National College of Ireland

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Postgraduate Diploma in Science in Data Analytics – Part-time – Year 1 – PGDDSB1
Masters in Science in Data Analytics – Full-time – Year 1 – MSCDAD1

Semester Two Examinations – 2016/17

Wednesday 10th May 2017
2:00pm – 4:00pm

Data Visualisation

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Answer FOUR out of the available FIVE Questions. You will be marked on your best four answers, All questions are worth equal marks

Duration of exam: 2 hours
Attachments:

1. Discuss, in your own words, two out of the following three concepts relating to the physiology and psychology of human visual processing: Smooth Pursuit eye movement, Trichromatic vision, or visual inferences.
   For each concept, discuss it under the following headings
   i. Provide a definition of the term (2x 1.5 marks)
   ii. Explain the circumstances under which it occurs (2x2.5 marks)
   iii. Describe the consequent advantages or disadvantages of this in terms of visual perception (2x2.5 marks)
   iv. Identify a contrasting, but directly related concept in the same domain (e.g. Foveal vision could be contrasted with Peripheral vision) (2x3 marks)
   v. Compare and contrast the new concept you have identified with the original, or explain how the balance may be drawn between these two. Do not try to contrast the three points listed above. (2x3 points)

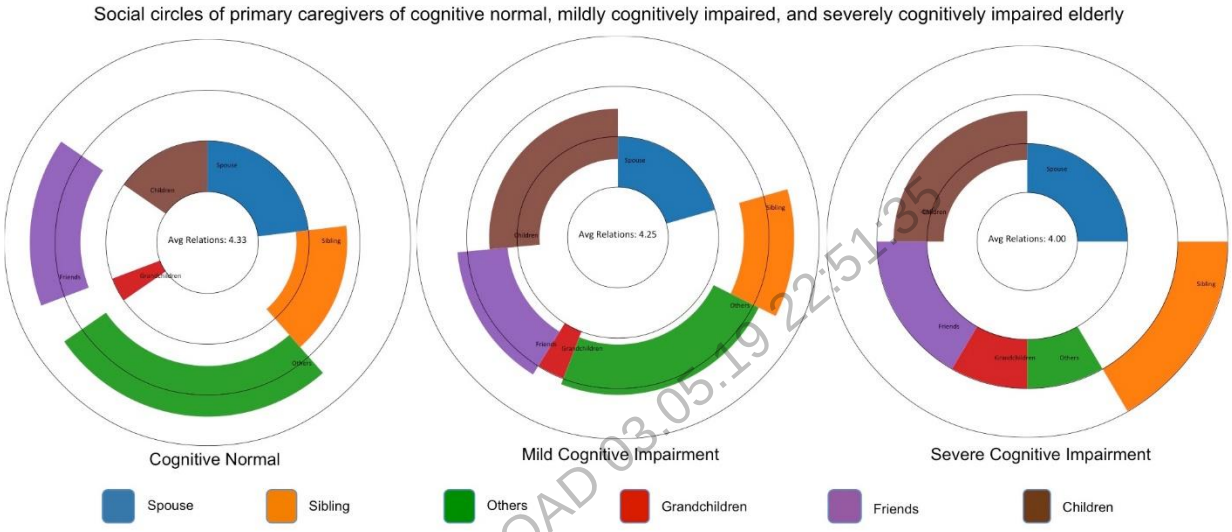
2. You are given the following input data, taken from Greenwood & Ernshaw (1997) and Averill & Eldredge (2007) referring to the Physical behavior of the Alkali metals.

Name	Lithium	Sodium	Potassium	Rubidium	Caesium	Francium
Atomic number	3	11	19	37	55	87
Standard atomic weight	6.94	22.98976928	39.0983	85.4678	132.9054519	223
Melting point (°C)	180.54	97.72	63.38	39.31	28.44	?
Boiling point (°C)	1342	883	759	688	671	?
Density (g/cm^3)	0.534	0.968	0.89	1.532	1.93	?

Identify and describe, using the principles of visual design, preattention and affordance:
   i. The key data parameters to be represented (6 marks)
   ii. The visual variables to be used to represent each of those parameters. These should be chosen based on their suitability, which should be explained appropriately. (6 marks)
   iii. Sketch a design for how to represent the results visually: if you propose to use interactivity or temporal changes, you should describe these in text. (6 marks)
   iv. Your design should account for appropriate data associations, and describe any additional features that you would suggest for an electronic presentation of this data. (7 marks)

3. Discuss the different challenges that occur when producing data visualisations for communications purposes when compared with those for knowledge discovery. You should include reference to at least some of these features, and introduce others as appropriate:
   - Prior knowledge and expectations
   - Preattentive feature selection
   - Differentiation between norms and observed features
   - Appropriate user skills and experiences

4. You are given the following visual representation, taken from Chen, 2016 via Herndon, 2016. It describes the social circles of the primary caregivers for elderly people pf a variety of cognitive capacity.



Compare the quality, variety of relationships and averages sizes between three groups of caregivers. Quality, closeness in relationships, is denoted by the distance from the innermost circle. Variety is denoted by the size of each arc. Avg Relations is the average number of relationships per caregiver

Discuss this representation under the following headings and others as appropriate.

i. State the visual variables used in this representation, and their association with data variables and propose a explanation for the choice of these variables (7 marks)
ii. Identify at least one important feature or trend observed in the data, and state which elements of the representation permitted this trend to be observed. Discuss whether you believe this pattern was visible clearly or preattentively. (6 marks)
iii. Propose and justify any ways in which this representation could have been made clearer using interactive elements or otherwise. (6 marks)
iv. This representation uses the size of arc as a visual feature in the communication of some key information. Critically assess how well this represents the data, with respect to any misleading interpretations it might lend its hand to. (6 marks)

5. Define, with the use of examples, each of the five following terms used in Data Visualisation. Your Answer should show an in depth understanding of the term and how it is used in the data visualisation and the data design process.
    i. Proximity
    ii. Novice User
    iii. Brightness (visual variable)
    iv. Attentive Processing
    v. Foveal Vision