RSNA Cervical Spine Fracture Detection

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Introduction

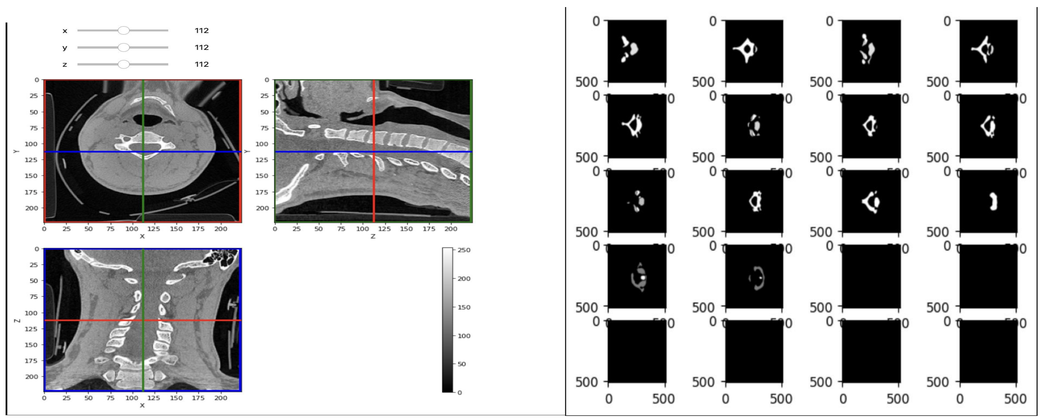
- Over 1.5 million spine fractures occur annually in the United States alone resulting in over 17,730 spinal cord injuries annually.
- Analyzing medical images can often be a difficult and time consuming process.
- It is increasingly urgent to use artificial intelligence instead of human force for Cervical Spine Fracture Detection.

Goals

- Developing a computer-aided diagnosis software.
- Quickly detecting the location of any vertebral fractures.
- Improving the accuracy of detection of bone fractures.
- Providing a user-friendly interface for radiologists to use.

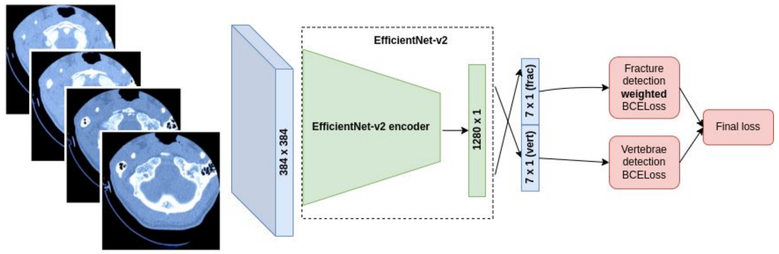
Cervical Spine Dataset preprocessing

- A portion of the imaging datasets have been segmented automatically.
- The train images: each image is in the dicom file format.
  The segmentation: pixel level annotations for a subset of the training set, and this data is provided in the nifti file format.



Network Architecture

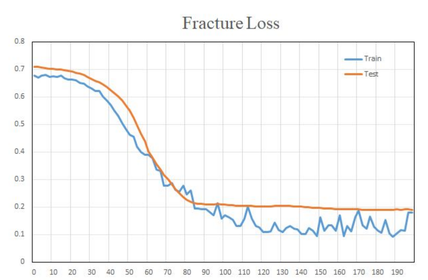
Efficient Net V2

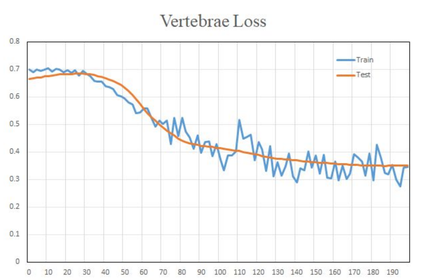


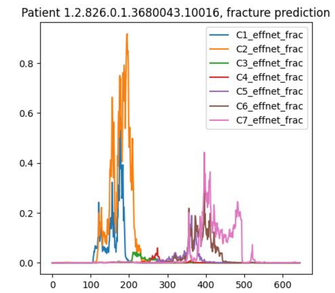
- Input Images are resized to 384*384
- Perform vertebrae and fracture detection at the same time
- Binary Cross Entropy Loss is used to measure the binary classification error for each vertebrae
- Overall prediction is given by combined probability of fracture and vertebrae

Results

- Training epochs = 100, Training Loss=0.542, Test Loss=0.579

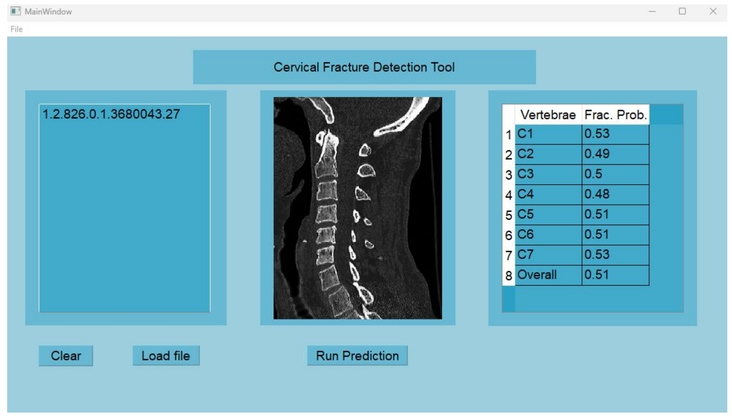






Demo

- The application was built using PyQt, one of the most popular Python bindings for the Qt cross-platform C++ framework.
- The **Efficient Net V2 Network** is implemented for high efficiency
- Users can upload cervical radiographs in dicom formats and receive a fracture prediction



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kaggle

GitHub:https://github.com/wyachen/601_Cervical-spine-fracture-detection