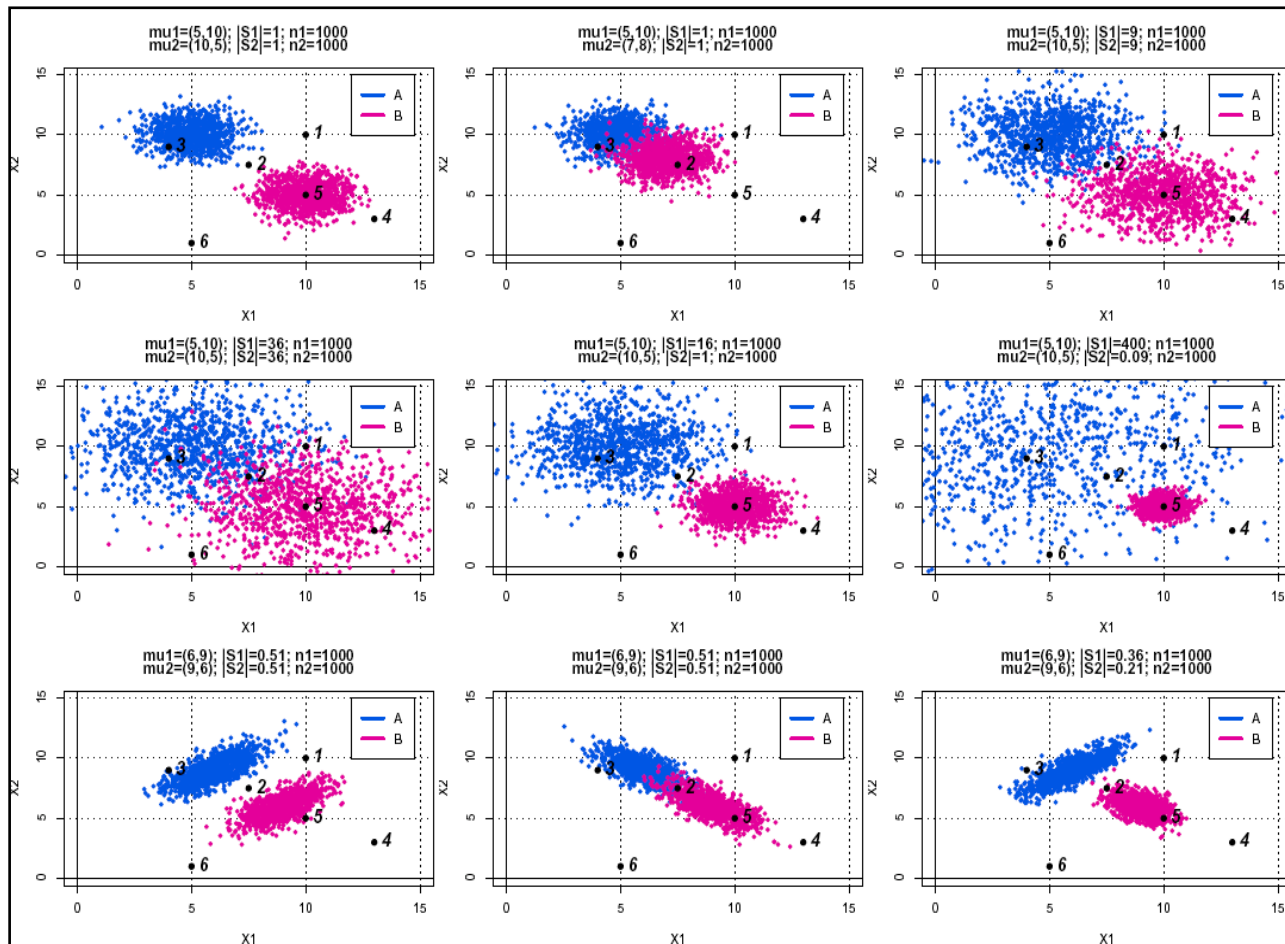


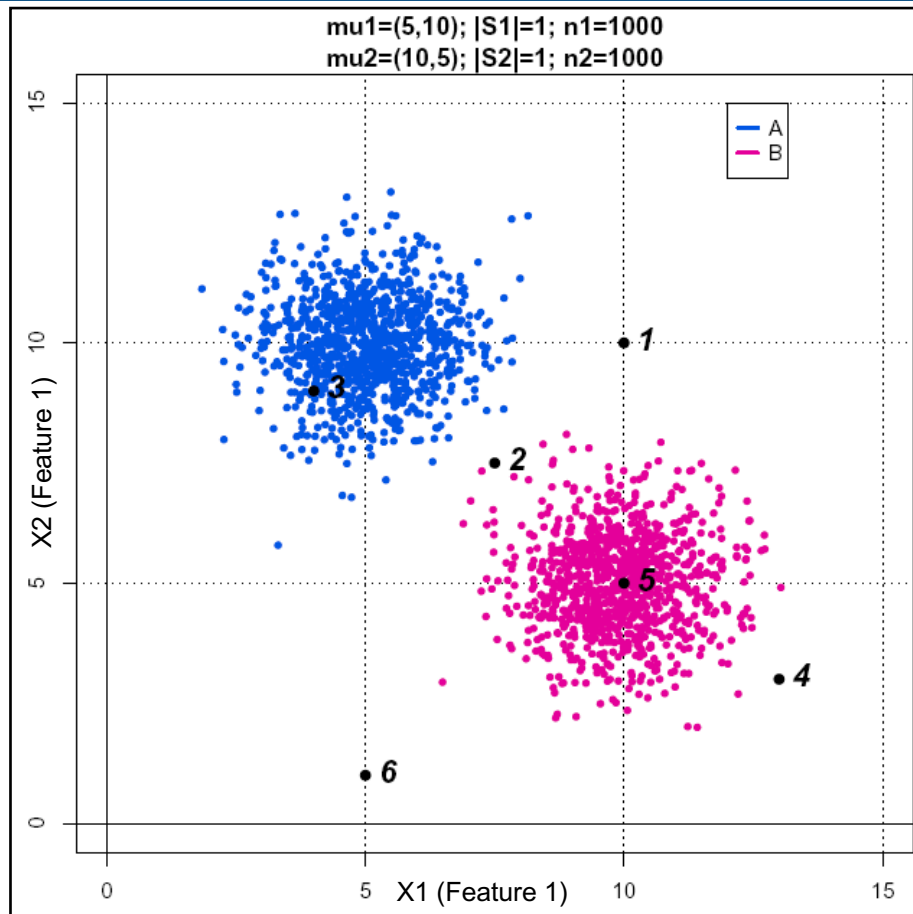
Brain-learning exercise : assign individuals to groups based on their features

Conceptual illustration with two predictor variables



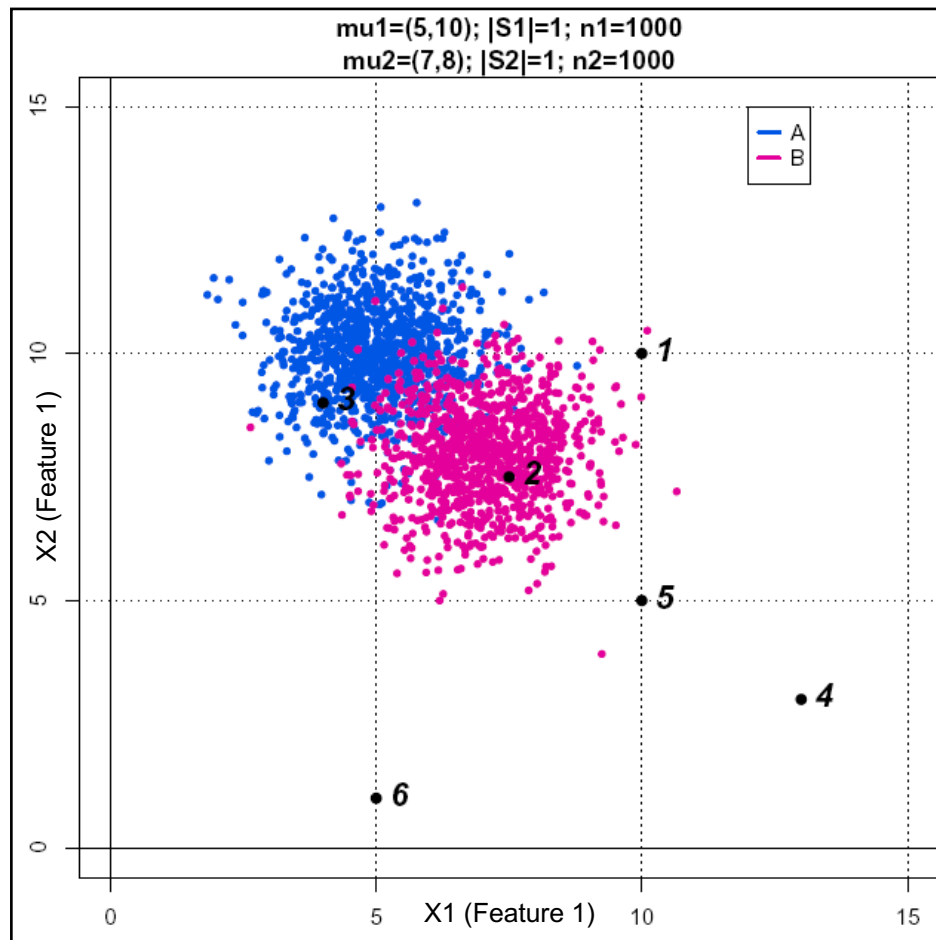
- In the next slides, we will provide you with a higher-resolution of the plots, which represent represent a study case.
- Exercise: assign intuitively each individual (black dot) to one of the two groups (A, B).
 - At each step, ask yourself the following questions.
 - Which criterion did you use to assign an individual to a group?
 - How confident do you feel for each of your predictions?
 - What is the effect of the respective means?
 - What is the effect of the respective standard deviations?
 - What is the effect of the correlations between the two variables?

