Optimization Method:-

Optimization:-The process of finding maximum or minimum values is called optimisation.
#Application of optimization:-We are trying to do things like "maximise the profit in a company", or "minimise the costs", or find the "least amount of material to make a particular object".

*You may recall from calculus that the first derivative of a function is the rate of change or curvature of the function at a specific point. The derivative can be followed downhill (or uphill) by an optimization algorithm toward the minima of the function (the input values that result in the smallest output of the objective function).

*There are many method are:-

1)First-Order Methods: Optimization algorithms that make use of the first-order derivative to find the optima(maxima or minima) of an objective function.

2)Second-Order Methods:The second derivative can be followed to more efficiently locate the optima of the objective function. This makes sense more generally, as the more information we have about the objective function, the easier it may be to optimize it.
The second-order derivative allows us to know both which direction to move (like the first-order) but also estimate how far to move in that direction, called the step size.

Optimization algorithms that make use of the second-order derivative to find the optima of an objective function.
*Newton's method:-An example of a second-order optimization algorithm

*Vector:-Means straight line in slope of curve.
*Gradient:-the measure of the steepness of a straight line.The higher the gradient of a graph at a point, the steeper the line is at that point. A negative gradient means that the line slopes downwards.

*Hessian: Matrix of partial second-order derivatives for multiple input variables of an objective function.The Hessian matrix is square and symmetric if the second derivatives are all continuous at the point where we are calculating the derivatives. This is often the case when solving real-valued optimization problems and an expectation when using many second-order methods.
*Hessian matrix plays an important role in many machine learning algorithms, which involve optimizing a given function.The Hessian Matrix is a square matrix of second ordered partial derivatives of a scalar function. It is of immense use in linear algebra as well as for determining points of local maxima or minima.

3)BFGS:- is a second-order optimization algorithm.It is used for solving symmetric nonlinear equations.
Example:-

```
from scipy.optimize import minimize
def eqn(x):
  return x**2 + x + 2
mymin = minimize(eqn, 0, method='BFGS')      //where 0 is initialize of x=0
print(mymin)
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
o/pfun: 1.75
 hess_inv: array([[ 0.50000001]])
      jac: array([ 0.])
  message: 'Optimization terminated successfully.'
     nfev: 12
      nit: 2
     njev: 4
   status: 0
  success: True
        x: array([-0.50000001])  ///minimize x value
```

4)CG:-Conjugate Gradient algorithm is used to solve a linear system.it optimizes a quadratic equation in fewer step.

*Quadratic function:-It is a non-linear function and it produces a parabola.

5)Other method are:-*Newton-CG'
*'L-BFGS-B'
*'TNC'
*'COBYLA'
*s'SLSQP'