MVA Pythonpdf

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import pandas as pd
import matplotlib.pyplot as plt

def mean_value_analysis(N, Z, V, S):
    R = [0] * len(S)
    X = [0] * N
    R_combined = []
    R_total = []
    N_i = [[0 for _ in range(len(S))] for _ in range(N)]

    for n in range(1, N + 1):
        tmp_R = []
        for i in range(len(S)):
            if n > 1:
                R[i] = S[i] * (1 + N_i[n-2][i])
            else:
                R[i] = S[i]

            tmp_R.append(R[i])

        R_combined.append(tmp_R)

        current_R = [0] * len(S)
        for i in range(len(S)):
             if n > 1:
                current_R[i] = S[i] * (1 + N_i[n-2][i])
             else:
                current_R[i] = S[i]

        total_response_time = Z + sum(V[i] * current_R[i] for i in␣
 ↪range(len(S)))
        X[n-1] = n / total_response_time

        if n < N +1 :
             for i in range(len(S)):
                N_i[n-1][i] = X[n-1] * V[i] * current_R[i]


    for i in range(N):
        suma = 0
        for j in range(len(V)):
            suma += V[j] * R_combined[i][j]
        R_total.append(suma)

    return R_combined, R_total, X, N_i[:N]


# Test
if __name__ == "__main__":
    N = 10
    Z = 8.0
    V = [8, 7]
    S = [0.03, 0.1]

    R, Rt, X, N_i = mean_value_analysis(N, Z, V, S)

    df_R = pd.DataFrame(R, columns=["Station 1", "Station 2"], index=range(1, N + 1))
    df_Rt = pd.DataFrame(Rt, columns=["Total Response Time"], index=range(1, N + 1))
    df_X = pd.DataFrame(X, columns=["Throughput"], index=range(1, N + 1))
    df_N_i = pd.DataFrame(N_i, columns=["Jobs at Station 1", "Jobs at Station 2"], index=range(1, N + 1))

    fig, axs = plt.subplots(2, 2, figsize=(12, 10))
    fig.suptitle('Mean Value Analysis Results')

    df_R.plot(ax=axs[0, 0], marker='o')
    axs[0, 0].set_title('Response Time per Station')
    axs[0, 0].set_xlabel('Number of Jobs (n)')
    axs[0, 0].set_ylabel('Response Time (R)')
    axs[0, 0].grid(True)

    df_Rt.plot(ax=axs[0, 1], marker='o')
    axs[0, 1].set_title('Total System Response Time')
    axs[0, 1].set_xlabel('Number of Jobs (n)')
    axs[0, 1].set_ylabel('Total Response Time (Rt)')
    axs[0, 1].grid(True)


    df_X.plot(ax=axs[1, 0], marker='o')
    axs[1, 0].set_title('System Throughput')
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axs[1, 0].set_xlabel('Number of Jobs (n)')
axs[1, 0].set_ylabel('Throughput (X)')
axs[1, 0].grid(True)

df_N_i.plot(ax=axs[1, 1], marker='o')
axs[1, 1].set_title('Average Number of Jobs per Station')
axs[1, 1].set_xlabel('Number of Jobs (n)')
axs[1, 1].set_ylabel('Average Number of Jobs (N_i)')
axs[1, 1].grid(True)

