Data Mining and Knowledge Discovery

Knowledge Discovery and Knowledge Management in e-Science

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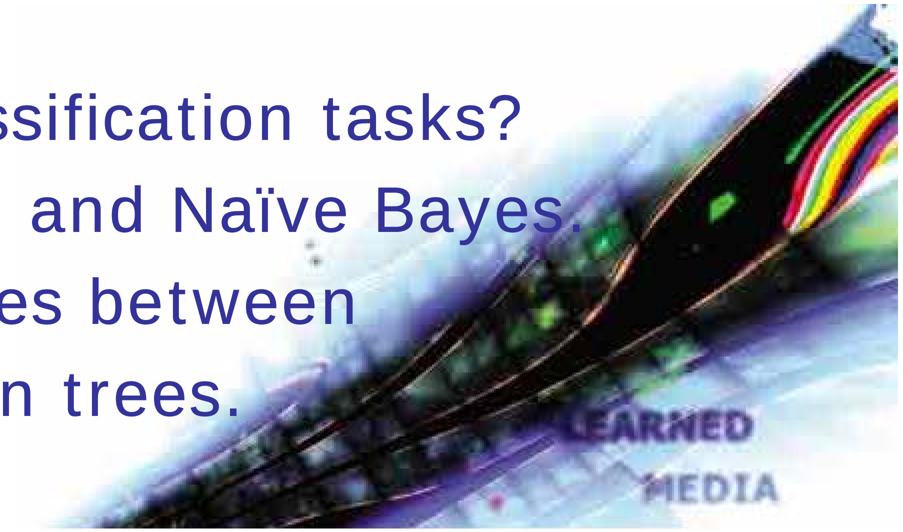
Discussion

- Consider a dataset with a target variable with five possible values:
    1. non sufficient
    2. sufficient
    3. good
    4. very good
    5. excellent
  - Is this a classification or a numeric prediction problem?
  - What if such a variable is an attribute, is it nominal or numeric?
- Can KNN be used for classification tasks?
- Similarities between KNN and Naïve Bayes.
- Similarities and differences between

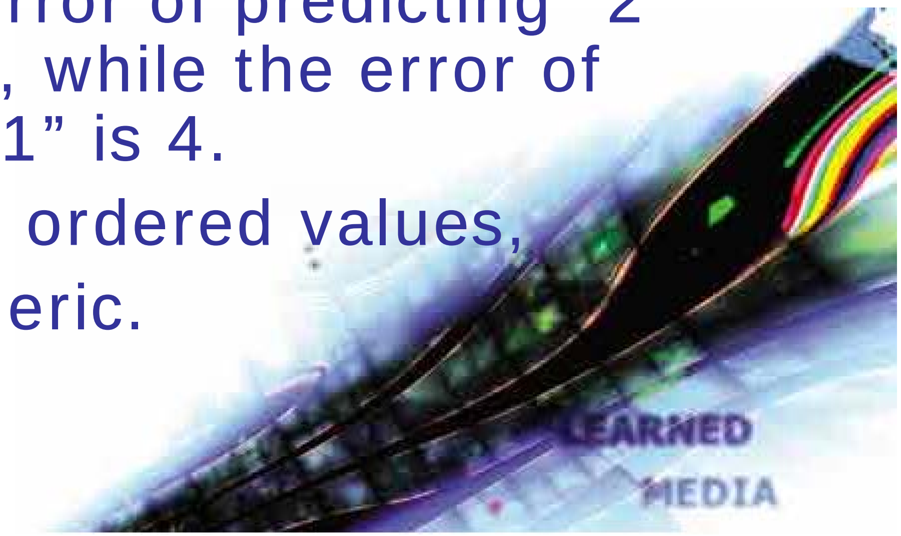
decision trees and regression trees.



Classification or a numeric prediction problem?

- Target variable with five possible values:
  1. non sufficient
  2. sufficient
  3. good
  4. very good
  5. excellent
- Classification: the **misclassification cost** is the same if “non sufficient” is classified as “sufficient” or if it is classified as “very good”
- Numeric prediction: The error of predicting “2” when it should be “1” is 1, while the error of predicting “5” instead of “1” is 4.
- If we have a variable with ordered values,

it should be considered numeric.



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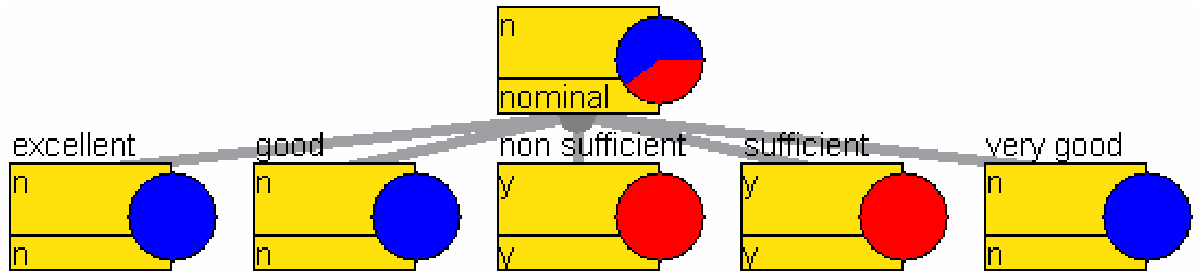
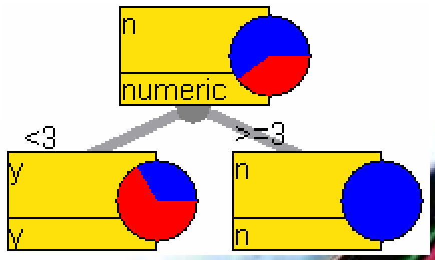
Nominal or numeric attribute?

