Interactive Data Visualization
2015 / 2016

19, October 2015
2 hours

1 - QUESTION [4]

a) Explain with your own words what is Data Visualization.
b) Explain why it is important to study Data Visualization.
c) Describe an example of data visualization that is considered as an landmark in the history of data visualization.
d) According to many authors the visualization techniques can used in different contexts. John C. Hart propose a table to describe 3 different visualization modes. Fill-in the rest of the table.

Visualization Mode	User Interaction	Graphics Rendering	Target	Medium
		Real-time rendering		
Interactive Storytelling				internet or Kiosk
	User only observes			

2 - QUESTION [6]

The data for visualization should be understood, and eventually pre-processed to address common issues such that missing values, bad data, outliers, etc..

a) Explain what are the most common components of information available in the datasets's metadata.
b) Explain the most common techniques for dealing with missing data. Indicate the pros and cons of each one.
c) Propose different variables to encode the person age by using a scale of measurement: (i) ordinal; (ii) Interval; (iii) ratio.
d) On the dataset *mtcars* (used in the lab 01) indicate a variable for each one of the following data types: (i) nominal arbitrary; (ii) nominal categorial; (iii) nominal ordered. numeric discrete; numeric continuous.
e) The use of basic statistics may be useful to understand the data. For each data type indicate which statistics are appropriate: (i) all data types; (ii) all non numeric data-types (excluding names and such); (iii) non continuos values; (iv) continuous variables.
f) We discussed many pre-processing techniques, namely: normalization; segmentation; dimension reduction. Pick one and explain when such type of technique is appropriate or even necessary, and briefly explain 2 common methods for the selected technique.

3 - QUESTION [6]

a) Explain with your own words what is Perception. Suggestion: includes one or more examples helping the explanation.

b) The retina is composed by two types of photosensitive cells, the *rods* and the *cones*. Explain their photosensitive properties, their roles, their placement in the retina, their relative quantities.

c) What is the *blind spot*? Present the physiology explanation. How can we detect?

d) The eyes movements are, in general, classified into four different types. Describe those movement patterns and explain their role, in the perception process.

e) Explain the meaning of the expression "pre-attentive" properties. Why the name is considered not really accurate? Provide some examples of "pre-attentive" properties. What are the most common visual tasks for "pre-attentive" properties evaluation?

f) Explain what is the "Change Blindness". Provide one or two examples illustrating the phenomenon. Point some of the theories explaining the Change Blindness phenomenon.

4 - QUESTION [4]

a) Color is a very important component in the visualization. Explain the RBG and CYM color models, their relationship, their common usage and their limitations.

b) Mussel propose a color model. Explain what is fundamentally different from this model and the previous color models. Describe the its components.

c) Present and explain the Weber's and Stevens's Laws.

d) Explain the concepts of Expressiveness and Effectiveness for a visualization.