import pandas as pd  
import matplotlib.pyplot as plt  
import matplotlib.font\_manager as fm  
  
# Set the global font to Arial  
plt.rcParams['font.family'] = 'Arial'  
  
# Read data from the document  
data = pd.read\_excel(r'C:\Users\junxi\OneDrive - UNSW\Desktop\Algorithm NSGA2\parato.xlsx')  
  
# Extract the required column data  
investment\_budget = data['Investment budget']  
network\_reliability = data['Network connectivity reliability']  
total\_evacuation\_time = data['Total self-evacuation time']  
  
# Calculate the Pareto distribution  
def pareto\_distribution(data):  
 data = sorted(data, reverse=True)  
 total = sum(data)  
 cumulative\_percentage = 0  
 pareto\_percentages = []  
 for value in data:  
 percentage = (value / total) \* 100  
 cumulative\_percentage += percentage  
 pareto\_percentages.append(cumulative\_percentage)  
 return pareto\_percentages  
  
pareto\_percentages\_budget = pareto\_distribution(investment\_budget)  
pareto\_percentages\_reliability = pareto\_distribution(network\_reliability)  
pareto\_percentages\_time = pareto\_distribution(total\_evacuation\_time)  
  
# Plot the Pareto Chart  
plt.plot(range(1, len(data) + 1), pareto\_percentages\_budget, marker='o', label='Investment budget')  
plt.plot(range(1, len(data) + 1), pareto\_percentages\_reliability, marker='o', label='Network connectivity reliability')  
plt.plot(range(1, len(data) + 1), pareto\_percentages\_time, marker='o', label='Total self-evacuation time')  
  
# Set the x-axis interval to 2 and y-axis interval to 10  
plt.xticks(range(1, len(data) + 1, 3))  
plt.yticks(range(0, 101, 10))  
  
# Set the graph title and axis labels  
plt.title('Pareto Chart', fontweight='bold')  
plt.xlabel('Data Points', fontweight='bold')  
plt.ylabel('Cumulative Percentage', fontweight='bold')  
plt.legend()  
  
# Display the graph  
plt.show()