OVERVIEW OF THE MEDICAL CLUSTERING TASK

M. Ashraful Amin and Mahmood Kazi Mohammed

Computer Vision and Cybernetics Group

Independent University, Bangladesh

THE TASK

- The primary objective: group digital x-ray images
- 4 clusters: head-neck, upper-limb, body, and lower-limb.

- The secondary goal: farther partitioning the initial clusters into sub-clusters,
- Example the upper-limb: farther divided into Clavicle, Scapula, Humerus, Radius, Ulna, and Hand

WHY THIS IS IMPORTANT !

- M. S. Shahriar Faruque, Shourav Banik, M. Kazi Mohammed, Mahady Hasan, M. Ashraful Amin: **Teaching & Learning System for Diagnostic Imaging - Phase I: X-Ray Image Analysis & Retrieval.** CSEDU (1) 2015: 430-435

THE DATASET

THE DATASET--COLLECTION

- The main folder ‘medical clustering’ there are two folders named ‘Training Data’ and ‘Test Data’. Inside the ‘Training Data’ folder there are five folders: ‘Body’, ‘Head-Neck’, ‘Lower Limb’, ‘True Negative’, ’Upper Limb’.
- Inside each of this folders there are 100 down sample images of the type annotated on the folder name.
- Original images are of type .dcm, however because of the large image size we have converted them into high resolution .jpg images. Image size varies as the aspect ratio cannot be changed.
- All together there are 500 training images.
- Likewise the test folder is organized, however the in the test folder there are 50 images per category, so there are 250 images for testing.
- True negative folder contains images taken by the same digital x-ray camera for non-body parts.
- At this moment we are making 750 data available. After the contest all 5000 data in high resolution .dcm format will be made available for non-commercial uses from the research group website.

THE PARTICIPANTS

- 71 online registration
- 36 Download of the dataset
- 8 submission of results
- 6 submission of working note papers
- 2 oral presentation (top two results) and
- 1 Poster presentations

Region	Number of Groups
North America	14
South America	4
Europe	15
Africa	3
Asia	29
Australia	6
Total	71

RESULTS

Group Name	Country	Exact Match	Any match	Hamming Similarity
IBM MMAFL	Australia	0.752	0.864	0.863
SNUMedInfo	Korea	0.709	0.856	0.895
AmrZEGY	Egypt	0.646	0.780	0.868
NLM	USA	0.613	0.740	0.849
CASMIP	Israel	0.606	0.732	0.843
BMET	Australia	0.497	0.596	0.816
db Lab	China	0.219	0.264	0.664

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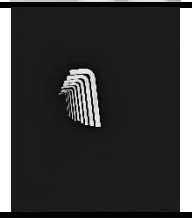
ACCURACY MEASUREMENT

Input	Output			
	body	Head-Neck	U-Limb	L-Limb
	1	1	1	0
	0	0	0	1
	1	0	0	1
	0	0	0	0

- **Exact Match:** T = 1110, A=1110, accuracy count increases 1.
- **Any match:** T = 1110, A=1xxx, or A=x1xx, or A=xx1x, accuracy count increases 1.
- **Hemming distance:** For binary strings *a* and *b* the Hamming distance is equal to the number of ones (population count) in *a* XOR *b*. T = 1110, A=1010 Hamming Distance 1.

COMMENTS ON THE FEATURES

- About 28 different image feature extraction tecniques
- Intensity Histogram (IH), Gradient Magnitude Histogram (GM), Shape Descriptor Histogram (SD), Curvature Descriptor Histogram (CD), Histogram of Oriented Gradient (HOG), Local Binary Pattern (LBP), Color Layout Descriptor (CLD), Edge Histogram Descriptor (EHD) from MPEG-7 standard, Color and Edge Direction Descriptor (CEDD), Fuzzy Color and Texture Histogram (FCTH), Tamura texture descriptor, Gabor texture feature, primitive length texture features, edge frequency texture features, autocorrelation texture features, Bag of Visual Words (BoVW), Scale invariant feature transform (SIFT), Speeded up robust features (SURF), Binary robust independent elementary features Brief (BRIEF), Oriented fast and rotated BRIEF (ORB), Multi-scale LBP Histogram with Spatial Pyramid, Sparse Coding with Max-pooling and Spatial Pyramid, Fisher Kernel Feature Coding, Global mean of rows and columns, Local Mean of rows and columns, and Gray Level Co-occurrence Matrix (GLCM).

