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**Course : Image Processing for Earth Observation (ENV-540)**

**Mid term examination**

**Project group number: \_\_\_\_**

**Project topic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| --- | --- | --- | --- |
| **Student** | **Last Name** | **First Name** | **Students Master/Section** |
| **#1** |  |  |  |
| **#2** |  |  |  |
| **…** |  |  |  |

**This mid-term homework is composed of 7 questions.**

**The questions are to be answered by your group and no exchange/communication with other groups about the questions is allowed.**

**/!\ Be concise in your answer but always motivate them.**

**Lausanne, 11.11.2020**

**Question 1**

In your project, imagine that you would have enough resources/budget to make a/several drone image acquisition campaign(s).

1. What campaign(s) would you plan (frequency, coverage, spatial/spectral resolution):

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| Use k = 3 to pick the 3 modes we see in the histogram. |

1. How would that data fit within your project (complementing or replacing current data, which processing steps involved, etc.) ?

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1. What budget should you assume roughly for that/those campaign(s)? Explain how you derive it.

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1. Assume that the campaign(s) have to be replaced by VHR satellite data.

* Estimate the budget difference this would make:

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* Would it make sense to replace the drone campaigns by VHR satellite data? In both case explain why and what is the main reason for choosing one or the other in your project.

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| Use k = 3 to pick the 3 modes we see in the histogram. |

**Question 2**

1. Do you plan to extract band indices from your data in your project?

* If yes, which one(s), what bands are involved and why?
* If no, motivate why did you discard indices?

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| Use k = 3 to pick the 3 modes we see in the histogram. |

1. What index could you create that would be related to your project topic?

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| Use k = 3 to pick the 3 modes we see in the histogram. |

**Question 3**

Does your project require some “domain adaptation” (in other word, is there the need to either preprocess the data in a manner to standardize it or to adapt a model between different datasets)?

* If yes, describes what adaptation is needed and how you can perform it.
* If no, consider the situation where your project would be taken further by other students next semester and describe cases where they could be facing “domain adaptation” in relation to your topic.

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| Apply morphological operator opening by reconstruction on the DSM  using a structuring element of the size larger than the largest object to suppress.  Take the DSM and remove the above processed image to get the DHM |

**Question 4**

Does pansharpening is involved in your project?

* If yes, explain where it is involved and what positive and negative impacts it can have?
* If no, can you still imagine a possibility for pansharpening the type of data involved in your project? Check and report relevant literature if existing.

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| Apply morphological operator opening by reconstruction on the DSM  using a structuring element of the size larger than the largest object to suppress.  Take the DSM and remove the above processed image to get the DHM |

**Question 5**

1. Does it make sense to use morphology in your project?

* If yes, explain why, how you will apply it and what morphology operations you plan to use? Could several operations or chaining of operations be useful in your case?
* If no, explain why and provide examples of other applications where it could make sense with the same type of data than in your project.

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| Apply morphological operator opening by reconstruction on the DSM  using a structuring element of the size larger than the largest object to suppress.  Take the DSM and remove the above processed image to get the DHM |

1. Do you consider using convolution filters or co-occurrence indices?

* If yes, explain which filters or indices you think about and why these ones. Which pre-processing is needed when using these filters?
* If no, explain why and provide examples of other applications where it could make sense with the same type of data than in your project.

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| Use k = 3 to pick the 3 modes we see in the histogram. |

**Question 6**

You will have to assess the performances of your project outputs based on some validation data. You want that these performances tell about your outputs accuracies and the generalization and robustness of your approach.

1. Explain how you will setup your training and validation data (e.g. how to split, rough amounts, etc.)

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| Use k = 3 to pick the 3 modes we see in the histogram. |

1. Complete the confusion table row & column names wit your foreseen output classes (remove/add necessary columns/rows):

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| **Confusion table:** | | **Groundtruth** | | | |  |
|  |  | Class \_\_\_\_\_ | Class \_\_\_\_\_ | Class \_\_\_\_\_ | Class \_\_\_\_\_ |  |
| **Prediction** | Class \_\_\_\_\_ |  |  |  |  |  |
| Class \_\_\_\_\_ |  |  |  |  |  |
| Class \_\_\_\_\_ |  |  |  |  |  |
| Class \_\_\_\_\_ |  |  |  |  |  |

**Question 7**

1. Based on the data characteristics for your project which of the main families of supervised classifiers would best apply to it?

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| Use k = 3 to pick the 3 modes we see in the histogram. |

1. Are you planning to use unsupervised classification?

* If yes, explain why and how you will use these outputs.
* If no, explain what you could gain in using it to complement a supervised approach.

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| Use k = 3 to pick the 3 modes we see in the histogram. |