Conceptual illustration with two variables – Study case 1



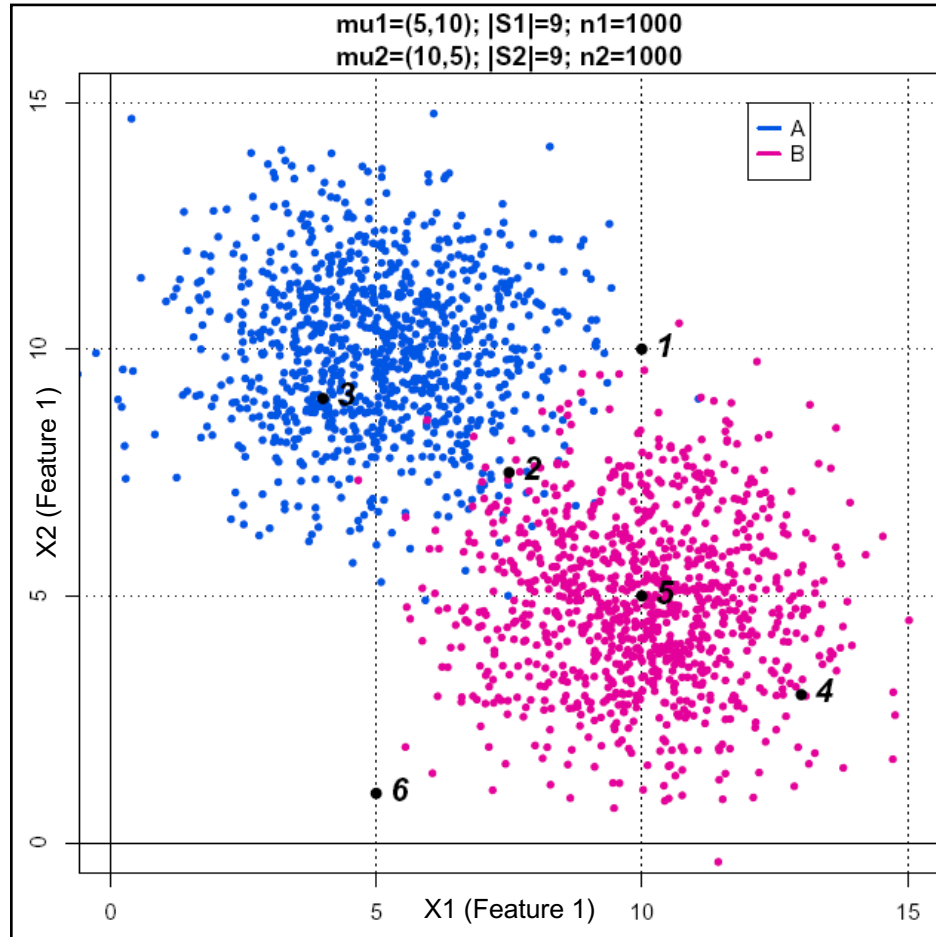
- Inspect the distribution of points for the two groups of individuals (pink, blue) on the 2-dimensional feature space.

