

**Final exam**

James R. Eagan

30 June 2016

**Your name:**

---

Instructions:

- You have 1 hour 30 minutes to complete this exam.
- No notes and no electronic devices are authorized.
- Exception: dictionaries are permitted.
- All work should be yours and yours alone.
- Answers should be short and clear. They should fit in the space provided.
- You may respond in either English or French.
- There are 54 points total.

**True/False (12 points, +2 per correct response, -1 per incorrect)**

- T   1. A radial tree-map (e.g., Sunburst) is useful for showing hierarchical data.
- F   2. The parallel-coordinates technique scales well with the number of data cases, but not with the number of dimensions.
- F   3. Metadata is the study of data encoding formats.
- T   4. People can discriminate color pre-attentively.
- T   5. People can discriminate shape pre-attentively.
- F   6. People can discriminate the combination of color and shape pre-attentively.

## Short Answer Questions

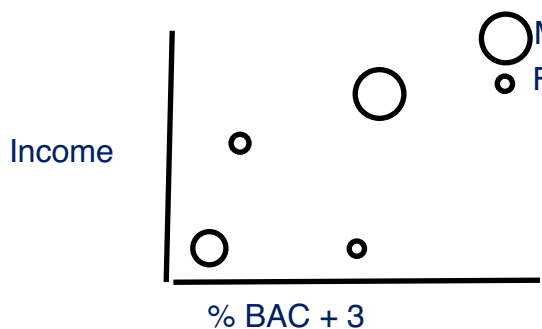
7. Give an example of a nominal dataset, a dataset that is ordinal but not quantitative, and a quantitative dataset. (6 points, 2 points each)

Nominal: Names of cars (e.g. Clio, Mégane, Escort, ...)

Ordinal: Ivory, Silver, Gold, Platinum

Quantitative: Age

8. You are given a dataset of the regions of France containing three dimensions: population, percentage of the population with an education level BAC+3, and average income level. Define a spatial mapping for these data and how you would encode these three dimensions. Justify your response. (6 points)




This representation uses three visual variables to encode three dimensions:

- x-position — % BAC + 3
- y-position — Income level
- area (not radius) of circle — population size

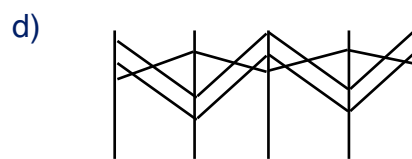
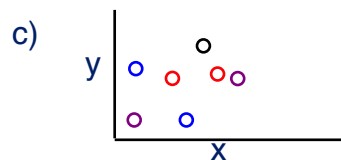
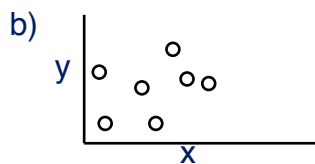
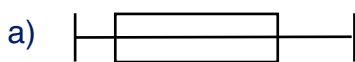
We avoid 3D because 3D is hard to read on a flat screen or piece of paper. The primary relation we want to show is education vs. income, so we put that on the x and y axes. Since population size is secondary, we use size to encode it.

9. Edward Tufte argues that a visualization should not lie about the data. What are three ways that we have seen for a visualization to lie? (6 points)
1. Not using an appropriate scale (to exaggerate or diminish the perceived effect)
  2. Not showing enough context.
  3. Using inappropriate visual encodings (e.g. area vs. height) to exaggerate the perceived value of the data.

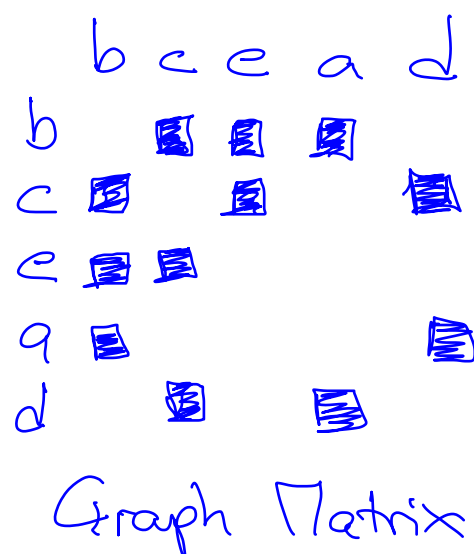
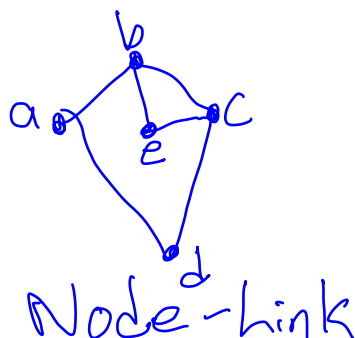
10. Describe one advantage and one problem with using a greyscale encoding (e.g. ). (2 points)

