Classification Of Tumor Cell Using a Naive Convolutional Neural Network Model

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Outline

- Introduction
- Literature review
- Problem statement
- Methodology
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- Limitations
- Conclusion
- Future work
- References

Introduction

- Medical image analysis
- Deep learning
- CNN(Convolutional Neural Network) for images

Literature Review

- Deep-learning: A potential method for tuberculosis detection using chest radiography. [1]
- A Novel Approach for Tuberculosis Screening Based on Deep Convolutional Neural Networks. [2]

Problem Statement

- Tuberculosis Detection
- Small dataset

Methodology

- **Dataset** - Montgomery County X-ray Set [2]
  & Shenzhen Hospital X-ray Set[2]
- **Montgomery County X-ray Set** - 138 CXRs
  - Normal - 80 CXRs
  - Tuberculosis - 58 CXRs
- **Shenzhen Hospital X-ray Set** - 662 CXRs
  - Normal - 326 CXRs
  - Tuberculosis - 336 CXRs

Methodology

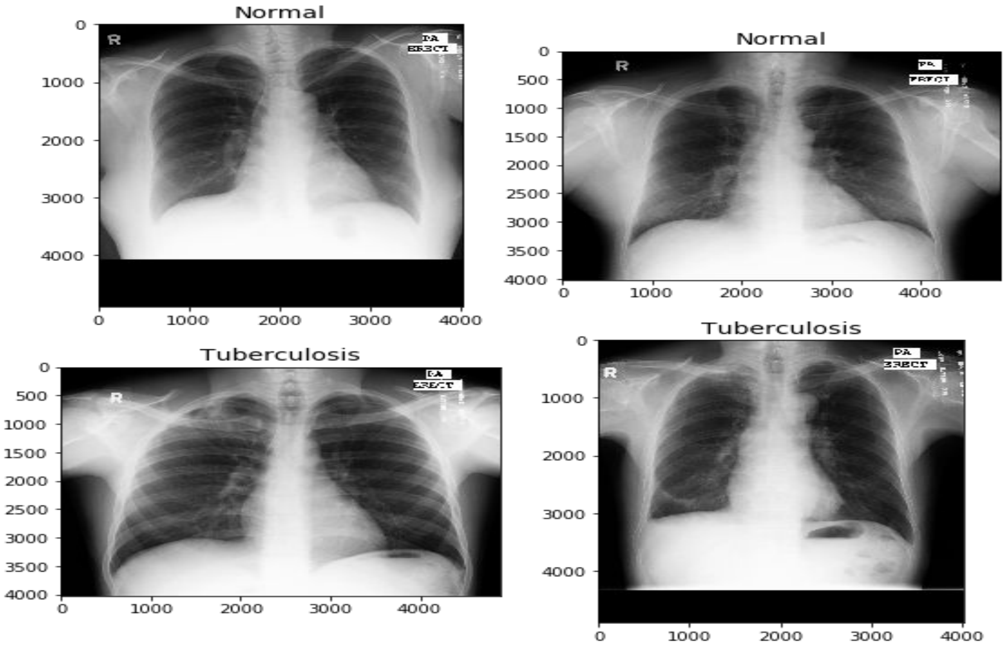


Fig 1: Montgomery County X-ray Set

Methodology

