# Assignment 1

**Q1. What in optimisation? Define the types of optimisations.**

Optimization in Python refers to the process of finding the best solution to a problem from a set of possible solutions, often under specific constraints. This process is crucial in various fields, including operations research, machine learning, engineering design, and economics, where the goal is typically to minimize costs or maximize profits.

**Linear Optimization**:

* Used when both the objective function and constraints are linear.
* **Python Tool**: scipy.optimize.linprog

**Nonlinear Optimization**:

* The objective function or constraints are nonlinear.
* **Python Tool**: scipy.optimize.minimize

**Constrained Optimization**:

* Optimization with constraints (linear or nonlinear).
* **Python Tool**: scipy.optimize.minimize with constraints

**Unconstrained Optimization**:

* No constraints on the variables.
* **Python Tool**: scipy.optimize.minimize (Same as nonlinear optimization when there are no constraints.)

**Discrete Optimization**:

* The variables take discrete values.
* **Python Tool**: PuLP for integer programming

**Q2. Minimise the given function using python.**

**f(x,y)=x^2+y^2+3x+4y+5**

import numpy as np

from scipy.optimize import minimize

def f(xy):

x, y = xy

return x\*2 + y\*2 + 3\*x + 4\*y + 5

initial\_guess = [0, 0]

result = minimize(f, initial\_guess)

if result.success:

print(f"Minimum value found at x = {result.x[0]}, y = {result.x[1]}, f(x, y) = {result.fun}")

else:

print("Optimization failed.")

output: x= -1.50

y= -2.00

f(x,y)= -1.25