

# T-61.5010 INFORMATION VISUALIZATION

21 February 2015.

To pass the course you must pass this written examination as well as the course assignment. Results of this examination will be valid for one year after the examination date.

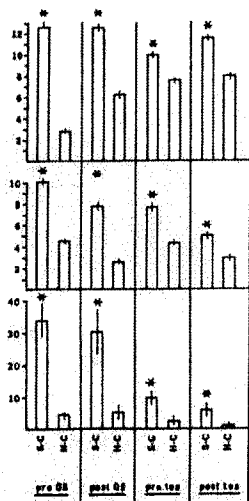
This examination has five questions each worth 6 points. You must answer in English, unless you have agreed otherwise with the lecturers at least two weeks prior to the examination. Please write clearly and leave a wide left or right margin. You can have a calculator, with memory erased. No other extra material is allowed.

The results will be announced in Noppa. You can keep this paper.

Each question should be answered on a fresh new page. Questions 1, 3, 5 should be written on one booklet (sheet of paper) and questions 2 and 4 on another, as different lecturers will mark these questions.

## Question 1: Theory and practice of data graphics

- a) Explain (briefly) the terms below in the context of the course.
  - 1) Lie factor (1p)
  - 2) Space-time narrative (1p)
  - 3) Design variation and data variation (1p)
- b) Briefly discuss the graphic below from the point of view of the design principles given by Edward Tufte. (3p)



## Question 2: Human perception

- a) Briefly explain Gibson's affordance theory and the term 'affordances'. (1p)
- b) Name the two types of receptor cells in the retina. Briefly explain the role of these two types of receptor cells in the retina and how they differ. (2p)
- c) What is a preattentive feature? Give two preattentive features and two non-preattentive features. (1p)
- d) Name and briefly explain two Gestalt laws. Indicate the importance of these two laws for information visualization. (2p)

**Question 3: Object recognition, surface shapes, space**

- a) Two theories for object recognition are image-based and structure-based object recognition. Describe them briefly (one sentence each). (2 points)
- b) What evidence do we have in support of the image-based theory of object recognition? (1p)
- c) What is the role of object silhouettes in structure-based object recognition? (1p)
- d) How can these two theories be used when designing user interfaces? (2p)

**Question 4: Graph visualization and navigation**

- a) What is a graph? Give the name of the diagram that is often used to visualize a graph. (1p)
- b) List three of the main challenges of visualizing real-world data graphs and three ways how to address these challenges. (2p)
- c) Different graph drawing algorithms produce different types of graph layouts. Briefly explain one graph layout. (1p)
- d) Compare node-link diagrams with adjacency matrices for graph visualization, indicating the advantages and disadvantages of each one. (2p)

**Question 5: Dimensionality reduction**

- a) Define precision and recall in the context of dimensionality reduction. (2p)
- b) In what sense are PCA and MDS are similar? What is their main difference? (2p)
- c) In what sense are SOM and vector quantization (k-means) similar? In what way are they different? (2p)