Semantic image Segmentation of Chest Xrays for Pneumonia Detection

Team Members **Panel Number:10**

S.No	Reg.No	Name of the Student	Section
1			
2	CB.EN.U4CSE172		CSE C
3	CB.EN.U4CSE172		CSE C
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Problem Definition

To classify each pixel in the image using Computer Vision Algorithm

Literature Survey

Learning to Recognize Chest-Xray Images Faster and More Efficiently Based on Multi-Kernel Depthwise Convolution

- This paper aims to automatically diagnose diseases on chest X-rays images quickly and effectively. We propose the multi-kernel depthwise convolution(MD-Conv) which contains depthwise convolution kernels with different filter sizes in one depthwise convolution layer.
- it is appropriate for medical images diagnosis tasks in which abnormalities varied in sizes. In addition, larger depthwise convolution kernels are adopted in MD-Conv to obtain a larger receptive field efficiently.
- They obtained a better performance of 98.3% AUC than original paper (96.8%) for recognize pneumonia versus normal

Literature Survey

Efficient Pneumonia Detection in Chest Xray Images Using Deep Transfer Learning

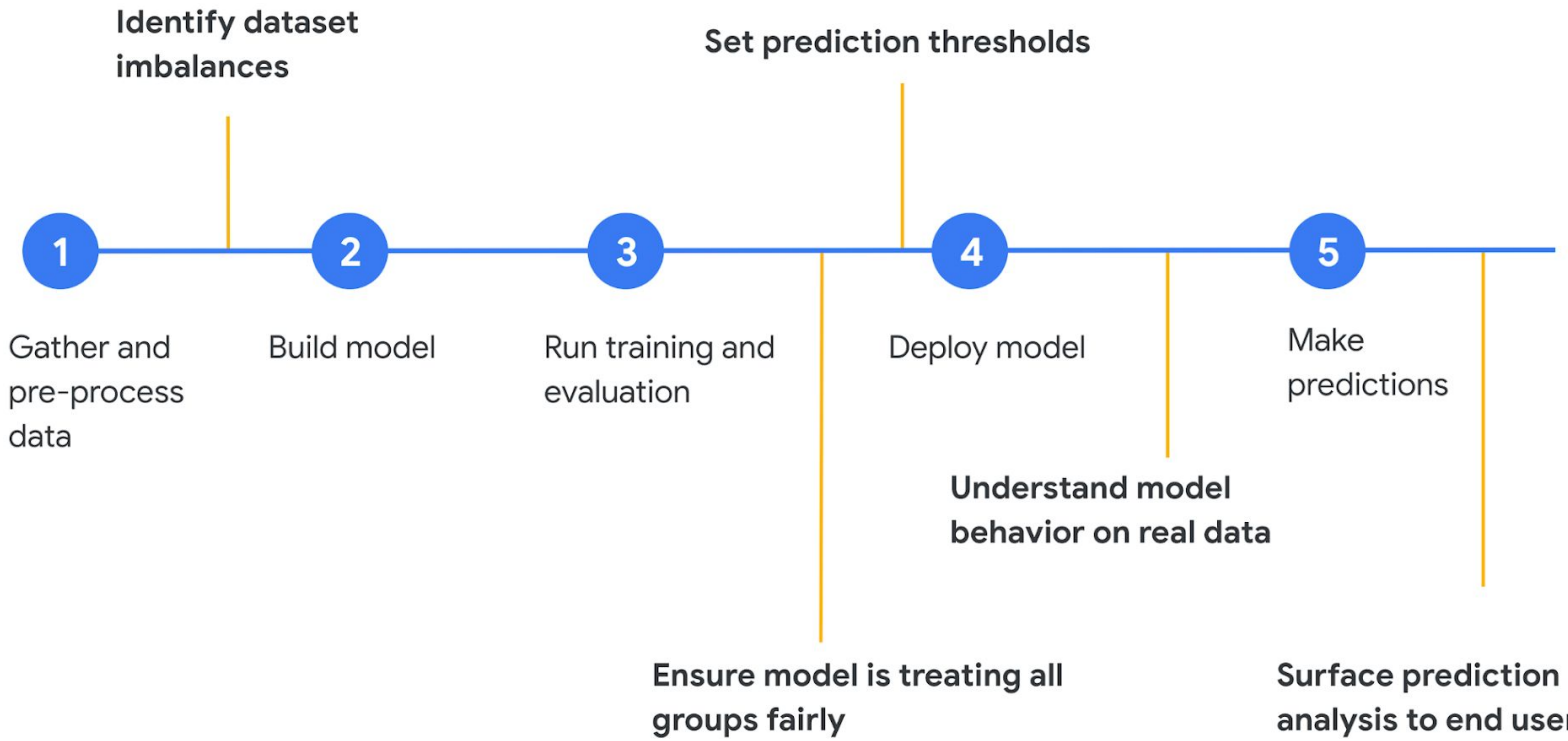
- In this work, an efficient model for the detection of pneumonia trained on digital chest X-ray images is proposed, which could aid the radiologists in their decision making process.
- A novel approach based on a weighted classifier is introduced, which combines the weighted predictions from the state-of-the-art deep learning models such as ResNet18, Xception, InceptionV3, DenseNet121, and MobileNetV3 in an optimal way.
- The final proposed weighted classifier model is able to achieve a test accuracy of 98.43% and an AUC score of 99.76 on the unseen data.

Literature Survey

InstaCovNet-19: A deep learning classification model for the detection of COVID-19 patients using Chest X-ray

- In this paper, an integrated stacked deep CNN InstaCovNet-19 is proposed. The proposed model makes use of various pre-trained models to compensate for a relatively small amount of training data.
- The proposed model detects COVID-19 & pnuemonia by identifying the abnormalities caused by such diseases in chest X-ray images of the person infected.
- I The proposed model achieved an accuracy of 99.08% on 3 class (COVID-19, Pneumonia, Normal) classification while achieving an accuracy of 99.53% on 2 class(COVID, NON-COVID) classification.

Architecture diagram



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Important Modules

- **Data Annotation**
  - Data is first pre-processed to improve the quality of image using Open CV image processing techniques
  - Now, using labelme(Image Annotation tool) we create masks for all the images in our Dataset.

- **Model Training**
  - Implement semantic segmentation algorithm to train the model on Image data.
  - Use Keras Callback functions to monitor the performance of the model during training phase.

Important Modules

- **Model Evaluation:**
  - To check the performance of the model, we evaluate the model on unseen data.
  - We use some performance metrics like dice overlap coefficient and Jaccard index.

- **Model Deployment:**
  - Deploy the final model in AWS EKS cluster.

Project Plan

•This project aims to design an efficient approach for semantic image segmentation, which allows researchers to accurately segment all objects in the image and classify them based on their concept/meaning.

Conclusions

- Semantic image segmentation helps in classifying each pixel which helps in calculating percentage of pixels belonging to different classes in the image.
- Semantic image segmentation is a key application in image processing and computer vision domain.
- UNet is an Encoder-Decoder architecture:
  - Encoder: Extract high-level semantics.
  - Decoder: Generate instance from semantics.

References (in IEEE format)

- [1] MENGJIE HU , HEZHENG LIN, ZIMENG FAN, WENJIE GAO, LU YANG , CHUN LIU , AND QING SONG Pattern Recognition and Intelligent Vision Laboratory, Beijing University of Posts and Telecommunications, Beijing 100876, China Corresponding author: Qing Song (priv@bupt.edu.cn)

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THANK YOU