Optimization Assignment-1

G.Kumar
kumargandhamaneni20016@gmail.com
IITH - Future Wireless Communication (FWC)

Problem: A company produces soft drinks that has a contract which requires that a minimum of 80 units of the chemical A and 60 units of the chemical B go into each bottle of the drink. The chemicals are available in prepared mix packets from two different suppliers. Supplier S had a packet of mix of 4 units of A and 2 units of B that costs Rs.10. The supplier T has a packet of mix of 1unit of A and 1 unit of B that costs Rs.4. How many packets of mixes from S and T should the company purchase to honour the contract requirement and yet minimize the cost? Make a LPP and solve graphically.

Solution

Let mixture contains x packets from supplier S,y packets from supplier T.
According to given problem, the condition can be formulated as,

$$P = \min_{x,y}(10x + 4y) \tag{1}$$

where P is minimum cost of mixture.
for Chemical A,

$$4x + y \geq 80 \tag{2}$$

for Chemical B,

$$2x + y \geq 60 \tag{3}$$

mixture contains both x,y so,

$$x \geq 0, y \geq 0 \tag{4}$$

eq 1 and 2 to 4 can be expressed in vector form as

$$\mathbf{P} = \min_{\mathbf{x}} \begin{pmatrix} 10 & 4 \end{pmatrix} \mathbf{x} \tag{5}$$
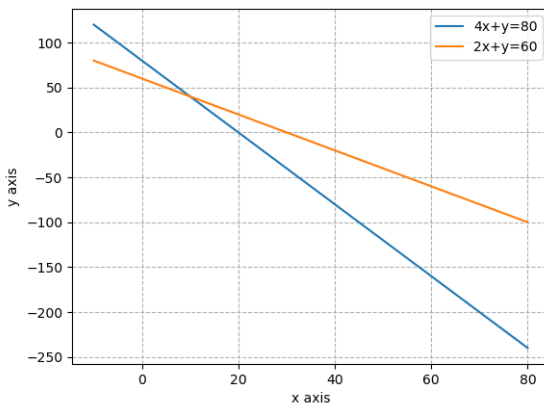
$$\begin{pmatrix} 4 & 1 \\ 2 & 1 \\ 1 & 0 \\ 0 & 1 \end{pmatrix} \mathbf{x} = \begin{pmatrix} 80 \\ 60 \\ 0 \\ 0 \end{pmatrix} \tag{6}$$

Solving above equations using cvxpy, we get

$$P_{min} = 260 \tag{7}$$

$$\mathbf{x} = \begin{pmatrix} 10 \\ 40 \end{pmatrix} \tag{8}$$