COMMENTS ON THE CLASSIFIERS

- About 12 classification technique

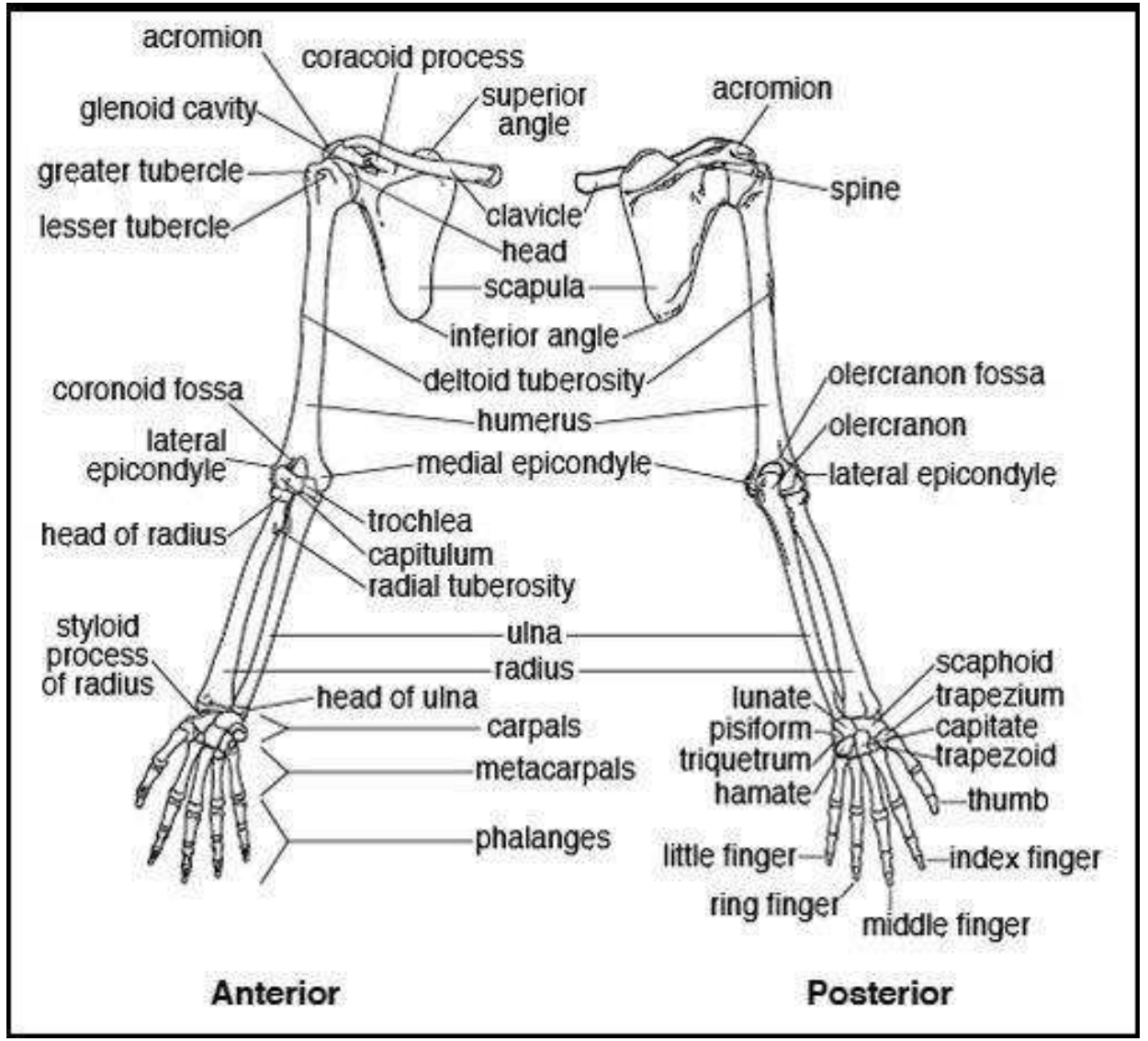
- Backpropagation Neural Networks (BPNN), Logistic Regression (LR), K Nearest Neighbors (KNN), Deep Belief Network (DBN), Convolution Neural networks (CNN), Decision Tree, Support Vector Machine (RBF Kernel, Poly kernel, Normalized Ploy kernel and Puk kernel), Random Forest, Logistic Model Tree (LMT), Naive Bayesian, and Ensemble Neural Network.

OBSERVATIONS

- Proper annotation data preparation was challenging, specially for images containing objects from multiple groups
- Training data preparation from Sub-clustering task was very time consuming and second part of the task was excluded from 2015 medical clustering task
- Registration vs. final participation number is very low
- For this particular task there is no submission from the EU even though it is primarily an EU event.
- Due to the open-source availability of tools from feature extraction and classification broad-spectrum results are observed.
- Popularity of Neural Network

2016-TASK

- Decision to take
- There should be more than one Manual annotation of the training & test dataset



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THE END

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