UNIVERSITY
OF SKÖVDE

WRITTEN EXAMINATION

Course – Visual Data Analysis

Examination – Written test

Course code – IT824A

Credits for written examination – 3.5

Date – 2026-03-24

Examination time – 8:15-12:30

Examination responsible: Tove Helldin

Teachers concerned: Juhee Bae

Aid at the exam/appendices: no aid

Other

Instructions

- ☐ Take a new sheet of paper for each teacher.
- ☒ Take a new sheet of paper when starting a new question.
- ☒ Write only on one side of the paper.
- ☒ Write your name and personal ID No. on all pages you hand in.
- ☒ Use page numbering.
- ☒ Don´t use a red pen.
- ☒ Mark answered questions with a cross on the cover sheet.

Grade points:

- F: ≤ 32
- E: 33-36
- D: 37-40
- C: 41-44
- B: 45-49
- A: 50-54

Examination results should be made public within 18 working days

Good luck!

General information about the test

The test contains 15 questions. The questions are worth different points.

Read the questions carefully and answer what is asked for.

Also have a look at the general instructions on the test front page. Questions 12 and 15 are to be answered on the question sheet.

1. When performing an evaluation, the development team can use *empirical methods* or *inspection methods*. Describe these two general evaluation strategies as well as one [1] positive and one [1] negative aspect of the two strategies. (4 points)
2. Ware describes the concepts of *bottom-up* vs *top-down processing*. Describe these two processes. (4 points)
3. Describe the three critical measures of *usability*. For each measure, describe one way of evaluating it.
   (a) Critical measure 1 + 1 evaluation metric
   (b) Critical measure 2 + 1 evaluation metric
   (c) Critical measure 3 + 1 evaluation metric
   (6 points)
4. A designer must have knowledge of human perception when designing. For example, he or she must take into account the concepts of *recognition* and *recall*. How should knowledge of these two concepts influence the design of a visual interface? Exemplify and motivate. (2 points)
5. What is one [1] positive and one [1] negative aspect of performing lab testing when evaluating a visualization with users? (2 points)
6. A designer can use several techniques to make elements in a visualization "pop-out". Describe two [2] strategies a designer can use for this purpose as well as what a designer needs to have in mind when designing these pop-out effects. (4 points)
7. There are two types of dashboards. Describe these two types as well as when one type is to be preferred over the other when designing. (2 points)
8. A faulty visualization is provided (Figure 1). Identify at least three [3] significant problems with the visualization. For each problem you identify, explain why it is an issue based on visual analytics principles, and propose a specific improvement that would address the problem. (4 points)

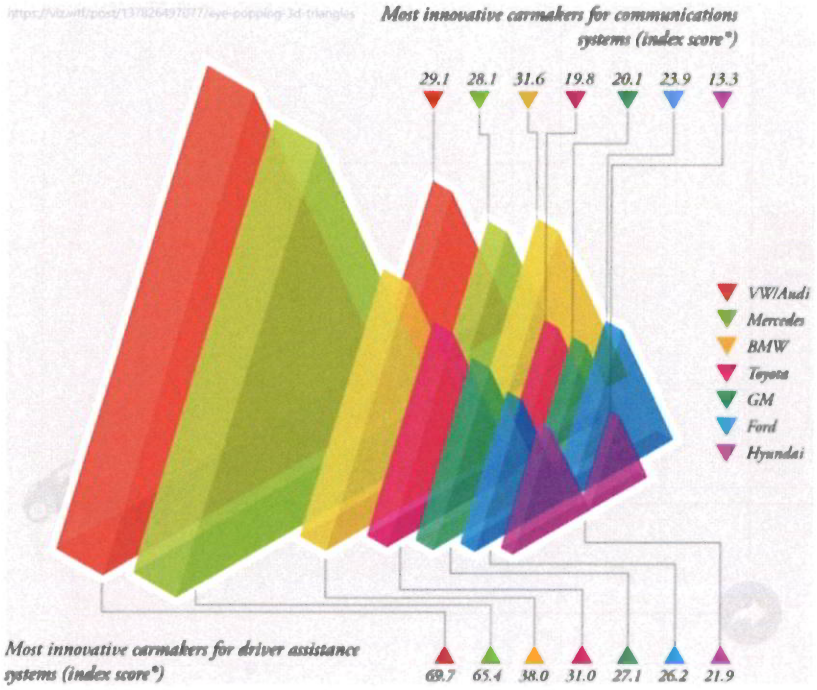

Figure 1: Visualization for question 8.

