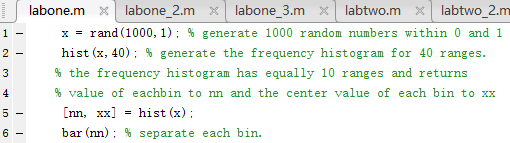
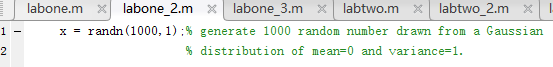
# Machine Learning Lab 1

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Problem 1

Answer:





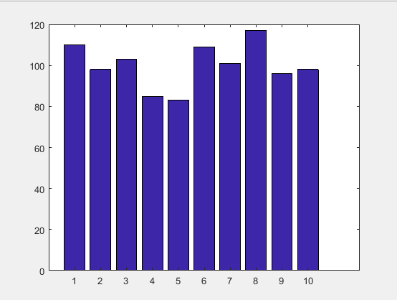
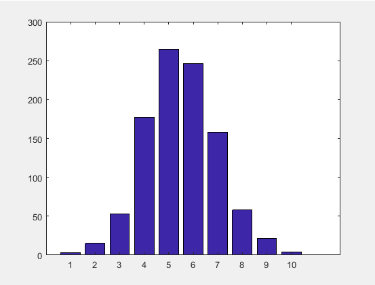
 

Figure 1.1: result of labone.m Figure 1.2: result of labone\_2.m

It could find ‘rand’ command is uniform distribution and ‘randn’ is Gaussian distribution.

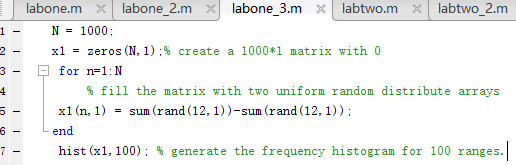
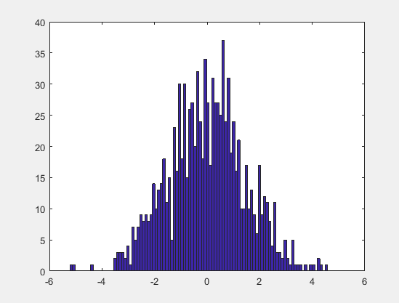
 

Figure 1.3: result of labone\_3.m

It could find the result is similar to a Gaussian distribution. Due to the central limit theorem, in most situations, when independent random variables are added, their properly normalized sum tends toward a normal distribution.

Problem 2

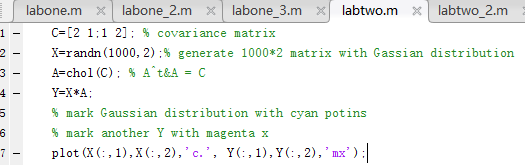
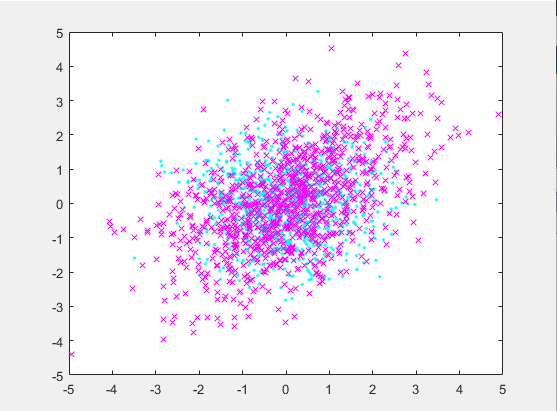
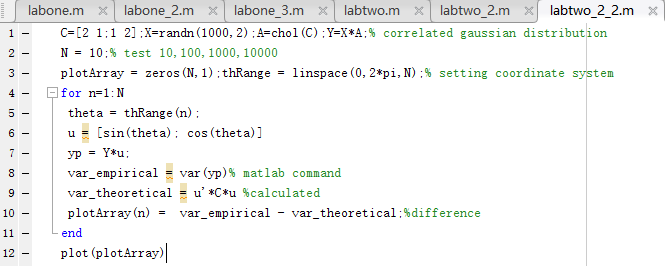
 

Figure 1.4: result of labtwo.m

This is using a linear transformation to generate the multivariate normal distribution. The n-dimensional random variable is normal distribution N(u,B), suppose m dimensional random variable Y is the linear transformation of X, it means Y=XC, C is a n\*m matrix, therefore Y is m dimensional normal distribution N(Uc,C’BC).

In this case, using Cholesky decompose to a covariance matrix and multiply a normal distributed matrix can obtain a linear correlated or negative correlated distribution which like figure 1.4.



The curve will smooth with the increasing N from 10,100,1000,10000.

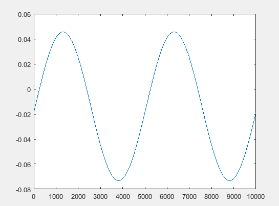
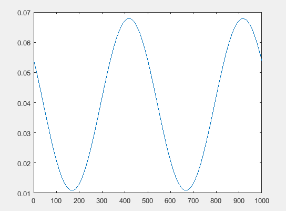
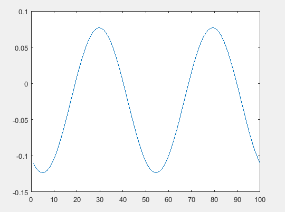
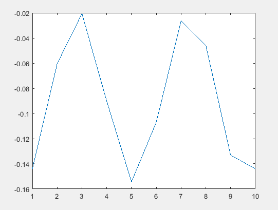


Figure 1.5: result of labtwo2\_2.m

Therefore, the eigenvalue of A is and

When , \*, so and the eigenvector is

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