Optimizers in SciPy

In [3]:
```
# Optimizing Functions
# Essentially, all of the algorithms in Machine Learning are nothing more than a
```

Roots of an Equation

NumPy is capable of finding roots for polynomials and linear equations, but it can not find roots for non linear equations, like this one:

x + cos(x)

For that you can use SciPy's optimze.root function.

This function takes two required arguments:

fun - a function representing an equation.

x0 - an initial guess for the root.

The function returns an object with information regarding the solution.

The actual solution is given under attribute x of the returned object

In [4]:
```
#  Find root of the equation x + cos(x):

from scipy.optimize import root
from math import cos

def eqn(x):
  return x + cos(x)

myroot = root(eqn, 0)

print(myroot.x)
```

```
[-0.73908513]
```

In [6]:
```
 #  Print all information about the solution (not just x which is the root)

from scipy.optimize import root
from math import cos

def eqn(x):
  return x + cos(x)

myroot = root(eqn, 0)

print(myroot)
```

```
message: The solution converged.
success: True
 status: 1
    fun: [ 0.000e+00]
      x: [-7.391e-01]
   nfev: 9
   fjac: [[-1.000e+00]]
      r: [-1.674e+00]
    qtf: [-2.668e-13]
```

In [ ]:

```
Finding Minima
We can use scipy.optimize.minimize() function to minimize the function.

The minimize() function takes the following arguments:

fun - a function representing an equation.

x0 - an initial guess for the root.

method - name of the method to use. Legal values:
    'CG'
    'BFGS'
    'Newton-CG'
    'L-BFGS-B'
    'TNC'
    'COBYLA'
    'SLSQP'

callback - function called after each iteration of optimization.

options - a dictionary defining extra params:

{
     "disp": boolean - print detailed description
     "gtol": number - the tolerance of the error
  }
```

In [7]:

```
# Minimize the function x^2 + x + 2 with BFGS:

from scipy.optimize import minimize

def eqn(x):
  return x**2 + x + 2

mymin = minimize(eqn, 0, method='BFGS')

print(mymin)
```

```
  message: Optimization terminated successfully.
  success: True
   status: 0
      fun: 1.75
        x: [-5.000e-01]
      nit: 2
      jac: [ 0.000e+00]
 hess_inv: [[ 5.000e-01]]
     nfev: 8
     njev: 4
```

In [ ]: