

**AMD (MLDM – Machine Learning and Data Mining) – Module of Practice**

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## 1. Install and test “Orange Data Mining Framework” and “Python”

The software to install (Windows/OSX) is available in “distribution\_02\_OrangeDM.zip” (cf., “moodle”, folder “SoftwareDistributions”). Nevertheless, steps to download/install Orange are as follows.

- a) If you have a **64bit** architecture download directly from the Orange site:

<http://orange.biolab.si/download/>

in Windows, choose: “Orange3-3.23.0-Miniconda-x86\_64.exe”.

in OSX, choose: “Orange3-3.23.0.dmg”

to use (**64bit** version) follow the instructions in “<https://orange.biolab.si/download/>”; for more details see “<https://github.com/biolab/orange3/blob/master/README.md>”

- b) **ONLY** If you have a **32bit** architecture (*this was my case!*):

1. download a 32bit older version from:

<https://download.biolab.si/download/files/>

“Orange3-3.21.0-Python36-win32.exe” seems to be the last 32bit version.

2. this Orange version version (3.21.0) is bundled with Python3.6.4

this Orange version installs the framework within a “python virtual environment”; for more information on “virtual environment”: <https://virtualenv.pypa.io/en/stable/>.

So, you will find the installation in “(...)\\Orange” folder.

*note:* there are useful example datasets in “(...)\\Orange\\Lib\\site-packages\\Orange\\datasets”

3. test if your installation can properly use the Orange libraries:

open a new “Command Prompt” window

change current folder to the installation; `cd c:(...)\\Orange`

initiate the Orange virtual environment; execute “Orange Command Prompt” file

launch Python interpreter (i.e., write `python`):

```
>>> import Orange
```

```
>>>
```

To quit the Python environment write: `quit()`

In case you still problems with the Orange installation visit:

<https://datascience.stackexchange.com/tags/orange/info/>

4. follow the instructions in “**\_USAGE\_virtual-environment-for-python.txt**” file regarding the usage of “Python Virtual Environment:

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**2. Read the dataset using “Orange Canvas” – the graphical mode**

- a) Copy the file, “dataset\_3RowHeader.txt”, built in the previous practical class to this class’s folder.
- b) Execute the “Orange Canvas” application: “\Start\Orange3\Orange Canvas”.
- c) Select the “Data” separator. Drag the “File” icon into the white part of the canvas.
- d) Make a “double-click” in the “File” icon and choose the “Data File” to point to the folder that contains the “dataset\_3RowHeader.txt” file. Notice that the file is not available for selection! To fix the problem change the file extension “.txt” to “.tab” and select the file.
- e) Take a look at the file “dataset\_finalFormat.tab” provided with this practical lesson. If necessary adapt the script developed in previous practical lesson in order to generated a file with this format.
- f) Drag the “Data Table” icon into the white part of the canvas; “double-click” on the icon and notice the “info \ no data on input”.
- g) Make a connection between “File” and “Data Table” icons. To connect two processes, represented by icon A and icon B, select a connector on the right side (output pipe) of A and drag it into a left connector of B (input pipe). A connection is a data flow from an output pipe into an input pipe.
- h) See the “Data Table” output. Connect the “Data Table” process to a “Save Data” process.
- i) Point to the connector line and “double-click” (or “right-click” and choose “Reset Signals”). Notice that “Data Table” process has two output available ports; explore deleting established connection and activating the other one.
- j) Configure the “Save” process so that it generates a “.csv” (“comma separated values”) after some data transformations (e.g., via a pipeline of the processes explored in the previous items).
- k) Use Excel to read the file that was generated in the previous item.
- l) Explore the “Select Columns” process.
- m) Explore the “Select Rows” process.
- n) Explore the “Purge Domain” process.
- o) Explore the “Discretize” process.
- p) Save your work (\File \ Save As...) into an “Orange Schema” so that it can be used again later.

**3. Reuse an “Orange Schema”**

- a) Open the “z01\_schema.ows”; double-click on the file or open it within the “Orange Canvas”.
- b) Explore the schema and make sure that the “Save (z\_out\_xx)” widgets generate “.tab” files with the same information as in the provided “z\_out\_xx.txt” files. *Suggestion*: explore the options available in each widget and each link (right-click over the link and “Reset Signals”).

**4. Start working with “lenses” dataset in Orange – graphic mode**

Consider the dataset: “lenses.tab” (in folder “\_dataset”).

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- a) Execute the “Orange Canvas”, choose the “File” icon and read the dataset.

*Note:* we may consider an “Orange” icon as an “operator” of a visual programming language; so, instead of calling “icon” we may call “operator”.

- b) Connect the “File” operator with “Data Table” and visualize all the information about the dataset.

### 5. [before-proceeding] – a Python “crash-course”

Consider the file: “a00\_python\_crash\_course.py”.

- a) Open the “a00\_python\_crash\_course.py” and comment everything. *Hint:* if you are using IDLE, in order to comment a block of lines, select the lines and then select the menu option “\Format\Comment Out Region”.
- b) Uncomment each section (e.g., Strings, Numbers, Boolean, Multiple Assignment, No value, etc) at a time and explore the concept e that section. We can search for additional information for example in the “p01\_aByteOfPython\_v3.pdf” document.
- c) In the end make sure that the value computed in the “main” function gets printed!
- d) Now, encapsulate each section (e.g., Strings, Numbers, Boolean, etc) in a function and make sure that each of those new functions are called from the “main” function.

### 6. Read a dataset with Orange – programmatic mode

Consider the file: “a01\_datasetRead.py”.

- e) Open the “a01\_datasetRead.py” and comment everything except for the first lines of code where a dataset is read. Execute the code. *Hint:* if you are using IDLE, in order to comment a block of lines, select the lines and then select the menu option “\Format\Comment Out Region”.
- f) Add to the code a line with `print( dataset )` and execute.
- g) Now add a line to print `dataset.domain` and execute.
- h) Now add a line to print `dataset.domain.variables` and execute.
- i) Now add a line to print `dataset.domain.attributes` and execute.
- j) Eliminate the comments on the code that analyses the `dataset.domain.attributes`. Execute and explain the difference from the `dataset.domain.variables` structure.
- k) Eliminate the remaining comments, execute and explain the result.

### 7. The (second) “Kick-Off” of Final Project A

- a) Consider “final project A” (cf., moodle, “Final Project” folder). Develop “Project Item: 5”.
- b) Use the Orange Canvas to create a process that loads and (eventually) applies transformations to the dataset exported from PostgreSQL database. Save your work as an “Orange schema”.

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- c) Create a Python automatism to generate the dataset. *Suggestion:* extend the “\_goPy.py” script provided in the previous practical class (cf. folder “scripts”).
- d) Create a Python application to extract the metadata (features and class attributes along with the corresponding domains and values in the dataset) that is necessary to implement the 1R method.