"Good morning! Coffee?" (v2)

Difficulty level: intermediate

Keywords

- Transportation
- Mixed Integer Linear Programming
- Python+PuLP

Problem description

A chain of bars signed a commercial contract with a roasting industry for the exclusive supply of coffee. The industry has to decide which among its four roasting plants T_1, T_2, T_3, T_4 to open in order to supply the three bars B_1, B_2 e B_3. Given the different distances between the plants and the bars, and the different means of transport used, transporting coffee from a plant to a bar has different costs (in €/kg), summarized in Table 1.

	B_1	B_2	B_3
T_1	$0,4$	$0,3$	$0,2$
T_2	$0,2$	$0,3$	$0,5$
T_3	$0,1$	$0,6$	$0,2$
T_4	$0,5$	$0,1$	$0,3$

Table 1: Costs (in €/kg) to transport coffee from the roasting plants T_1, T_2, T_3, and T_4 to the bars B_1, B_2, and B_3.

Also, take into account that:

- the fixed cost to open each roasting plant is 1350 €;
- no more than 3 roasting plants can be opened;
- the roasting plants T_1, T_2, T_3, T_4 can produce daily at most 75, 90, 80, and 65 Kg of coffee, respectively;
- the three bars need 60, 75, and 80 Kg of coffee, respectively.

Tasks

1. Identify the variables, the constraints, and the objective function of the problem in order to determine the quantities of coffee to be transported from each plant to each bar by minimizing total costs.
2. Implement the mathematical model in Python and solve it by exploiting the PuLP library.