plt.tight_layout(rect=[0, 0.03, 1, 0.95])
plt.show()
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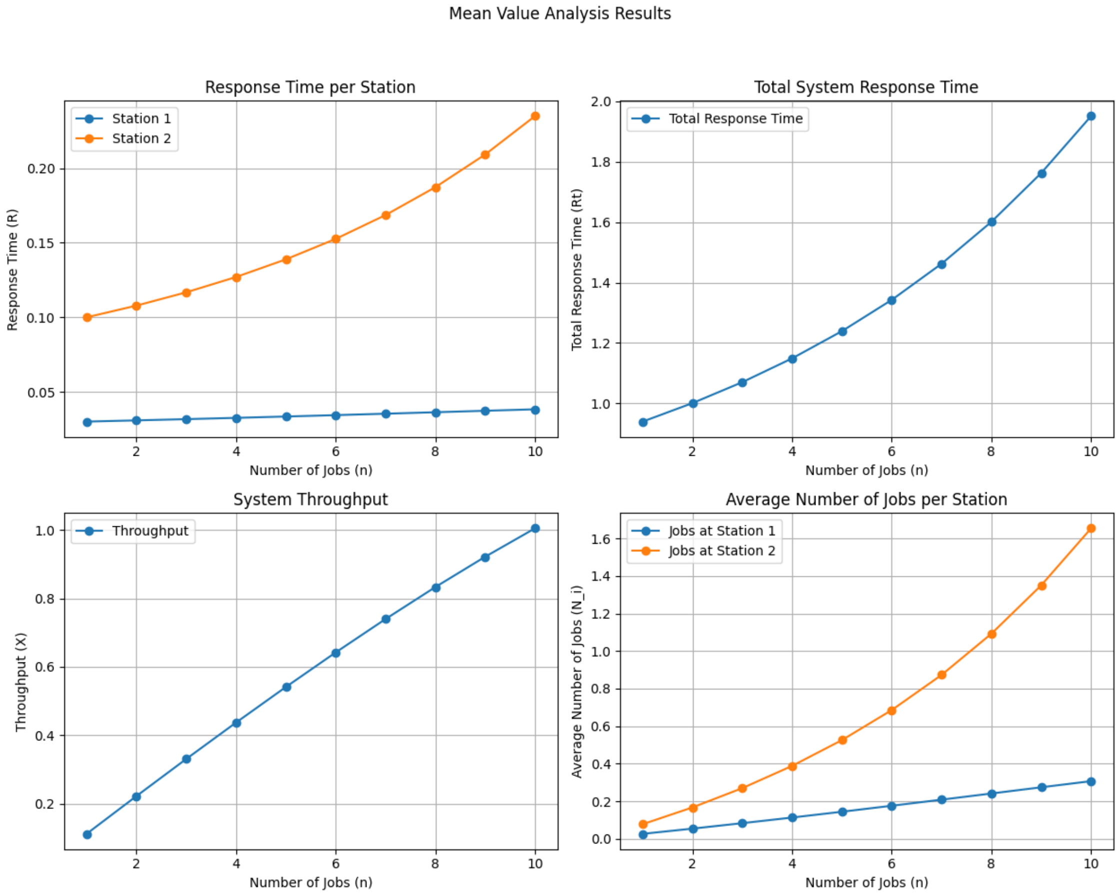

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[ ]: df_all = pd.DataFrame({
         "Response Time (R1)": [R[i][0] for i in range(len(R))],
         "Response Time (R2)": [R[i][1] for i in range(len(R))],
         "Total Response Time (R)": Rt,
         "Throughput (X)": X,
         "Jobs at Station 1 (N1)": [N_i[i][0] for i in range(len(N_i))],
         "Jobs at Station 2 (N2)" : [N_i[i][1] for i in range(len(N_i))]
     }, index=range(1, N + 1))

     df_all
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[ ]:     Response Time (R1)  Response Time (R2)  Total Response Time (R)  \
     1             0.030000            0.100000                 0.940000
     2             0.030805            0.107830                 1.001253
     3             0.031643            0.116771                 1.070540
     4             0.032512            0.127035                 1.149337
     5             0.033411            0.138877                 1.239428
     6             0.034339            0.152608                 1.342972
     7             0.035293            0.168603                 1.462561
     8             0.036266            0.187308                 1.601281
     9             0.037252            0.209248                 1.762755
     10            0.038242            0.235030                 1.951145

         Throughput (X)  Jobs at Station 1 (N1)  Jobs at Station 2 (N2)
     1         0.111857                0.026846                0.078300
     2         0.222191                0.054757                0.167712
     3         0.330741                0.083724                0.270347
     4         0.437190                0.113710                0.388768
     5         0.541159                0.144647                0.526081
     6         0.642194                0.176420                0.686028
     7         0.739757                0.208864                0.873076
     8         0.833222                0.241741                1.092482
     9         0.921871                0.274734                1.350299
     10        1.004909                0.307438                1.653286
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