**Work Progress Report**

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**Date:** FRI 25/12/2020

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| Milestones | Planned Dates | Comments |
| Finish the state of the art of the works that deal with applying deep learning in Bone Metastasis (BM) | December, 31 | Read more papers even is not exactly about BM (classification of other type of cancer)  Go deeply and try to understand the proposed architecture (Number of convolution layers, epoch...) |
| Understand what we call specificity, sensitivity, accuracy, precision…. | December,24 | done |
| Collect the labeled database | December,31 | We have already data from10 patients |
| Search about the influence of gamma camera ( Tools of scan) |  | We have asked **Doctor Hentati** and she said that there is no influence (no noise) when we have an image of BM but disease like lung we can have noise in the image |

## Accomplished this week

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| --- | --- |
| **Reading** | * See “Detailed Work Description” above |
| **Implementation** |  |
| **Theoretical contributions** |  |

## Planned for next week / meeting

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| 1. Task 1: prepare a table that contain the number of positive and negative patients and number of image/ patient 2. Task 2: Read more papers especially which are published in ranked conference like CVPR, ICML or journals deal with AI/ML/DL |

**Detailed Work Description**

**Paper1: HAMMAMI, Maryam, FRIBOULET, Denis, et KECHICHIAN, Razmig. Cycle GAN-Based Data Augmentation For Multi-Organ Detection In CT Images Via Yolo. In : *2020 IEEE International Conference on Image Processing (ICIP)*.**

In This paper a CycleGAN+YOLO combination for data augmentation to train a multi-organ detector for CT images is proposed. CycleGAN is an unsupervised method that synthesizes images from annotated source images of a different modality (used for data augmentation).

* CycleGAN( trained using 200 epochs)
* CNN Architecture :YOLOv3 ( 53 layers trained 450 epoch)
* 2 datasets used with 2 modalities ( CT/MRI)
  + 1st dataset (Gold) : data from 20 patients per modality
  + 2nd dataset (Silver): data from 30 patients per modality

**Paper2: SU, Ran, LIU, Tianling, SUN, Changming, *et al.* Fusing convolutional neural network features with hand-crafted features for osteoporosis diagnoses.  *Neurocomputing*, 2020, vol. 385, p. 300-309.**

**Objective:** a hybrid model to diagnose osteoporosis based on bone radiograph images by combine CNN features and hand-crafted features

**Approach:**

* Four sets of CNN features were extracted from four popular CNN architectures, AlexNet, VggNet, ResNet, and DenseNet.
* For the hand-crafted features, two sets of features, standard features including GLCM and LBP features and encoded features including encoded GLCM features and encoded LBP features, were extracted
* A minimum-redundancy maximum-relevance (mRMR) algorithm used to select the most discriminative features and reduce the computational cost
* The selected features were fed to a support vector machine (SVM) for classification

**Evaluation**

* 116 images with 58 from osteoporotic patients (with fracture) and 58 from healthy people were used to train and test the model + 58 new test images for blind classification were used as external validation.
* Accuracy: **77.5%**

**Paper 3: HASHIMOTO, Noriaki, FUKUSHIMA, Daisuke, KOGA, Ryoichi, *et al.* Multi-scale Domain-adversarial Multiple-instance CNN for Cancer Subtype Classification with Unannotated Histopathological Images. In : *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*. 2020. p. 3852-3861**

***Objective:*** *a new method for cancer subtype classification from histopathological images, which can automatically detect tumor-specific features in a given whole slide image (WSI).*

**Approach:**

CNN-based digital pathology image classification method by effectively combining MIL (Multiple Instance Learning), DA (Domain adversarial) and MS (Multi Scale) approaches. Apply the proposed method to malignant lymphoma classification tasks with 196 WSIs of H&E stained histological tissue slides.

***Evaluation***

*Accuracy:* 0.871 +- 0,028