9. A faulty scatterplot visualization is provided (Figure 2). Identify at least three [3] significant problems in the visualization. For each problem you identify, explain why it is an issue based on visual analytics principles, and propose a specific improvement that would address the problem. (4 points)

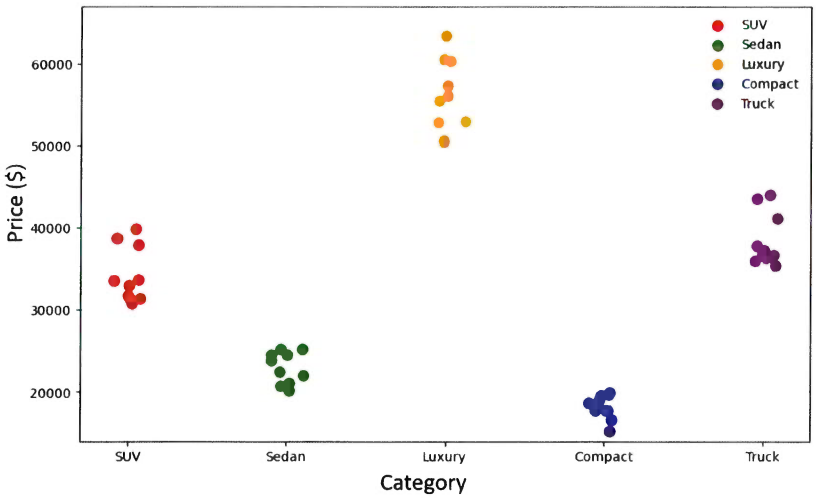

Figure 2: Visualization for question 9.

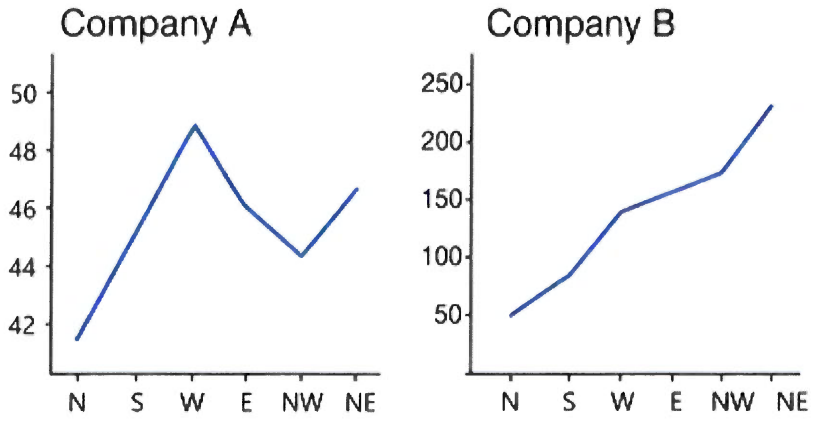

Figure 3: Visualization for question 10.

10. Two line charts are presented side-by-side for comparison (Figure 3). Both show values for two different companies. However, the visualizations contain multiple design flaws that make comparison misleading or difficult. Identify at least three [3] significant problems in comparing the two plots (e.g., missing grids are minor concerns). For each problem you identify, explain why it is an issue based on visual analytics principles, and propose a specific improvement that would address the problem. (4 points)

11. Explain *Shneiderman's Mantra*. Why is it important in visual data analysis? Provide an example of how the mantra applies in a modern visualization tool. (2 points)

12. Quiz question: Write "O" if the statement is true and "X" if the statement is false in the brackets. Only O/X allowed — everything else is incorrect. (5 points)

    (a) [ ] A line chart is best used to show trends over time.

    (b) [ ] A scatterplot can help identify correlations between two categorical variables.

    (c) [ ] Boxplots display the median, quartiles, and potential outliers of a dataset.

    (d) [ ] Choropleth maps are useful for visualizing trends over time.

    (e) [ ] Heatmaps use variations in hue, saturation, or brightness to represent values across two dimensions.

    (f) [ ] Using a pie chart to compare 10 categories with values between 5% and 15% is generally recommended.

    (g) [ ] A scatterplot can reveal a strong relationship even if the slope of the trend line is near zero.

    (h) [ ] Boxplots can be misleading if the data distribution is heavily skewed but still used to compare medians.

    (i) [ ] Choropleth maps can exaggerate differences if geographic areas vary greatly in size.

    (j) [ ] Heatmaps can be misleading because color intensity may suggest large differences even when the underlying numerical values are similar.

13. Identify and briefly define at least three [3] types of data commonly used in visualization. Provide one [1] example for each type. (3 points)

14. First, define "visual channels" in the context of information visualization. Next, based on empirical studies of perceptual accuracy, rank common visual channels for encoding quantitative data. Finally, briefly explain the perceptual reasons why the most effective channels support more precise comparisons than the least effective ones. (3 points)

15. In visualization design, understanding the distinction between task abstraction and data abstraction is crucial. For each of the following statements, select the one that applies (Only T/D/B allowed — everything else is incorrect.): (5 points)

    - T: Task Abstraction
    - D: Data Abstraction
    - B: Both Task and Data

    (a) [ ] Selecting which variables to aggregate for a specific analytical goal.

    (b) [ ] Choosing a visual encoding that accurately represents numeric magnitude.

    (c) [ ] Reflects the "why" behind the visualization.

    (d) [ ] Deciding which subset of the dataset to filter for analysis.

    (e) [ ] Identifying data transformations necessary to reveal patterns (e.g., normalization, binning).

    (f) [ ] Structuring multi-dimensional data for effective visual comparison.

    (g) [ ] Determining the data to present to examine patterns or relationships.

    (h) [ ] Deciding which metrics to calculate from raw data to support a user's analysis.

    (i) [ ] Determining the order in which visual elements are presented to emphasize key insights.

    (j) [ ] Ensuring data values are represented accurately to preserve their true magnitude and relationships.