SMAI-M20-Lec 13 Review questions

IIIT Hyderabad

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Review Question - I (one, none or more correct)

Consider X to be a square matrix of size $n \times n$ and $X = UDV^T$. Then:

1. If rank(X) $= n$, D has all non-zero entries in diagonal.
2. If rank(X) $= k$, D has k zeros in diagonal
3. If rank(X) $= k$, D has $n - k$ zeros in diagonal
4. if rank(X) $= n$ but $|A|$ is a very small number then, D takes the form $D = diag(d_1, d_2, .., \epsilon)$ where ϵ is a very small number
5. None of these

Ans: ACD

Review Question - II (one, none or more correct)

Suppose you want to apply PCA to your data X which is in 2D and you decompose X as UDV^T. Then,

1. PCA can be useful if all elements of D are equal
2. PCA can be useful if all elements of D are not equal
3. D is not full-rank if all points in X lie on a straight line
4. V is not full-rank if all points in X lie on a straight line
5. D is not full-rank if all points in X lie on a circle
6. None of these Ans: BC

Review Question - III (one, none or more correct)

If $g(\mathbf{w})$ is L1 norm of $\mathbf{w}$ and $\lambda = 1$, what is the optimal value of $\mathbf{w}$ (if the true answer is very close to one given, do round/approximate for simplifying the answer here)

1. $[0, 3]^T$
2. $[4, 0]^T$
3. $[1, 1]^T$
4. $[3, 4]^T$
5. None of the above

Ans: A

Review Question - IV (one, none or more correct)

Consider the vector $\mathbf{w} = [w_1, w_2]^T$ and the objective function to be minimized as:

$$\min_{\mathbf{w}} (3w_1 + 4w_2 - 12)^2 + \lambda g(\mathbf{w})$$

If $g(\mathbf{w})$ is L2 norm of $\mathbf{w}$ and $\lambda = 1$, what is the optimal value of $\mathbf{w}$

1. $[0, 3]^T$
2. $[4, 0]^T$
3. $[1, 1]^T$
4. $[3, 4]^T$
5. None of the above

Ans: E

Consider the vector $\mathbf{w} = [w_1, w_2]^T$ and the objective function to be minimized as: enumerate

$$\min_{\mathbf{w}} (3w_1 + 4w_2 - 12)^2 + \lambda g(\mathbf{w})$$

If $g(\mathbf{w})$ is L1 norm of $\mathbf{w}$ and $\lambda = 2$, what is the optimal value of $\mathbf{w}$ (if the true answer is very close to one given, do round/approximate for simplifying the answer here)

1. $[0, 3]^T$
2. $[4, 0]^T$
3. $[1, 1]^T$
4. $[3, 4]^T$
5. None of the above

Ans: A