Conceptual illustration with two variables – Study case 2



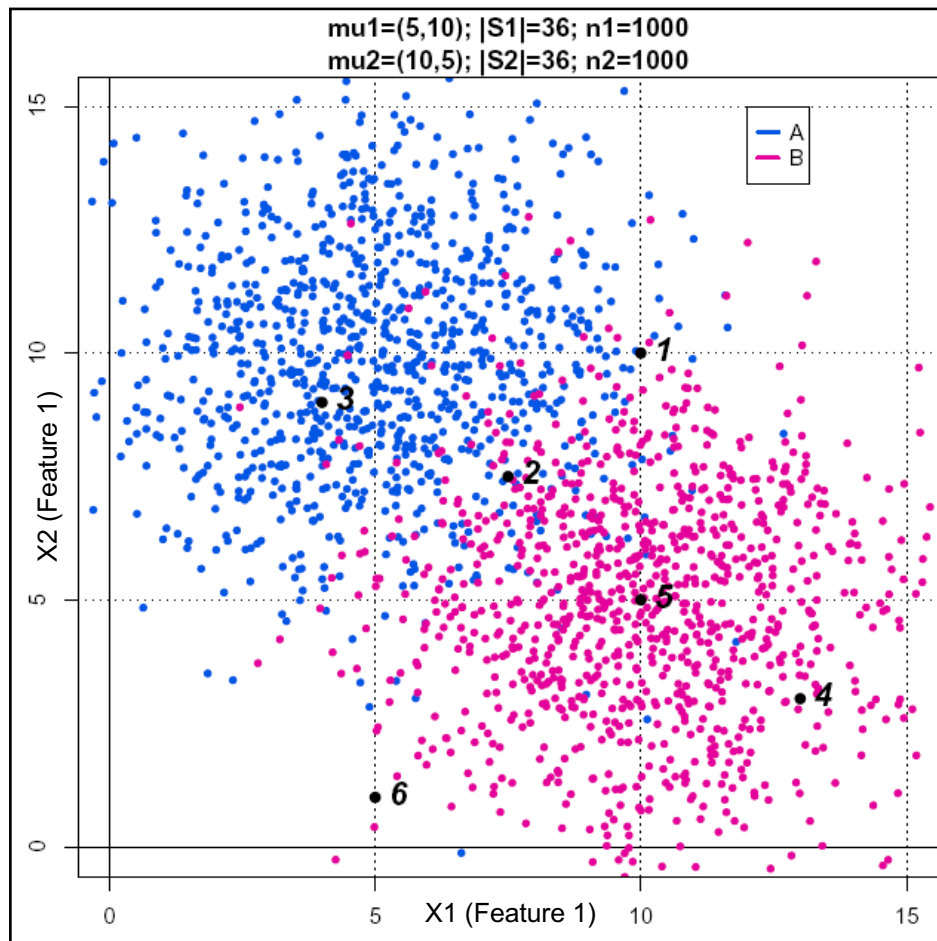
- Effect of the group **centre location**.

Conceptual illustration with two variables – Study case 3



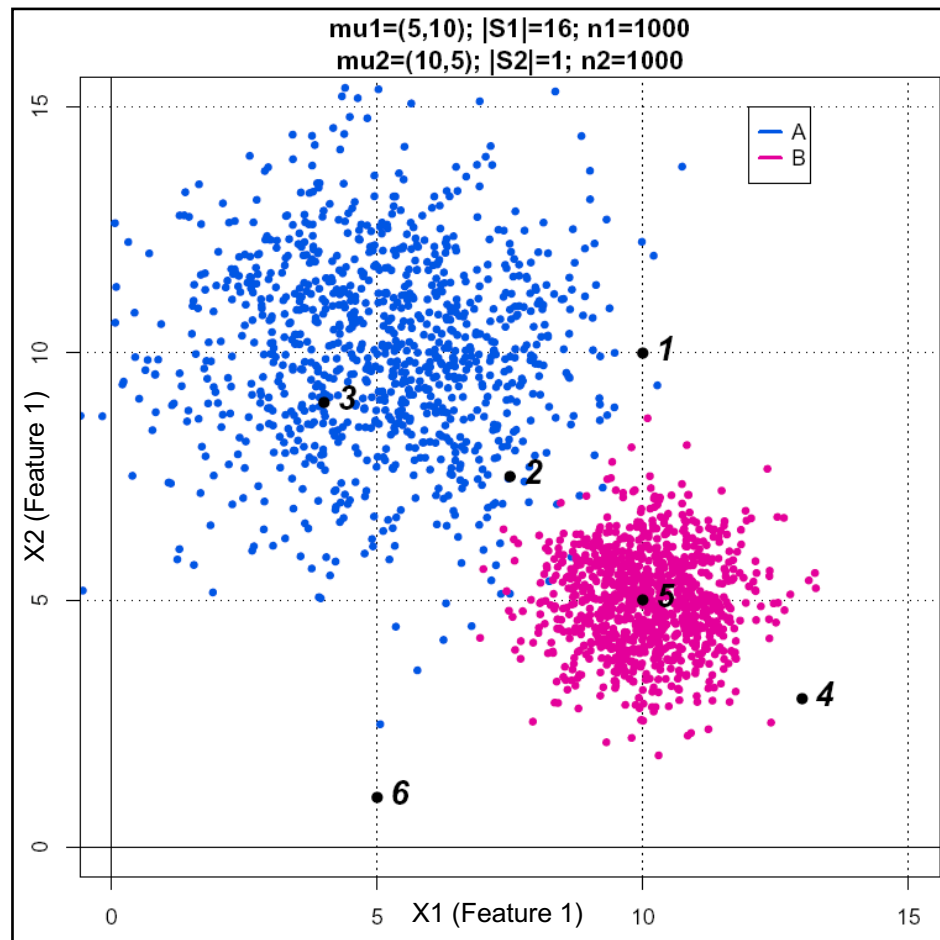
- Effect of the group **variance**.