- A variable with five possible values:
    1. non sufficient
    2. sufficient
    3. good
    4. very good
    5. excellent

Nominal:



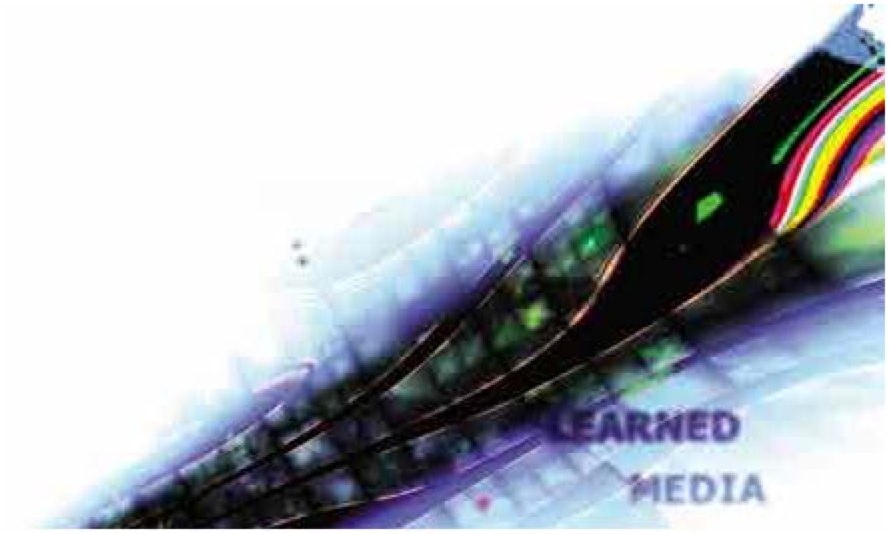
Numeric:



- If we have a variable with ordered values, it should be considered numeric.

Can KNN be used for classification tasks?

- **YES**.
- In numeric prediction tasks, the average of the neighborhood is computed
- In classification tasks, the distribution of the classes in the neighborhood is computed



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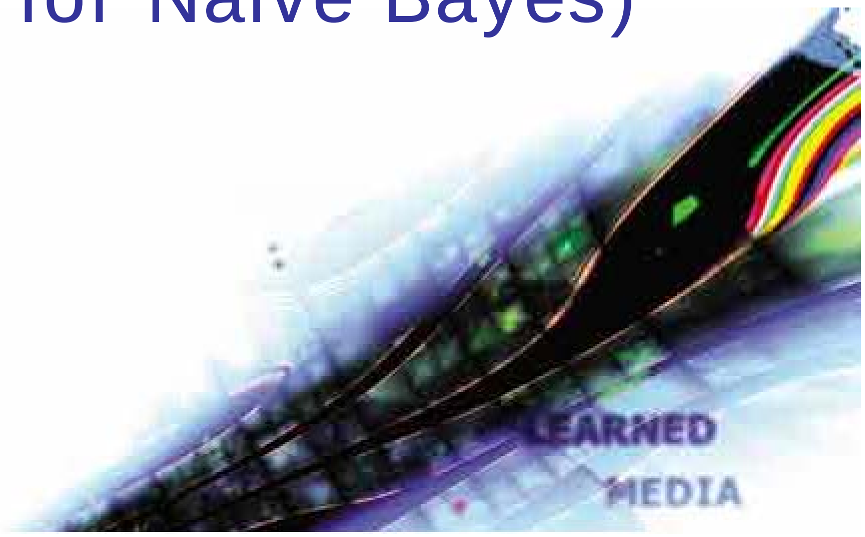
Similarities between KNN and Naïve Bayes.

- Both are “**black box**” models, which do not give the insight into the data.
- Both are “**lazy classifiers**”: they do not build a model in the training phase and use it for predicting, but they need the data when predicting the value for a new example (partially true for Naïve Bayes)



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Regression trees	Decision trees
Data: attribute-value description	
Target variable: Continuous	**Target variable**: Categorical (nominal)
Evaluation: cross validation, separate test set, …	
Error: MSE, MAE, RMSE, …	**Error**: 1-accuracy
Algorithm: Top down induction, shortsighted method	
Heuristic: Standard deviation	**Heuristic** : Information gain
Stopping criterion: Standard deviation< threshold	**Stopping criterion:** Pure leafs (entropy=0)