



Medical Report Generation from Chest X-Ray images

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Abstract

Radiology report generation is an area of research in artificial intelligence and clinical medicine. Our project works on building a model based on the transformer architecture (R2Gen model) and compare it with another model based on CNN and LSTM (Co-Attention). The resultant application is able to generate long reports, translated report and important keywords are extracted.

Introduction

Automatically generating radiology reports is highly desired to lighten the workload of radiologists and accordingly promote clinical automation. Medical images have normal and abnormal regions there is difficulty in diagnosing abnormal regions, as shown in Figure 1.

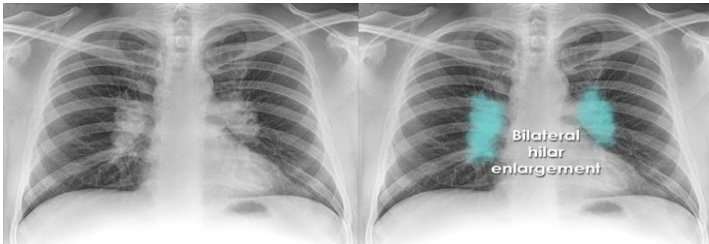


Figure 1. Normal and abnormal regions in medical image.

Methods

In our work, we generated reports from medical images by deep learning techniques, and experimented with the differences between two models (R2Gen, Co-Attention). Flowchart of our system is provided in Figure2.

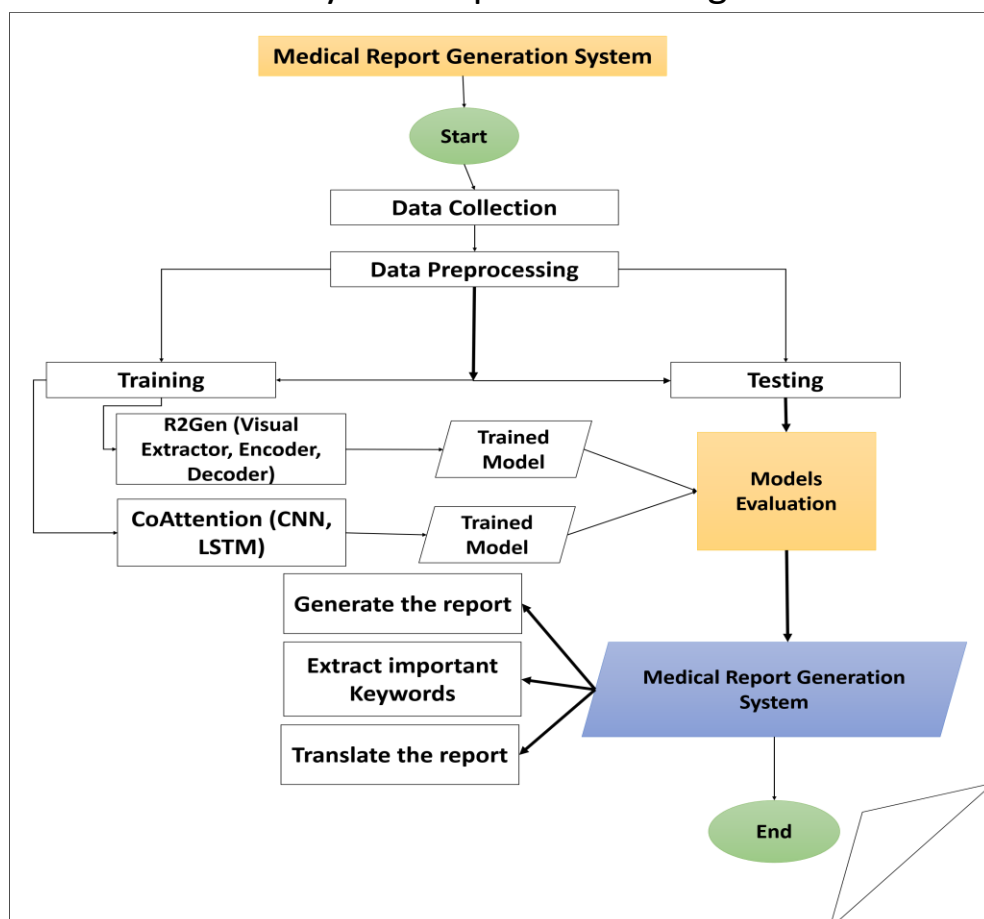


Figure 2. Medical report generation system.

Results

We trained visual extractor in our model using pre-trained resnet101 and vgg19 (results in Table1).

Visual Extractor	BL-1	BL-2	BL-3	BL-4	Testing time for one image (sec)
ResNet101	0.44	0.29	0.21	0.17	13.6
Vgg19	0.43	0.27	0.19	0.14	17.4

Table1 . results for Visual Extractor (Resnet101, VGG19).

Sample output from our website is the generated report, as shown in Figure 3.

Resultant Report:
the heart size is within normal limits . the lungs are clear . there is no pleural effusion or pneumothorax .

Important Keywords:
heart - size - limits - lungs - effusion - normal - pneumothorax - clear - within - pleural -

Figure 3. result of our system (long report and important keywords).

Conclusion

In this work, we introduce a summarized overview of our work to generate radiology reports from medical images by deep learning architectures. From the comparison, we found “R2Gen” is slower than “Co-Att” due to its more complex architecture.

Additionally, we experimented with the visual extractor of the R2Gen model using different architectures “ReNet101 and VGG19”.

Additionally, we used NLTK and TestRank algorithm to identify important keywords.

Finally, translate the report and important keywords using translation APIs.

References

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- [2] Chen, Z., Song, Y., Chang, T.H. and Wan, X., 2020. Generating radiology reports via memory-driven transformer. arXiv preprint arXiv:2010.16056.