- + Perceived smoothly across the whole range
- Cannot perceive absolute value; perceived values influenced by surroundings

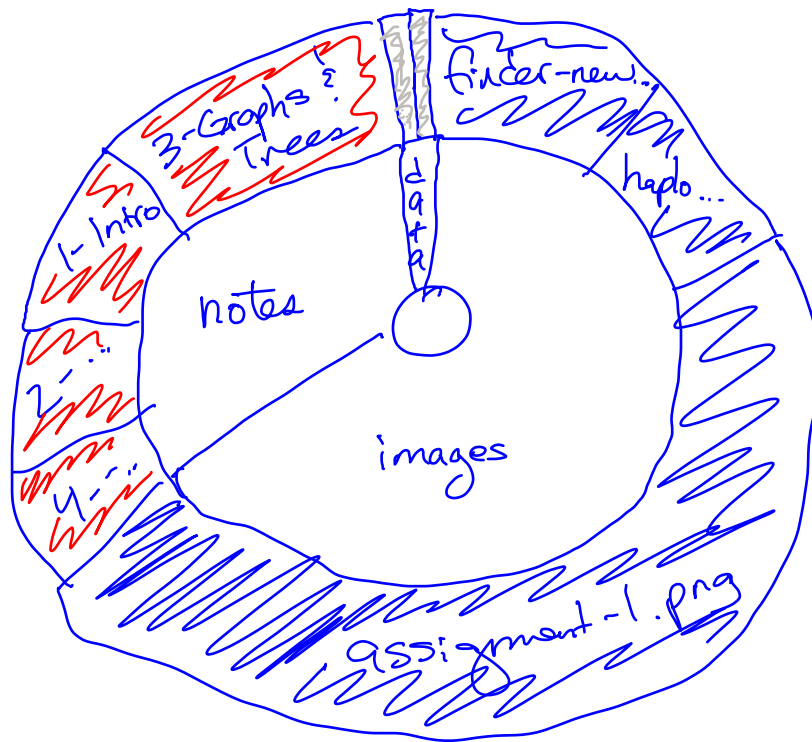
11. Give an example of a visualization technique for (a) univariate, (b) bivariate, (c) trivariate, and (d) hypervariate data. (8 points, 2 points each)



12. Identify two distinct ways that we have seen in class for drawing a graph. Provide a name and a drawing of each. (4 points)



13. Create a visualization of the tree shown on the next page. Be sure to show the structure and at least one attribute of each data case. (10 points)



Sunburst

Structure: radial composition

file size: size of each slice

bonus: file type: color

\*Note: error in data set: file size of image folder is incorrect

igr204			
21 éléments, 23,28 Go disponible			
Nom	^	Date de modification	Taille
▼ data		aujourd'hui 16h07	3,8 Mo
france.tsv		28 septembre 2015 14h16	1,9 Mo
population.tsv		24 novembre 2014 09h52	1,9 Mo
datasets.md		16 mai 2016 18h23	9 Ko
▼ images		aujourd'hui 16h08	115 Mo
assignment-1.png		24 novembre 2014 09h52	643 Ko
finder-new-proj		27 septembre 2015 14h27	136 Ko
haplotype.png		24 novembre 2014 09h52	194 Ko
meta.yaml		24 novembre 2014 09h52	35 octets
index.md		21 avril 2016 18h43	3 Ko
lab1.md		20 mai 2016 08h05	23 Ko
lab2-python.md		23 mai 2016 16h41	16 Ko
lab2.md		23 mai 2016 16h46	15 Ko
▼ notes		3 juin 2016 13h50	55,1 Mo
1—Intro		22 avril 2016 14h52	16,1 Mo
2—Data, Marks, Implantations		22 mai 2016 12h37	10 Mo
3—Graphs & Trees		3 juin 2016 13h50	23,2 Mo
4—Perception		3 juin 2016 13h12	5,8 Mo
index.md		22 avril 2016 14h54	325 octets
meta.yaml		27 janvier 2016 18h35	50 octets
project.md		26 mai 2016 17h39	8 Ko