Conceptual illustration with two variables – Study case 4



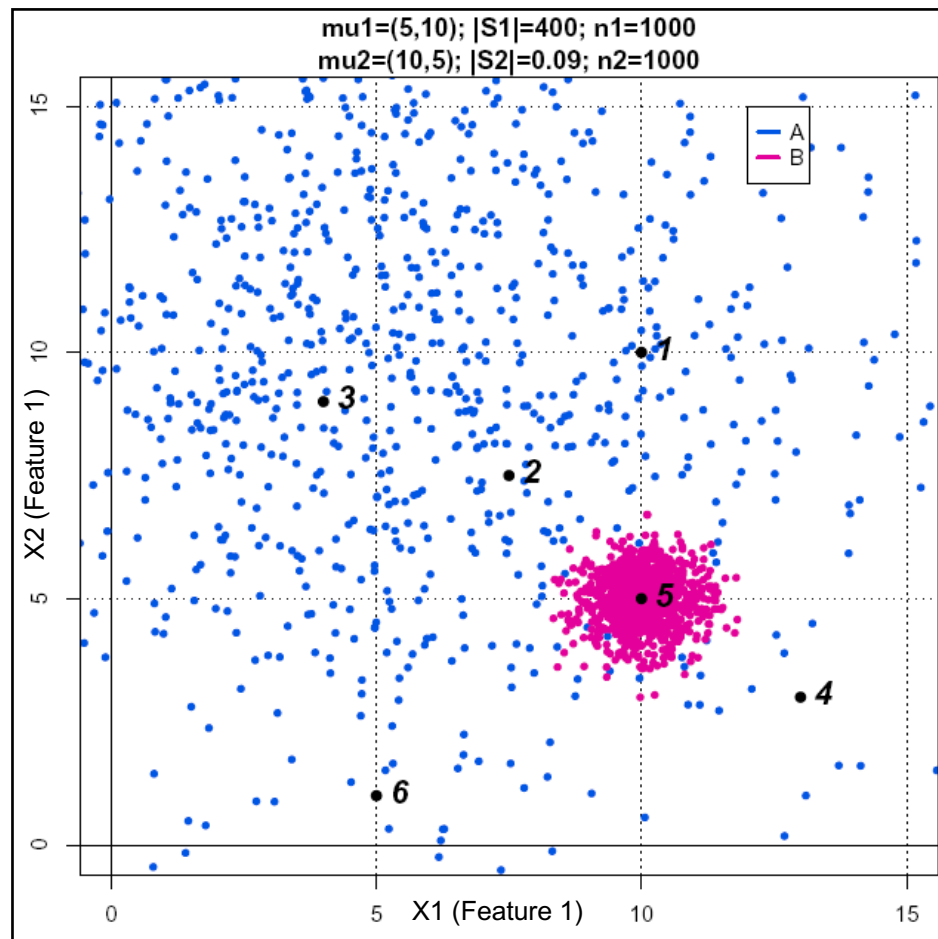
- Effect of the group **variance**.

