In [1]:

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# 2000031205 skill2
# hill climbing search of a one-dimensional objective function
from numpy import asarray
from numpy.random import randn
from numpy.random import rand
from numpy.random import seed

# objective function
def objective(x):
  return x[0]**2.0

# hill climbing local search algorithm
def hillclimbing(objective, bounds, n_iterations, step_size):
  # generate an initial point
  solution = bounds[:, 0] + rand(len(bounds)) * (bounds[:, 1] - bounds[:, 0])
  # evaluate the initial point
  solution_eval = objective(solution)
  # run the hill climb
  for i in range(n_iterations):
    # take a step
    candidate = solution + randn(len(bounds)) * step_size
    # evaluate candidate point
    candidte_eval = objective(candidate)
    # check if we should keep the new point
    if candidte_eval <= solution_eval:
      # store the new point
      solution, solution_eval = candidate, candidte_eval
      # report progress
      print('>%d f(%s) = %.5f' % (i, solution, solution_eval))
  return [solution, solution_eval]

# seed the pseudorandom number generator
seed(5)
# define range for input
bounds = asarray([[-5.0, 5.0]])
# define the total iterations
n_iterations = 1000
# define the maximum step size
step_size = 0.1
# perform the hill climbing search
best, score = hillclimbing(objective, bounds, n_iterations, step_size)
print('Done!')
print('f(%s) = %f' % (best, score))
```

```
>1 f([-2.74290923]) = 7.52355
>3 f([-2.65873147]) = 7.06885
>4 f([-2.52197291]) = 6.36035
>5 f([-2.46450214]) = 6.07377
>7 f([-2.44740961]) = 5.98981
>9 f([-2.28364676]) = 5.21504
>12 f([-2.19245939]) = 4.80688
>14 f([-2.01001538]) = 4.04016
>15 f([-1.86425287]) = 3.47544
>22 f([-1.79913002]) = 3.23687
>24 f([-1.57525573]) = 2.48143
>25 f([-1.55047719]) = 2.40398
>26 f([-1.51783757]) = 2.30383
>27 f([-1.49118756]) = 2.22364
>28 f([-1.45344116]) = 2.11249
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>30 f([-1.33055275]) = 1.77037
>32 f([-1.17805016]) = 1.38780
>33 f([-1.15189314]) = 1.32686
>36 f([-1.03852644]) = 1.07854
>37 f([-0.99135322]) = 0.98278
>38 f([-0.79448984]) = 0.63121
>39 f([-0.69837955]) = 0.48773
>42 f([-0.69317313]) = 0.48049
>46 f([-0.61801423]) = 0.38194
>48 f([-0.48799625]) = 0.23814
>50 f([-0.22149135]) = 0.04906
>54 f([-0.20017144]) = 0.04007
>57 f([-0.15994446]) = 0.02558
>60 f([-0.15492485]) = 0.02400
>61 f([-0.03572481]) = 0.00128
>64 f([-0.03051261]) = 0.00093
>66 f([-0.0074283]) = 0.00006
>78 f([-0.00202357]) = 0.00000
>119 f([0.00128373]) = 0.00000
>120 f([-0.00040911]) = 0.00000
>314 f([-0.00017051]) = 0.00000
Done!
f([-0.00017051]) = 0.000000
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