

## **Theoretical and Methodological Foundations of Visual Computing**

### **(Assignment 10)**

*Please submit your solution to ILIAS by 2025-01-12 23:55. Solutions will be discussed in the tutorial on Thursday, 2025-01-16. Please note that source code will only be accepted if it compiles.*

#### **Exercise 10.1 (8 points)**

- a) Differentiate between methodology and method with the help of an example.
- b) Suppose you are an interface designer and you are requested to design the interface of a hotel management website. You are struggling with the information needs of the users and are not sure how to incorporate them into the interface. What kind of evaluation study (formative or summative) would you choose? Justify your choice.
- c) You are responsible for setting up an experiment to evaluate the usability of three websites. Provide your arguments on a study design (within subjects or between subjects) you would choose.  
In a similar experiment, you are comparing how people from different age groups (15-30; 31-45; 46-60) would use the three websites. Which study design would you choose in this case?
- d) A scientist is interested in the effects of a pesticide on crops. She exposes one unprotected field of crop to pesticide; the other field is completely protected from the environment. She measures the effects of pesticide on both crops after a couple of weeks. Is this a good controlled experiment? If no, then how can this experiment be improved?

#### **Exercise 10.2 (4 points)**

- a) You're creating an account with a webshop you'd like to order from. You fill in your details and email address as instructed. According to the instructions on the website you should soon expect an email with a link to click to verify your email address. You check your in-box but no mail has arrived. You wait but after ten minutes, still no email. You give the instructions of the webshop another look and read that you might have to check your spam folder. You do this and see that the

email with the verification is there, marked as spam. What type of error (false positive or false negative) is this?

- b) One morning at breakfast you decide to check your email. There's a strange mail in your inbox that claims you won the latest iPhone. You have all reason to believe this is spam, you never entered a competition. You're spam filter should've marked this as spam but didn't for some reason. What type of error (false positive or false negative) is this?
- c) In your opinion, which error type (false positive or false negative) is usually more harmful to scientific experiments? Support with an example.

### **Exercise 10.3 (8 points)**

- a) You're investigating how effective different kinds of laundry detergent are at removing stains from your clothing. You're testing 3 different kinds of detergent: detergent A, detergent B and detergent C. What would be the primary independent variable in this case?
  - 1) Water
  - 2) Clothes
  - 3) Detergent
  - 4) Types of stains
- b) Which of the following would be the most suitable hypothesis for your detergent experiment?:
  - 1) "Detergent B removes stains as well as detergent A"
  - 2) "Detergent B removes more stains than detergent A"
  - 3) "Some detergents are better than other detergent"
  - 4) "Is detergent C best at removing stains?"
- c) During an experiment, it is advisable to:
  - 1) compare multiple independent variables at the same time
  - 2) make readily conclusions
  - 3) change experimental setup
  - 4) record measurements and observations
- d) What is the advice on changing the number of variables in a less complex and well-designed controlled experiment?
  - 1) Change no variables
  - 2) Change one variable at a time
  - 3) Change multiple variables at a time
  - 4) Changing variables does not matter
- e) You are assigned to conduct an experiment to check if sunscreen lotion reduces sunburn. You have formulated your hypothesis as follows:  
"People wearing sunscreen experience less sunburn than people wearing no sunscreen"

Identify control group, independent variable(s), and dependent variable(s).

- f) In large and complex experiments, 'Latin Square' is usually used to ensure all permutations of conditions and participants. Suppose you have encountered an experiment where only two conditions with no variations are considered. Would you still prefer to use 'Latin Square' for this scenario? Justify your answer.

**[Note: read about 'Latin Square']**

- g) Solve the following puzzle using 'Latin Square' concept. **[Note: It is just for fun so not graded.]**

S	E				R			
P		E	N	O		S	G	
N	G	R			O	A	P	
	O		<b>S</b>	<b>I</b>	<b>N</b>			
	S		<b>G</b>	<b>A</b>	<b>P</b>		E	O
		G	<b>O</b>	<b>R</b>	<b>E</b>			
	R	I	E		S	O	N	G
O	P		<b>A</b>		G	R	I	N
E			R	N		G	S	P