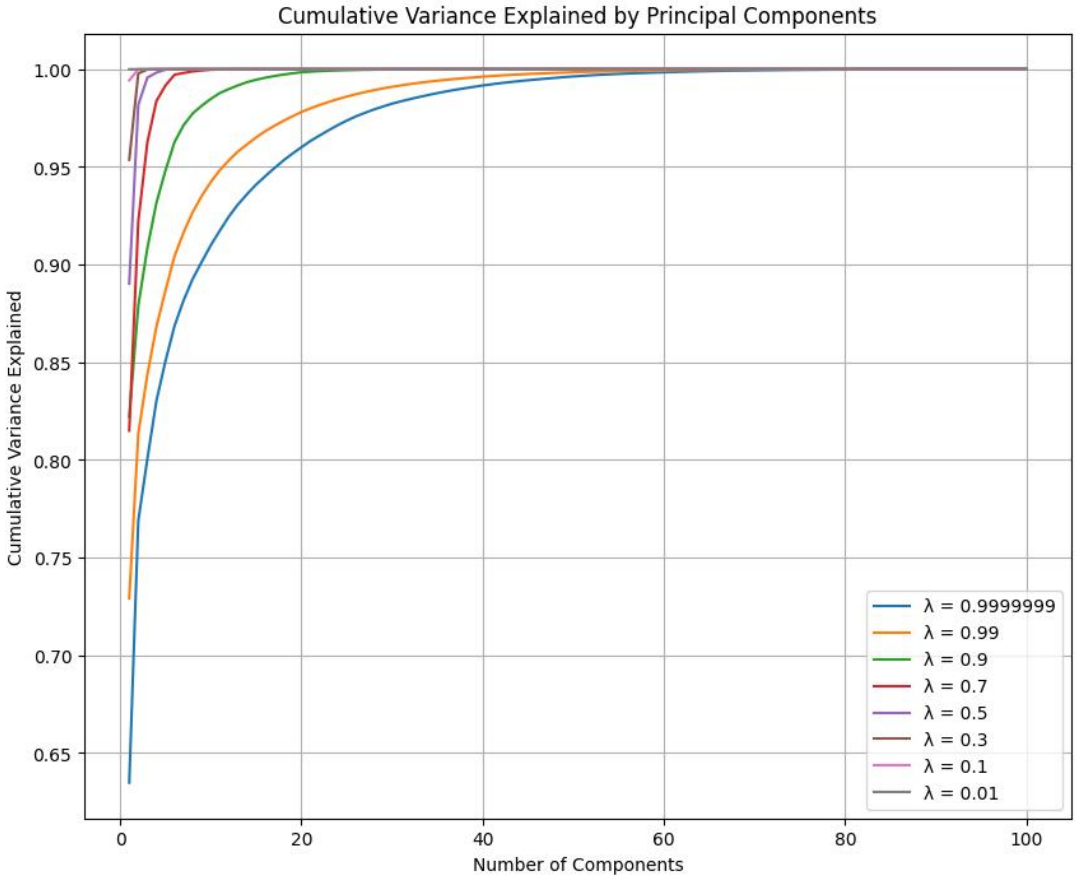
Problem1



Problem2

Matrix size: 100x100
Is original matrix PSD? False
Is near_psd() matrix PSD? True
Is Higham's method matrix PSD? True
Frobenius norm difference (near_psd): 43.220803907840704
Frobenius norm difference (Higham): 56.507550083496135
Runtime (near_psd): 0.0222 seconds
Runtime (Higham's method): 1.0724 seconds

Matrix size: 200x200
Is original matrix PSD? False
Is near_psd() matrix PSD? True
Is Higham's method matrix PSD? False
Frobenius norm difference (near_psd): 90.93783139832286
Frobenius norm difference (Higham): 121.16279655813064
Runtime (near_psd): 0.0242 seconds
Runtime (Higham's method): 2.6277 seconds

Matrix size: 300x300

Is original matrix PSD? False
Is near_psd() matrix PSD? True
Is Higham's method matrix PSD? False
Frobenius norm difference (near_psd): 139.29967282579483
Frobenius norm difference (Higham): 187.11574461366075
Runtime (near_psd): 0.0237 seconds
Runtime (Higham's method): 2.3743 seconds

Matrix size: 400x400
Is original matrix PSD? False
Is near_psd() matrix PSD? True
Is Higham's method matrix PSD? False
Frobenius norm difference (near_psd): 187.27495997073552
Frobenius norm difference (Higham): 253.09728277035427
Runtime (near_psd): 0.0429 seconds
Runtime (Higham's method): 4.5026 seconds

Matrix size: 500x500
Is original matrix PSD? False
Is near_psd() matrix PSD? True
Is Higham's method matrix PSD? False
Frobenius norm difference (near_psd): 236.08161762273485
Frobenius norm difference (Higham): 320.45679323732674
Runtime (near_psd): 0.0821 seconds
Runtime (Higham's method): 10.3035 seconds

Problem3

Simulating from covariance matrix: pearson_var
Direct simulation completed in 0.28 seconds.
PCA simulation (100% variance) completed in 0.28 seconds.
PCA simulation (75% variance) completed in 0.06 seconds.
PCA simulation (50% variance) completed in 0.03 seconds.

Simulating from covariance matrix: pearson_ew_var
Direct simulation completed in 0.26 seconds.
PCA simulation (100% variance) completed in 0.26 seconds.
PCA simulation (75% variance) completed in 0.05 seconds.
PCA simulation (50% variance) completed in 0.03 seconds.

Simulating from covariance matrix: ew_corr_var
Direct simulation completed in 0.23 seconds.
PCA simulation (100% variance) completed in 0.28 seconds.
PCA simulation (75% variance) completed in 0.05 seconds.
PCA simulation (50% variance) completed in 0.02 seconds.

Simulating from covariance matrix: ew_corr_ew_var
Direct simulation completed in 0.26 seconds.
PCA simulation (100% variance) completed in 0.29 seconds.
PCA simulation (75% variance) completed in 0.05 seconds.
PCA simulation (50% variance) completed in 0.02 seconds.

Timings (in seconds):

Covariance Matrix: pearson_var
  direct: 0.28 seconds
  pca_100: 0.28 seconds
  pca_75: 0.06 seconds
  pca_50: 0.03 seconds

Covariance Matrix: pearson_ew_var
  direct: 0.26 seconds
  pca_100: 0.26 seconds
  pca_75: 0.05 seconds
  pca_50: 0.03 seconds

Covariance Matrix: ew_corr_var
  direct: 0.23 seconds
  pca_100: 0.28 seconds
  pca_75: 0.05 seconds
  pca_50: 0.02 seconds

Covariance Matrix: ew_corr_ew_var
  direct: 0.26 seconds
  pca_100: 0.29 seconds
  pca_75: 0.05 seconds
  pca_50: 0.02 seconds

Frobenius Norms:

Covariance Matrix: pearson_var
  direct: 0.0002
  pca_100: 0.0002
  pca_75: 0.0011
  pca_50: 0.0021

Covariance Matrix: pearson_ew_var
  direct: 0.0002
  pca_100: 0.0003

pca_75: 0.0013
pca_50: 0.0028

Covariance Matrix: ew_corr_var
direct: 0.0002
pca_100: 0.0002
pca_75: 0.0013
pca_50: 0.0026

Covariance Matrix: ew_corr_ew_var
direct: 0.0002
pca_100: 0.0002
pca_75: 0.0016
pca_50: 0.0035