

Exam JBI100 Visualization

21-12-2021 duration max:2 hours

Name:

Student id:

This is an exam where short answer questions and multiple choice questions are combined. For the multiple choice questions, only one answer is correct per question. Write down your answers to the exam questions in this provided document of 7 pages. The total amount of points of the exam is 25 points.

For the multiple choice questions, one point is added for each correct answer; half a point is subtracted for each wrong answer. Nothing is added or subtracted if no answer is given. In short: Guessing can have a negative impact!

Please, mark your answers directly below the exercise or next to it (but always before next question). Of course, the answers are expected to be related to the material given during the course lectures.

Make clear what your answer is; half a point will be subtracted for ambiguous answers!

Good Luck!!

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1. This question was discussed in class and similar questions have given as examples during class. There are multiple answers possible IMPORTANT, justify what you propose when asked to provide motivation.

ID	Average Temperature(°C)	Country	Season	Year
31	20	The Netherlands	Summer	1994
32	10	The Netherlands	Autumn	1994
33	4	The Netherlands	Winter	1994
34	25	Spain	Spring	1995

- a. (1point) Above we have a tabular data set with 5 attributes. Which type of attribute is each of them according to the abstract categorization of Tamara Munzner as given during the lectures (be as specific as possible)?
 1. ID categorical
 2. Average temperature : Ordered - quantitative – (sequential or divergent would be accepted here)
 3. Country : Categorical
 4. Season: Ordered – ordinal – cyclic
 5. Year: Ordered – quantitative - sequential
- b. (2 point) We want to visualize the tabular information above. Which visual encodings would be the most effective to visualize all the information on the tabular data set?

Name the mark and visual channel per attribute. Provide a short motivation for each

You can specify which task you are going to address with the visualization to motivate your choices

Many options are possible here. You can also mention that ID is not relevant so you do not show it.

1.
2.
3.
4.
5.

Provide a sketch of your answer for the **overall visualization** :

- c. (1 point) Which combination of visual channels are separable and which are not from the ones you chose in 1b?

This depends on the previous so I cannot answer in general you can look at what was done in class some visual channels interfere with each other and therefore are not separable.

2. (1 point) Change blindness is a perceptual phenomenon that

- a. supports the use of animation for changing states
- b. indicates that animation should be avoided to visualize and detect change
- c. supports the use of small multiples for storytelling
- d. indicates that short memory can be used effectively

3. (1 point)



Name two characteristics of a data attribute for which using the colormap above as visual channel would be adequate (shortly motivate):

There are at least three characteristics – Ordered / quantitative / sequential

Motivation: The color coding is perceptually ordered so the attribute should be ordered.

The colormap is continuous so it indicates it is adequate for quantitative data.
 Sequential, there is perceptually one direction of increase or decrease which indicates sequential attribute is adequate, in contrast for example to diverging that would need a central point

4. (1 point)

a.



b.



Which of the colormaps above is a better choice according to what has been seen in this course?
 Shortly motivate your answer.

b because as we saw in class our visual system is more sensitive to green than it is to perceive blue which is rather weak.

5. (1 point) Which of the following statements is true?

- a. HSV color model is perceptually uniform
- b. Color space representations/models are 2 dimensional
- c. CIE color model represents all human visible colors
- d. RGB color representation is device independent

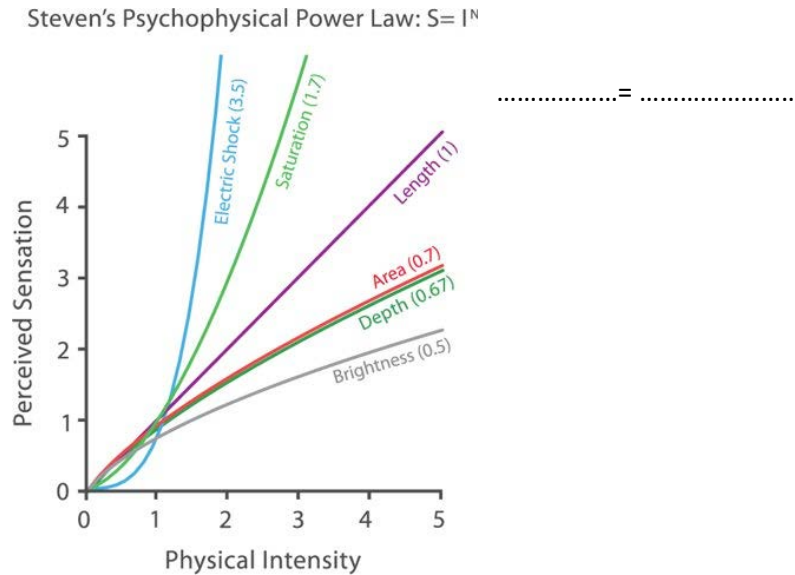
6. (1 point) Name three dangers of visualizing non-spatial data in 3D

- a. There are many examples of that in the slides:
 Perception distortion, cluttering, text in 3D is difficult to read, depth vs visual encoding of size or length, interaction complexity, ...