Conceptual illustration with two variables – Study case 5



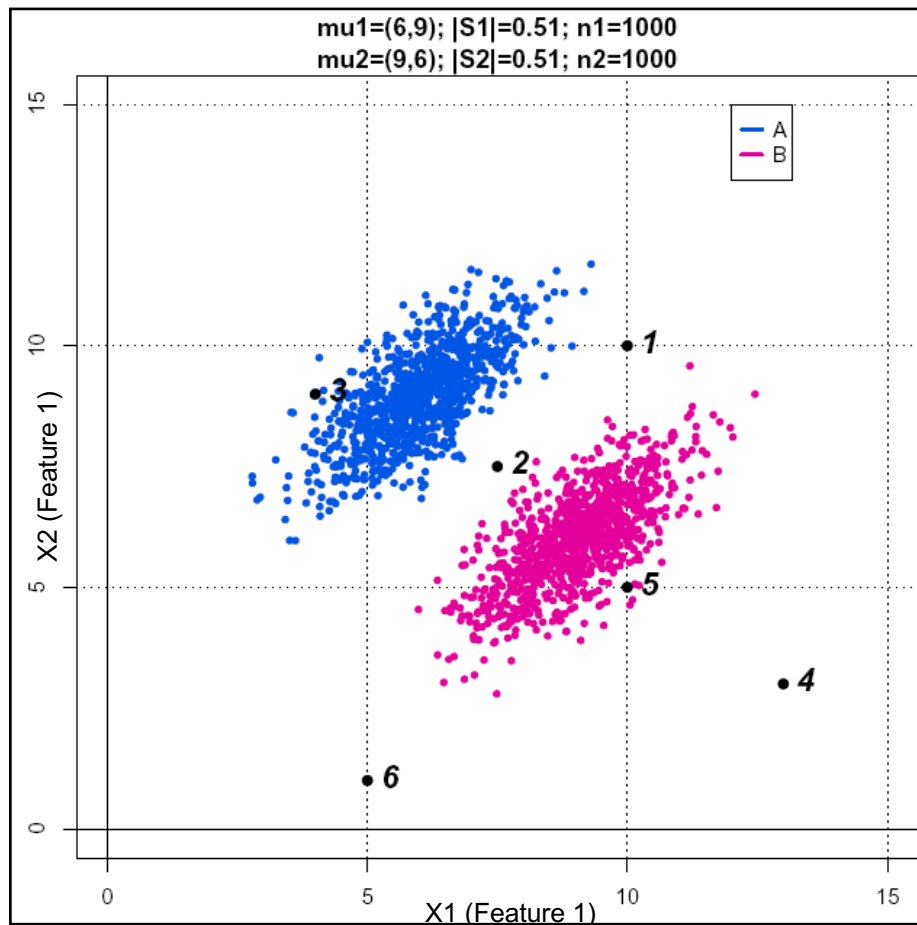
- Impact of the group-specific variances (heteroscedasticity of the data)

