import pandas as pd  
import numpy as np  
from scipy.optimize import linprog  
  
# Load input data from file  
data = pd.read\_csv(r:'C:\Users\junxi\OneDrive - UNSW\Desktop\modeling RTNDP\20230617\traffic equilibruim data.CSV')  
  
# Extract necessary data from input  
num\_nodes = data["num\_nodes"].values[0]  
num\_edges = data["num\_edges"].values[0]  
demand\_matrix = data.iloc[0:num\_nodes, 1:num\_nodes+1].values  
cost\_matrix = data.iloc[num\_nodes:num\_nodes+num\_edges, 1:num\_nodes+1].values  
  
# Frank-Wolfe algorithm for traffic assignment  
def frank\_wolfe(demand\_matrix, cost\_matrix):  
 num\_nodes = demand\_matrix.shape[0]  
 num\_edges = cost\_matrix.shape[0]  
  
 # Initialize flow variables  
 flow\_matrix = np.zeros((num\_nodes, num\_nodes))  
  
 # Perform iterations  
 num\_iterations = 100 # Set the desired number of iterations  
 for iteration in range(num\_iterations):  
 # Solve the linear program for traffic assignment  
 c = cost\_matrix.flatten()  
 A\_eq = np.zeros((num\_nodes, num\_edges))  
 for i in range(num\_nodes):  
 for j in range(num\_nodes):  
 if i != j:  
 A\_eq[i, j] = 1  
 b\_eq = demand\_matrix.flatten()  
 bounds = [(0, None)] \* num\_edges  
 result = linprog(c, A\_eq=A\_eq, b\_eq=b\_eq, bounds=bounds)  
 flow\_vector = result.x.reshape((num\_edges, 1))  
 flow\_matrix = flow\_vector.reshape((num\_nodes, num\_nodes))  
  
 # Update cost matrix based on the new flow  
 cost\_matrix = calculate\_updated\_cost\_matrix(cost\_matrix, flow\_matrix)  
  
 return flow\_matrix  
  
# Function to calculate updated cost matrix based on flow matrix  
def calculate\_updated\_cost\_matrix(cost\_matrix, flow\_matrix):  
 updated\_cost\_matrix = cost\_matrix - flow\_matrix  
 updated\_cost\_matrix[updated\_cost\_matrix < 0] = 0  
 return updated\_cost\_matrix  
  
# Run Frank-Wolfe algorithm  
flow\_matrix = frank\_wolfe(demand\_matrix, cost\_matrix)  
  
# Save flow data to file  
output\_data = pd.DataFrame(flow\_matrix)  
output\_data.to\_csv(r:'C:\Users\junxi\OneDrive - UNSW\Desktop\modeling RTNDP\20230617\traffic equilibruim data(new).CSV', index=False)