7. (1 point) We want to map a quantitative sequential attribute weight (W) to Brightness (B). Give the equation that indicates the adequate mapping of W to brightness, B, given Steven's Psychophysical Power Law.

We gave an example of this twice in class

$B = W^2$ because $S = B^{0.5}$ $S = (W^2)^{0.5} = W$ (we want a linear relation from perception to attribute)



8. (1 point) In the visualization below, which principle seen during the lectures is being violated (shortly motivate)?



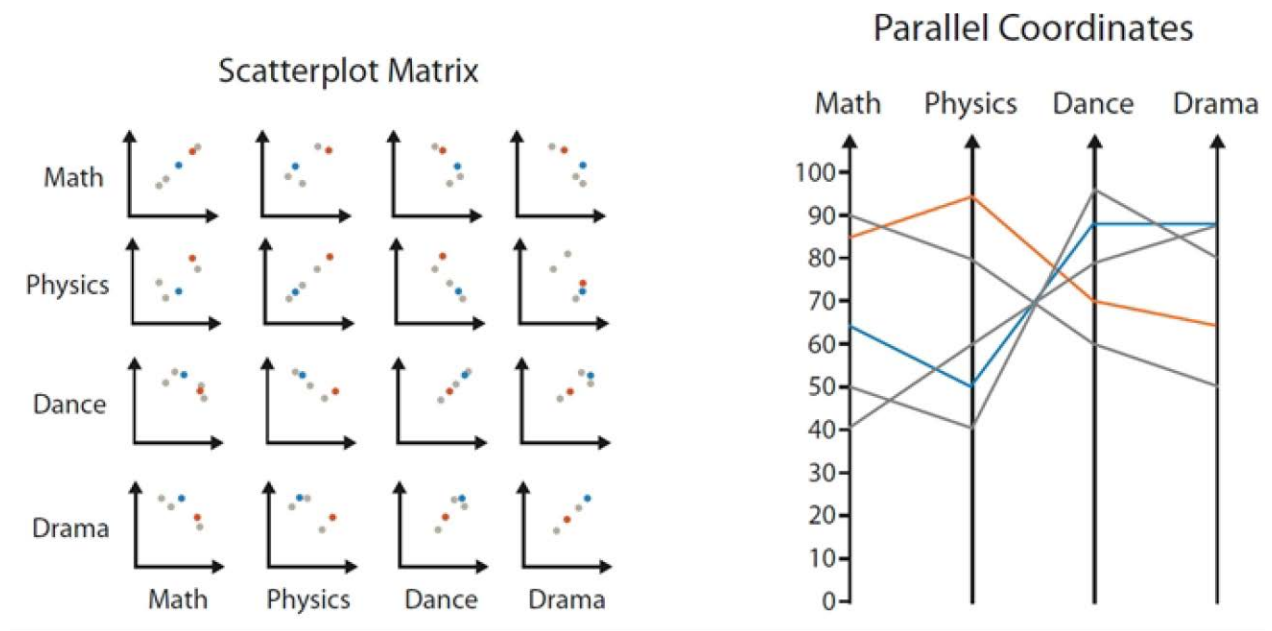
We also answered this in class. There might be more correct answers to this question, but the most obvious one

Expressiveness principle is violated. You want to match data to visual channel. Using different colors for a specific color is not a good match.

9. (2 point) Draw the Parallel Coordinates and Scatterplot Matrices (SPLOM) that would correspond to the following table:

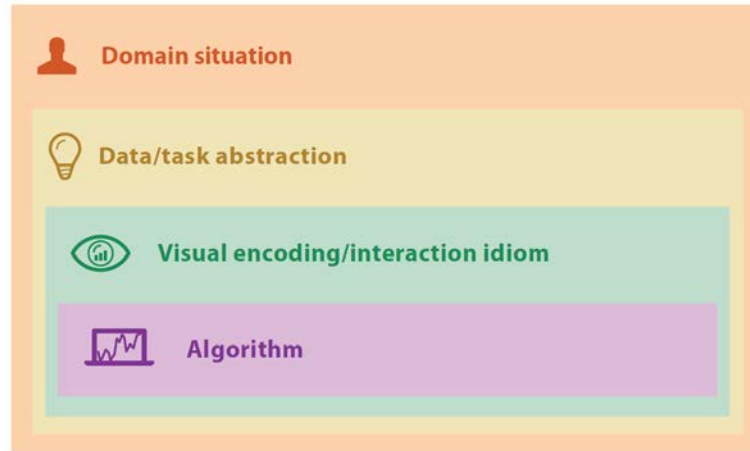
Math	Physics	Dance
85	95	70
90	80	60
65	50	90
50	40	95
40	60	80

