ProstateX dataset, related work and experiments

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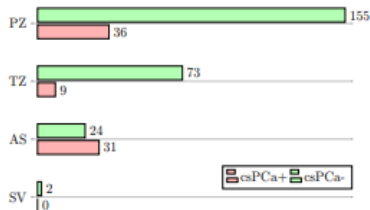Bucaramanga - Colombia

Outline

1 ProstateX dataset

2 State of the art
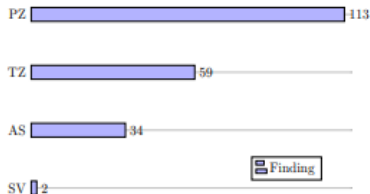
3 LeNet Experiments

ProstateX dataset

Data

- The training dataset consists of 204 patients with 330 suspicious lesion findings
- The test dataset includes 140 patients and 208 non-labeled findings.
- Each annotation includes lesion location, state: clinically or non- clinically singnificancy
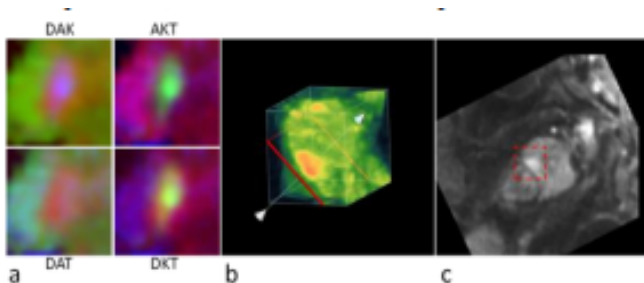

(a) Train data.   (b) Test data.

State of the art

Saifeng Liu Work - Data Augmentation I

- Saifeng Liu et al proposed a data augmentation approach that uses both 3d Slicing (b) and in-plane rotation (c) with a window cropped of 32x32.
- The input data of this approach consist on an "RGB" channel compoused of D(DWI), A(ADC), K (Ktrans), T(T2WI) different combinations.

Saifeng Liu Work - Data Augmentation II

- All the images maps were co-registered, using the transverse T2WI as the reference.

- Each lesion was sliced to 7 different orientations.

- At the end, 207,144 train samples were prepared.
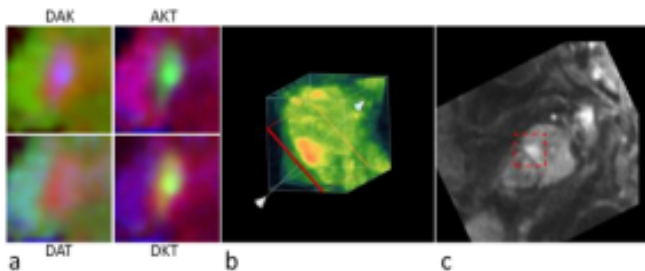
Saifeng Liu Work - Deep learning architecture

- A new Deep learning model was proposed in this work its name is "XmasNet".
- This model uses adam optimizer and DAK as input, this model was inspired by VGG architecture.
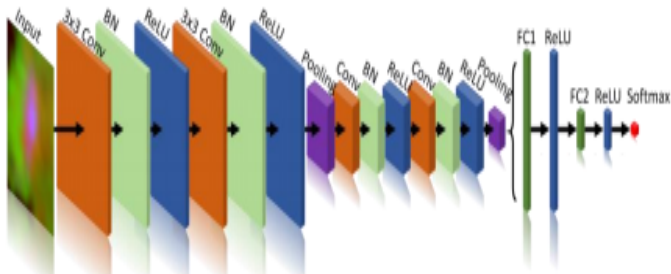
Saifeng Liu Work - XmasNet

- This model reached an AUC of 0.84.

Table 1. The patch size, stride and output size of each layer in XmasNet.

Layers	Conv1	Conv2	Max pooling1	Conv3	Conv4	Max pooling2	FC1	FC2	Softmax
Patch size/stride	3×3 / 1	3×3 / 1	2×2 / 2	3×3 / 1	3×3 / 1	2×2 / 2			
Output size	32×32 ×32	32×32 ×32	16×16 ×32	16×16 ×64	16×16 ×64	8×8 ×64	1024×1	256×1	2×1

Mehrtash Work - Data Augmentation

- Mehrtash used a translation and flipping techniques from the original data, resulting in a data augmentation.
- 5-fold cross-validation datasets were generated with 10,000 training and 2,000 validation samples for each fold.
- the input data used in this work includes: Ktrans maps from DCE, B-VAL and ADC from DWI maps.

Mehrtash Work - Deep learning model

- This model uses SGD optimizer with Adam's update rule.
- All the layers were normalized to increase the convergence.
- Dropout was used with a probability of 0.25
- This work reached an AUC of 0.80
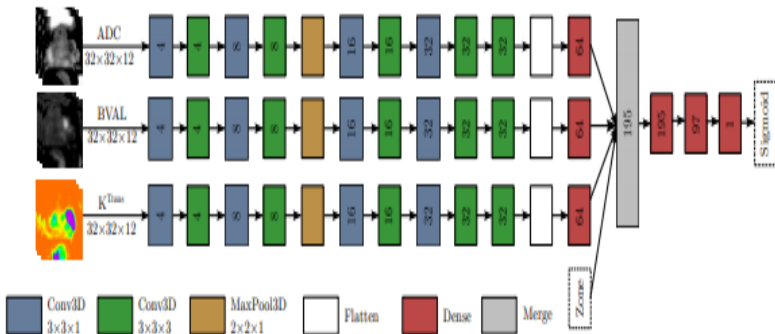
Seah Work - Data Augmentation

- Seah used a The ImageGeneratorClass from Keras in order to perform data augmentation, he applied extensive linear translation, horizontal flipping, rotation and scaling to the original data.
- Additionaly, Seah included the age of the patient as an input feature.
- Seah included the following maps as features: T2WI , ADC, and Ktrans.

Seah Work - Deep learning model

- Seah used a VGG16 model.
- This model reached an AUC of 0.84
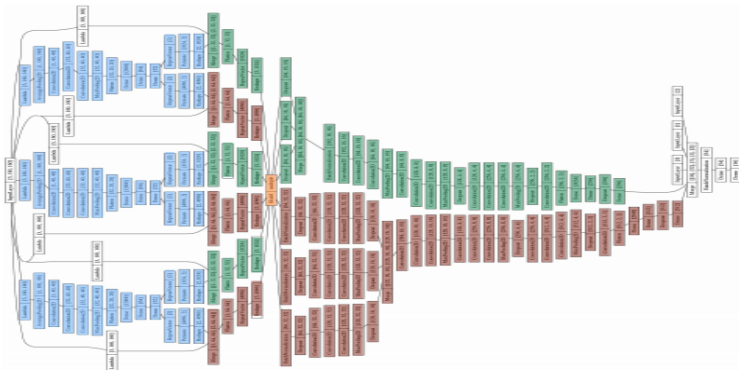
LeNet Experiments

Experiment notes

- In our experiment we are going to consider the following modalities: Ktrans, ADC, T2-Sagital, T2-transaxial.
- Each single modality was trained and tested using an 8-fold cross validation that was calculated 30 times.
- The AUC and also ROC curves for each modality was provided.

Experiment Notebook

- LeNet Experiments Link

Thanks for your attention!

Questions?