MATLAB Programming NCTU Spring 2017 Assignment#2 due 2017/4/9

In this assignment, you will make contour and pseudo-color plots for two-variable functions.

- The function you will use is generalized normal distribution in 2-D:

$$p(\boldsymbol{x}) = \frac{1}{\sqrt{(2\pi)^2|\Sigma|}} \exp\left(-\frac{1}{2}(\boldsymbol{x}-\boldsymbol{\mu})\Sigma^{-1}(\boldsymbol{x}-\boldsymbol{\mu})^T\right)$$

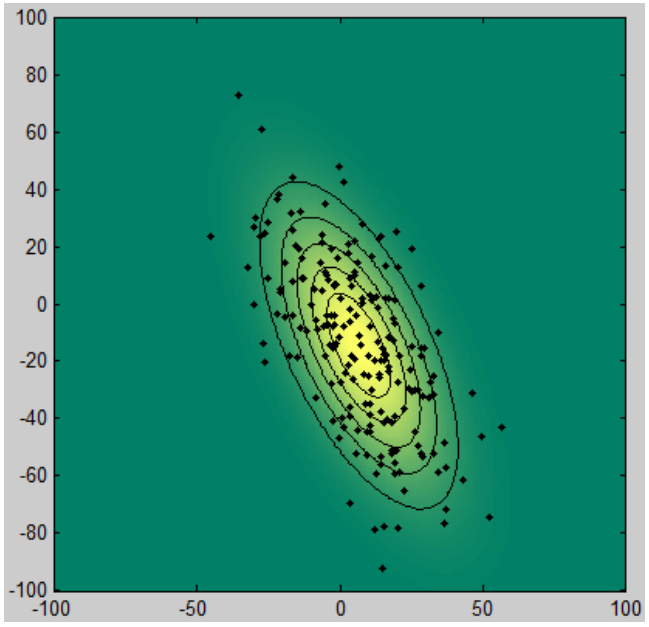
  All the vectors are row vectors. Each $\boldsymbol{x}$ here represents a 2-D point. Here $\boldsymbol{\mu}$ is the "mean" and Σ is the "covariance matrix".

- The following template code is given:

```
function c2017prog2  % change to your function name
  N = 200;
  A = [10 8; -15 30];  d = [5 -10];
  X = randn(N,2) * A + repmat(d, N, 1);
  fn(X);
return;

function fn(X)
  % put your code here
return;
```

  The first function generates a set of data points in **X** that approximate a normal distribution. Each row in **X** represents a point.



- Compute the mean vector and covariance matrix (matlab function **cov**) of the sample points. The covariance matrix is just 2x2.
- Next, create a dense 2-D grid of points (as we have done in previous lab sessions), and use the equation above to compute $p(\boldsymbol{x})$. You will use these matlab functions: **inv** (for inverse) and **det** (for determinant).
- Plot your $p(\boldsymbol{x})$ using contour and pseudo-color plots. The pseudo-color plot is generated using **imagesc**. Try to overlay them together, as well as the original sample points. An example result is shown above.
- For fun, try different values in A and d to create different normal distributions.

Submission: Submit your code (m file) through e3. Name your file **P2_#######.m**, where the ******* represents your student ID. There will be a three-day grace period after the due date, during which there will be a 10%/day deduction for your grade.

A "copy detection" will be applied to your submissions, and those found to have copied assignments will receive zero points for the assignment.

Your code should include sufficient comments. This will be part of the grade. Include your name and ID at the top of your code.

There will be demo session with the TAs (date/time to be announced later).