You do not need to be precise approximation of values is ok. The Scatterplot matrix just half is also enough



11. (1 point) Name two levels of Tamar Munzner's nested model:

See the book/and slides you should be able to answer this easily it was mentioned many times on the lectures, and you should also use it in the assignments.



12. (1 point) Which of the following statements is false:

- a. Tasks put constraints on suitable encodings
- b. Tasks help a designer to reason about a right encoding
- c. The encoding puts constraints on suitable tasks
- d. Tasks are determined after selecting encodings

13. (1 point) Consider the following situation. An aerospace engineer measures the air time of multiple planes with three different plane designs. She wants you to develop a visualization system for her task: "I want to contrast the three airplane designs and understand what the air time characteristics are of each airplane design: what is the average air time, what is the lowest air time, the highest, and everything in between". **More than an answer is possible**

- a. What (action, target) pair is a good task abstraction?
(compare, distribution)
- b. Motivate your choice.

The focus is on the distribution (in general) of air time for each design, and then you want to contrast/compare this distributions between multiple designs.

14. (1 point) Consider the following situation. An insurance company employee has collected data about claims on cars. He describes his task with the following sentence: "I want to find out if there is a relation between the amount being claimed and the value of the car, so we can set the monthly insurance contract costs (i.e., premium) accordingly." **More than an answer is possible**

- a. What (action, target) pair is a good task abstraction?
(Discover or identify, correlation)

- b. Motivate your choice.

find out indicates that you want to discover or identify something it is not known.

Relation between two variables the amount claimed and the value of the car, therefore it indicates that what you are interested in is correlation

15. Consider the visualization on grocery spending in the image below.



We discussed this in class many options are possible

- a. (1 point) Name two visualization principles that are violated and motivate your choices.

Color scheme (ordered attributes), Area is not the highest ranked visual channel, Gestalt common region gives the impression of regions belonging to another region while it is not the case, scale integrity (tufte) the scale has some jumps that can confuse the user ...

- b. (1 point) Provide one alternative solution that would fix both violations.

.....

Sketch your alternative solution here:

Multiple options. Do not forget to justify based on what has been seen in class. Justify why and what are you fulfilling, and why it is according to you the best choice based on what we have seen in class.

16. (1 point) A Choropleth map is primarily used to

- a. visualize time-series data.
- b. reduce high-dimensional data.
- c. cluster high-dimensional data.

- d. understand spatial relationships.
17. (1 point) Given a bar chart of a quantitative attribute of 70 items with a categorical key attribute, and the task to compare two specific items, consider (multiple answers might be possible with the right motivation)
- a. What is the best way to order the items?
Alphabetic order
 - b. Motivate your choice.
A lot of elements for a look-at operation to find the items would be the most effective.
18. (1 point) Which statement is true
- a. A violin plot is preferred over a boxplot because it shows the frequency at each value
 - b. A boxplot is preferred over a violin plot because it shows more detail
 - c. A violin plot is preferred over a boxplot because it shows less detail
 - d. A boxplot is preferred over a violin plot because it can be applied to both categorical and quantitative attributes
19. (1 point) Changing the visual encoding depending on zoom-level is an example of
- a. Geometric zooming
 - b. Semantic zooming
 - c. A camera metaphor
 - d. Constrained zooming
20. (1 point) Yi et. al identifies seven categories of interaction techniques that can be described based on user's intent. The category 'Encode' can be described as
- a. Mark something as interesting
 - b. Show me more or less detail
 - c. Show me a different representation
 - d. Highlight related items
21. (1 point) Assume you have a dataset with properties of a car. The dataset consists of 8 quantitative attributes (acceleration, weight, horsepower, ..). You want to show the relation between all dimensions in a single visualization. (multiple answers are possible)
- a. What visualization idiom would you use for this?
PCP (SPLOMS would also be a good answer)
 - b. Motivate your choice.
PCP allow to see the relationship between multiple variables at the same time. It requires some learning but it can show per item the relation to multiple dimensions and for example identify clusters or groupings, outliers...

