

CSE 515 Multimedia and Web Databases

Phase #1

(Due Sept 20th 2020, midnight)

Description: In this project, you will experiment with

- multi-variate time series data sets and
- vector models.

This project phase will be performed by each group member; but, you will get group grades.

- Download the sample data files from the project directory. See

[http : //chalearnlap.cvc.uab.es/dataset/12/description/](http://chalearnlap.cvc.uab.es/dataset/12/description/)

[http : //chalearnlap.cvc.uab.es/dataset/13/description/](http://chalearnlap.cvc.uab.es/dataset/13/description/)

for more information about gesture recognition and the multi-variate gesture data sets (we will use a mixture of data from these two challenges).

- **Task 1:** Implement a program which creates a *gesture words* dictionary: Given a directory, dir , window length, w , a shift length, s , and a resolution, r ,

1. for each data file, $f \in dir$, in the given directory, the program

- (a) normalizes the data file to values between -1.0 and 1.0,
- (b) quantizes the entries into $2r$ levels by dividing the range -1 to 1 into r Gaussian bands (with parameters, mean $\mu = 0$ and standard deviation $\sigma = 0.25$):

$$length_i = \frac{\int_{(i-r-1)/r}^{(i-r)/r} Gaussian(\mu=0.0, \sigma=0.25)(x) \delta x}{\int_{-1}^1 Gaussian(\mu=0.0, \sigma=0.25)(x) \delta x}$$

for each level, the center of the band is used as its representative.

(c) for each state uni-variate series in the program

- i. moves a w -length window on the corresponding time series (by shifting it s time units at a time), and
- ii. for each window, starting at t , writes the pair $\langle idx, \vec{win} \rangle$, where
 - $idx = \langle f, s, t \rangle$ and
 - \vec{win} is quantized content of the w -length window starting at time t , into the file, $f.wrd$, in the same directory.

- **Task 2:** Implement a program which, given a directory, dir , associates to each uni-variate time series in each gesture file 3 *gesture vectors*, based on

- TF values,

- TF-IDF values, and
- TF-IDF2 values (where IDF2 value is computed only considering those words in the given gesture).

Results are written into an output file, *vectors.txt*, in the same directory.

- **Task 3:** Implement a program which lets the user select a gesture file, $f \in dir$, and view it in the form of a gray scale heat map of

- TF values,
- TF-IDF values, or
- TF-IDF2 values

based on the user's choice.

- **Task 4:** Implement a program which given a gesture file, $f \in dir$, identifies the most similar 10 gestures in the database,
 - based on TF values,
 - based on TF-IDF values, or
 - based on TF-IDF2 values.

Deliverables:

- Your code (properly commented) and a README file.
- Your outputs for the provided sample inputs.
- A short report describing your work and the results.

Please place your code in a directory titled “Code”, the outputs to a directory called “Outputs”, and your report in a directory called “Report”; zip or tar all off them together and submit it through the digital dropbox.