



# Pattern Analysis and Machine Intelligence

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Answer the following questions identifying the key aspects and try not to exceed the 1.5 page limit per question.

- Use only the sheets provided by the teacher
- Write your name and Student ID on each sheet you turn in
- English is the official language, however Italian is allowed
- Both pen and pencil are allowed
- No other mean to support yourself is allowed

In case you have special needs (e.g., being graded within a given time) please write it on top of your assignment.

## **Question 1: Linear Classification**

Describe Linear Discriminant Analysis (LDA), its analytical form, its assumptions, and its advantages wrt plain Linear Regression (on the indicator matrix). How does it work for multi-class problems? How do we implement Quadratic Discriminant Analysis?

## **Question 2: Bayes Classifiers**

What is the idea behind a Bayes Classifier? How do we deal with discrete attributes? and with continuous one? What is a Kernel Density Estimator and what is its relationship with a Bayes Classifier? What is the main characteristic of a *Naive* Bayes Classifier and why it is useful?

## **Question 3: Regression**

Present the approach of variable subset selection in linear regression. Introduce and discuss the different algorithms that belong to this class of methods. What do they have in common and which are the main differences? what is the main difference between subset selection methods and shrinkage methods?

## **Question 4: Clustering**

Explain in few sentences what cluster evaluation is, why it is needed, what is evaluated and why a "statistical framework" is often necessary to give an interpretation to evaluation results.