CS 215 ASSIGNMENT

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Question 2

(a) $X = AW + \mu$.

μ & C are known. W can be ~~gre~~ generated from randn() function.

Now we have to find a candidate A.

$C = AA^T$.

$C = USU^T$. Spectral Theorem; SVD with C being symmetric

diagonal ~~vector~~ matrix consisting of eigen values.

If we can get W_1 such that;

$S = W_1 W_1^T$ (different from the W in $X = AW + \mu$)

then $AA^T = U W_1 W_1^T U^T = C$

$\Rightarrow$ $A = UW_1$ would serve the purpose.

Since $S = \begin{bmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{bmatrix}$; $W_1 = \begin{bmatrix} \sqrt{\lambda_1} & 0 \\ 0 & \sqrt{\lambda_2} \end{bmatrix}$

will satisfy $S = W_1 W_1^T = W_1^2$.

or $W_1 = \text{sqrt}(S)$ → element-wise square root.

eig( ) function gives us U & S of

$C = USU^T$.

$W_1 = \sqrt{S}$. $A = UW_1$.

Hence we get A.
From which now we generate $X = AW + \mu$

~~X~~ $W \rightarrow$ from randn() function
$\mu \rightarrow$ known.
$A \rightarrow$ obtained above.

(b.)

(c) Graphs & Plots attached.

(d.)