

SMAI-M20-Lec 22 Review questions

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

1. You know LDA/Fisher. Consider a two class problem with two samples $((2, 3), +)$ and $((3, 4), -)$. S_w is regularized as $S_w + \sigma I$. The LDA solution \mathbf{w}^* will be:
 - 1.1 along the direction of $(2, 3)$ and $(3, 4)$
 - 1.2 orthogonal to the direction of $(2, 3)$ and $(3, 4)$
 - 1.3 neither along nor orthogonal to the direction of $(2, 3)$ and $(3, 4)$.
 - 1.4 If we have not regularized, S_w would have become a NULL matrix.
 - 1.5 None of the above.

Ans: AD

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

You know LDA/Fisher. The goal is to:

1. maximize inter class scatter
2. minimize inter class scatter
3. maximize within class scatter
4. minimize within class scatter
5. Any two of the above.

Ans: AD

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

You know LDA/Fisher. There are two classes ω_1 and ω_2 . $d = 4$. Both are multivariate Gaussians with $\Sigma = I$. There are 50 and 100 samples from these two classes respectively. i.e., $N = 150$. The rank of S_B is

1. 1
2. 2
3. $150(N)$
4. $4(d)$
5. None of the above

Ans: A This is like finding rank of a covariance matrix of 2 points (the means of both classes)

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

You know LDA/Fisher. There are two classes ω_1 and ω_2 . $d = 4$. Both are multivariate Gaussians with $\Sigma = I$. There are 50 and 100 samples from these two classes respectively. i.e., $N = 150$. What is the rank of S_w is:

1. 2
2. 4
3. 1
4. 100
5. 150

Ans: B $S_W = 2I$ (where $I = \text{identity matrix of size } 4 \text{ by } 4$)

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

You know LDA/Fisher for two class classification problem. We know the problem as solving for:

$$S_b u = \lambda S_w u$$

and the solution as:

$$u^* = \alpha S_w^{-1} [\mu_1 - \mu_2]$$

1. Both S_B and S_w are of $d \times d$.
2. Given the problem statement, we can write $S_b = \lambda S_w$. Or one matrix is the scaled version of the other.
3. There is one and only one u that satisfy the problem. (or solution to the problem is unique).
4. u^* is obtained by solving our problem with an additional constraint of $\|u\|_2^2 = 1$
5. None of the above.

Ans: A