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## Homework #3

Linear Discriminant

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## Least Square

Implement Least square for Linear discriminant as follows.

1. Generate two groups of 2D random data. (Each group has 150 samples)
  - $(x_1, y_1) \sim (\mathcal{N}(3, 1^2), \mathcal{N}(1, 3^2))$
  - $(x_2, y_2) \sim (\mathcal{N}(-3, 1^2), \mathcal{N}(-1, 3^2))$
2. Use Least square, find  $\widetilde{\mathbf{W}}$ .
3. Plot data & decision boundary
4. Add some outliers (10 samples) -  $(x_3, y_3) \sim (\mathcal{N}(5, 1^2), \mathcal{N}(3, 1^2))$  and repeat 2, 3.

## Fisher's LDA

Use Fisher's linear discriminant, repeat above.

**Hint:** We know  $\mathbf{w} \propto \mathbf{S}_w(\mathbf{m}_2 - \mathbf{m}_1)$ . With normalization, we can find true  $\mathbf{w}$ .

### Helpful reference

- Bishop Chap 4
- <https://adnoctum.tistory.com/442>

## RANSAC

RANSAC means Random Sample Consensus. ([Wiki](#))

It is much more robust than Least square.

Implement RANSAC and apply to parabola problem in <https://darkpgmr.tistory.com/61>.