Conceptual illustration with two variables – Study case 6



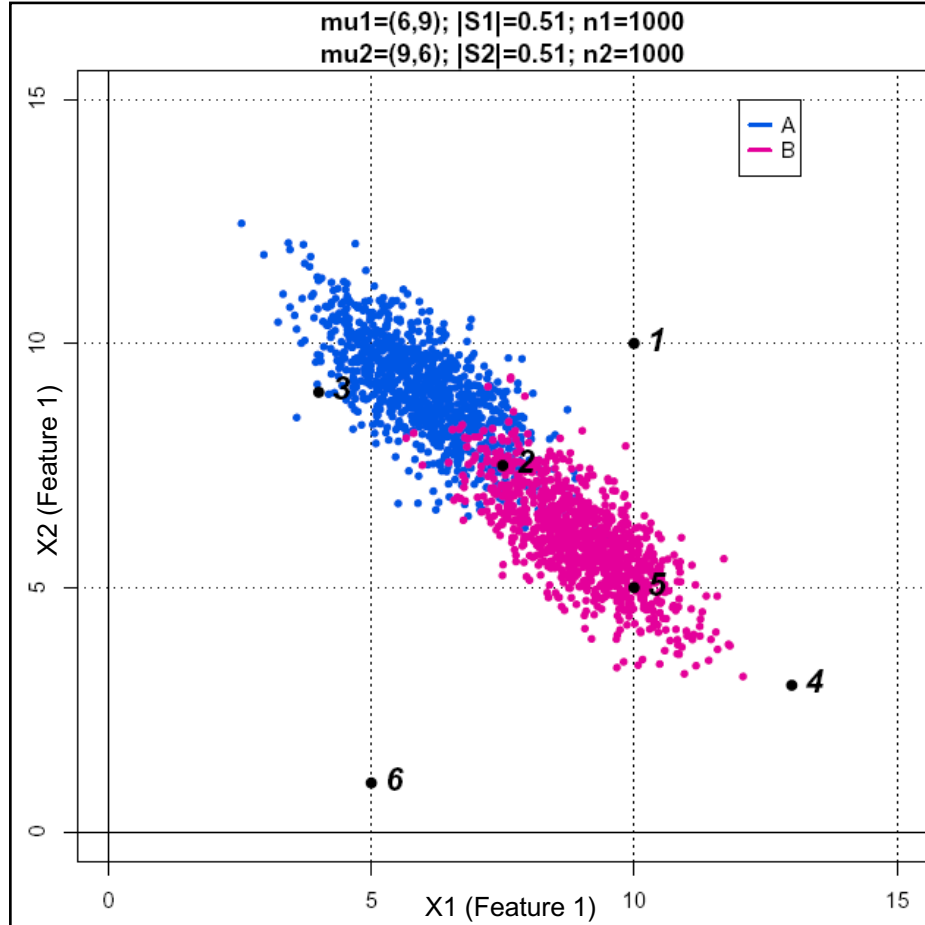
- Impact of the group-specific variances (heteroscedasticity of the data)

Conceptual illustration with two variables – Study case 7



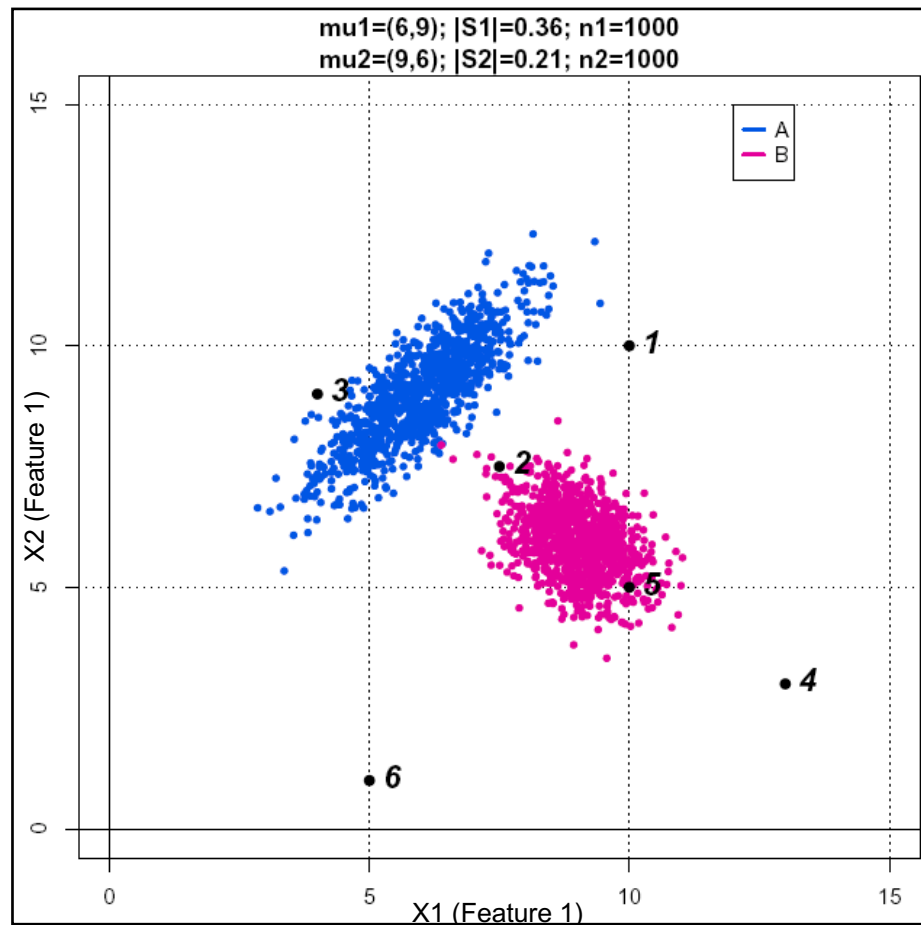
- Effect of the **covariance** between features.

