used to deliver that requirement.

The modified newton function is called in a script named call. Also to check the accuracy of the implemented Hessian approximation, the output of the SOFD is compared to the output of fHesse function and the result is:

1.2849e-05

Which shows the function approximation is quite accurate.