Pattern Recognition

Moreno Colombo, Egzon Syka, Lin Bai, Labinot Jakupi & Sukanya Nath



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Challenges

Keyword Spotting

Find Keywords in handwritten documents using DTW

Signature

Verify signatures to be genuine using DTW



Language and libraries

Language

- Python3

Libraries

- Scipy (distance functions)
- Fastdtw (dtw)
- Sklearn(MLP)
- Numpy (array processing and math functions)



Solution Outlines ****



Keyword Spotting

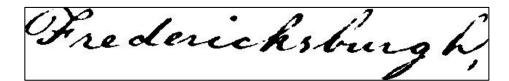
- Pre processing:
 - Document images were cut out into separate words
 - Words binarized with Gauss method
 - > Features extracted from single words scaled to 50x100 px, window width 1px
- * Recognition:
 - Using the the feature vectors from pre processing
 - Distance between given word (train) and all words of test set with DTW
 - Mean average precision on validation set ~ 54.5%



Keyword Spotting

- Feature vectors selection was performed yielding features
 - Upper contour
 - Lower contour
 - Number of black-white transitions
 - Original ratio width/height of each word





W/H ratio = 1.2

W/H ratio = 6.9



Signature Verification

- Mean distance of genuine signatures of each author was computed using DTW (and stored in a dictionary)
- For each Validation set instance, mean distance was computed against genuine signatures of that author
- A threshold of 10.000 was used to compare the Validation instance mean distance with the author's genuine signature mean distance
- Mean average precision on validation set ~ 87%



THANK YOU!

Any questions?

Solutions at

https://github.com/colombmo/pattern-recognition



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MNIST

- Best possible MLP Parameters found by using grid search
- solver='sgd',
 activation='relu',
 learning rate=0.3,
 neurons = 100,
 alpha=0.01
 max_iter=200
- Accuracy >97% on the test set