Conceptual illustration with two variables – Study case 8



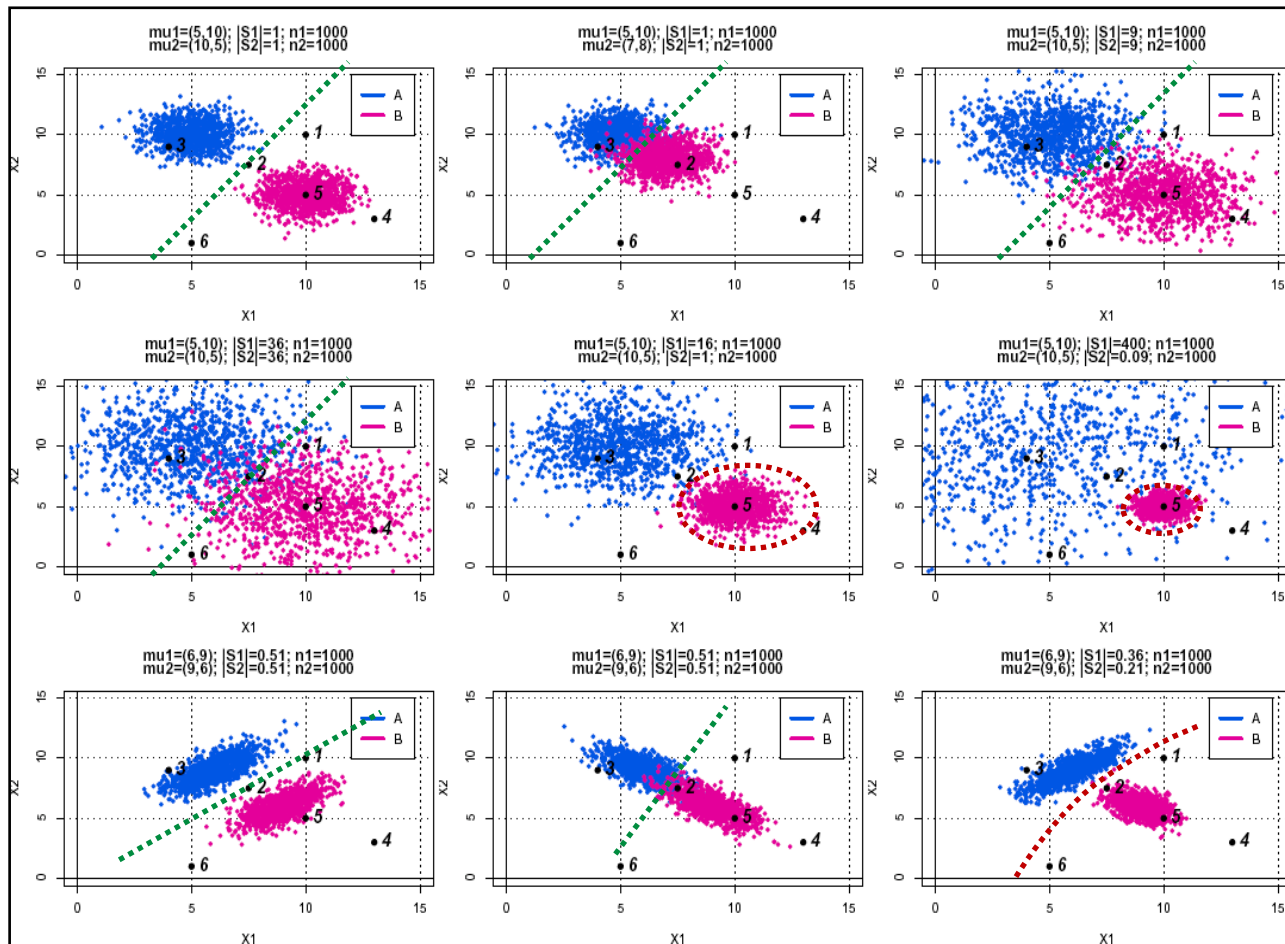
- Effect of the **covariance** between features

Conceptual illustration with two variables – Study case 9



- Group-specific **covariances** between features.
 - The two groups have different covariance matrices: the clouds of points are elongated in different directions.
 - How does this difference affects group assignments ?

Linear or quadratic discriminant analysis (LDA vs QDA)



- Equal covariance matrix between groups?
 - LDA is appropriate
 - Amounts to draw a straight line between the gravity centers of the groups
- Different covariant matrices?
 - QDA is recommended.