Course name: Data Science (ITE4005)

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< Programming Assignment #2 >

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Due Date: 14 Apr. 2021, 11:59 pm

1. Environment

- OS: Windows, Mac OS, or Linux
- Languages: C++, Java, or Python (any version is ok)

2. Goal: Build a **decision tree**, and then classify the test set using it

3. Requirements

The program must meet the following requirements:

- Execution file name: **dt.exe**
- Execute the program with three arguments: training file name, test file name, output file name
  - Example:

```
C:₩>dt.exe dt_train.txt dt_test.txt dt_result.txt
```

    - Training file name='dt_train.txt', test file name='dt_test.txt', output file name='dt_result.txt'
    - If using python, you are allowed to use 'dt.py' file instead of 'dy.exe'.
- Dataset
  - We provide you with 2 datasets
    - Buy_computer: dt_train.txt, dt_test.txt
    - Car_evaluation: dt_train1.txt, dt_test1.txt
  - You need to make your program that can deal with **any** datasets
  - We will evaluate your program with other datasets.
- File format for a training set

  [*attribute_name_1*]\t[*attribute_name_2*]\t … [*attribute_name_n*]\n

  [*attribute_1*]\t[*attribute_2*]\t … [*attribute_n*]\n

  [*attribute_1*]\t[*attribute_2*]\t … [*attribute_n*]\n

  [*attribute_1*]\t[*attribute_2*]\t … [*attribute_n*]\n

  - [*attribute_name_1*] ~ [*attribute_name_n*]: *n* attribute names

- [*attribute_1*] ~ [*attribute_n-1*]
  - *n-1* attribute values of the corresponding tuple
  - All the attributes are categorical (not continuous-valued)
- [*attribute_n*]: a class label that the corresponding tuple belongs to
- Example 1 (data_train.txt):

age	income	student	credit_rating	Class:buys_computer
<=30	high	no	fair	no
<=30	high	no	excellent	no
31...40	high	no	fair	yes
>40	medium	no	fair	yes

Figure 1. An example of the first training set.

- Example 2 (data_train1.txt):

buying	maint	doors	persons	lug_boot	safety	car_evaluation
high	high	3	4	big	low	unacc
med	high	2	2	small	med	unacc
low	med	5more	2	big	high	unacc
low	high	2	4	med	low	unacc
med	vhigh	4	2	med	med	unacc

Figure 2. An example of the second training set.

  - Title: car evaluation database
  - Attribute values
    - Buying: vhigh, high, med, low
    - Maint: vhigh, high, med, low
    - Doors: 2, 3, 4, 5more
    - Persons: 2, 4, more
    - Lug_boot: small, med, big
    - Safety: low, med, high
  - Class labels: unacc, acc, good, vgood
  - Number of instances: training set - 1,382; test set - 346

- Attribute selection measure: **information gain, gain ratio, or gini index**
- File format for a test set

[*attribute_name_1*]\t[*attribute_name_2*]\t … [*attribute_name_n-1*]\n

[*attribute_1*]\t[*attribute_2*]\t … [*attribute_n-1*]\n

[*attribute_1*]\t[*attribute_2*]\t … [*attribute_n-1*]\n

[*attribute_1*]\t[*attribute_2*]\t … [*attribute_n-1*]\n

- The test set does not have [*attribute_name_n*] (class label)
- Example 1 (dt_test.txt):

age	income	student	credit_rating
<=30	low	no	fair
<=30	medium	yes	fair
31...40	low	no	fair

Figure 3. An example of the first test set.

- Example 2 (dt_test1.txt):

buying	maint	doors	persons	lug_boot	safety
med	vhigh	2	4	med	med
low	high	4	4	small	low
high	vhigh	4	4	med	med
high	vhigh	4	more	big	low
low	high	3	more	med	low

Figure 4. An example of the second test set.

- Output file format

[*attribute_name_1*]\t[*attribute_name_2*]\t … [*attribute_name_n*]\n

[*attribute_1*]\t[*attribute_2*]\t … [*attribute_n*]\n

[*attribute_1*]\t[*attribute_2*]\t … [*attribute_n*]\n

[*attribute_1*]\t[*attribute_2*]\t … [*attribute_n*]\n

  - Output file name: **dt_result.txt (for 1th dataset), dt_result1.txt (for 2nd dataset)**
  - You must print the following values:
    - [*attribute_1*] ~ [*attribute_n-1*]: given attribute values in the test set
    - [*attribute_n*]: a class label predicted by your model for the corresponding tuple
  - Please **DO NOT CHANGE the order of the tuples** in each test set.
    - You should print your outputs to match the order of correct answers.
  - **Please be sure to use \t to identify your attributes.**

5. Submission

- Please submit the program files and the report to *GitLab*
  - Report
    - File format must be *.pdf.
    - Guideline
      - ✓ Summary of your algorithm
      - ✓ Detailed description of your codes (for each function)
      - ✓ Instructions for compiling your source codes at TA's computer (e.g. screenshot) (*Important!!*)
      - ✓ Any other specification of your implementation and testing
  - Program and code
    - An executable file
      - ✓ If you are in the following two cases, please submit alternative files (e.g., .py file, jar file, makefile)

        1. You cannot meet the requirements (.exe file) of the programming assignment due to your computing environment (ex. Mac OS or Linux)

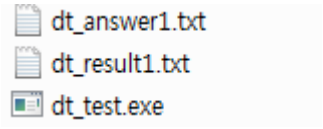
2. You are using python for implementing your program

✓ You MUST SUBMIT instructions for compiling your source codes. If TAs read your instructions but cannot compile your program, you will get a penalty. Please, write the instructions carefully.

- All source files

6. Testing program

- Please put the following files in a same directory: Testing program, your output files (dt_result.txt, dt_result1.txt), an attached answer file (dt_answer.txt, dt_answer1.txt)



- Execute the testing program with two arguments (answer file name and your output file name)

```
DM_assignment2>dt_test.exe dt_answer1.txt dt_result1.txt
```

- Check your score for the input file

```
346 / 346
```

  - the number of your correct prediction / the number of correct answers

- The test program was build with program 'mono'. So, even if you are using mac or linux instead of window, you can run dt_test.exe using C# mono.

7. Penalty

- Late submission
  - 1 week delay: 20%
  - 2 weeks delay: 50%
  - Delay more than 2 weeks: 100%
- Requirements unsatisfied
  - Significant penalty up to 30% will be given when the requirements are not satisfied