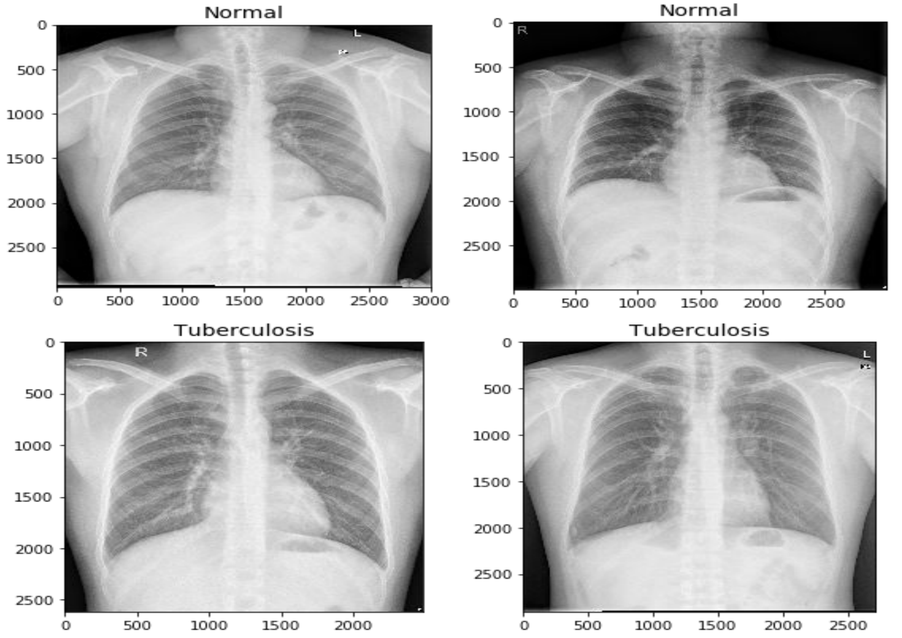
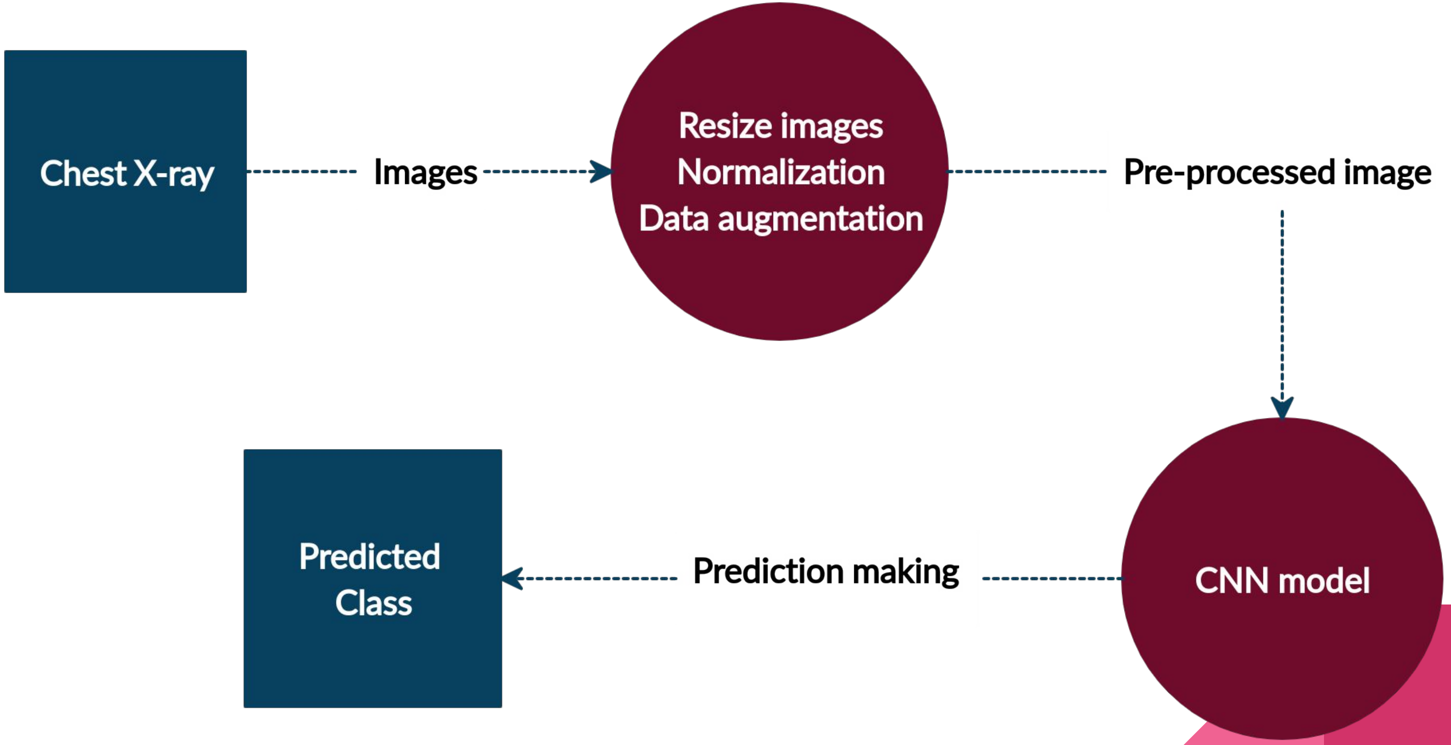


Fig 2: Shenzhen Hospital X-ray Set

Methodology



Methodology

- **Pre-processing:**
  - Resize images to 224*224*3
  - Normalize pixels of the images. [5]
  - Split training and validation set

Table 1 : Image Distribution of Training and Validation Set

Class	Training set	Validation set
Normal	345	61
Tuberculosis	335	59
Total	680	120

Methodology

- Data augmentation:
  - Applied on the training data

Table 2 : Image Distribution of Training and Validation Set before and after Data Augmentation

Class	Before Data Augmentation		After Data Augmentation	
	Training Set	Validation Set	Training Set	Validation Set
Normal	345	61	1530	61
Tuberculosis	335	59	1490	59
Total	680	120	3020	120

Methodology

- **Models:**
  - DenseNet-169
  - MobileNet
  - Xception
  - Inception-V3

Methodology

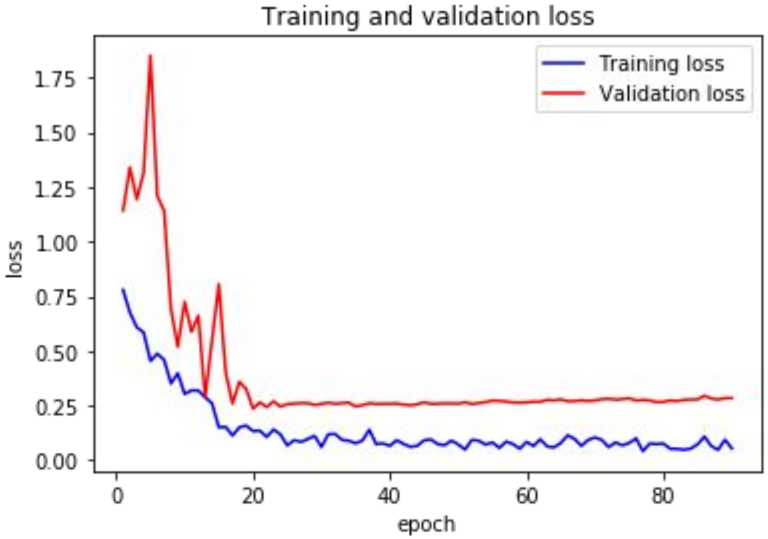
- **Experimental Setup:**
  - Activation Function : Sigmoid
  - Learning rate: 0.0001
  - Epoches : 90
  - Train and Validation Batch Size : 10
  - Loss Function : Binary Cross-Entropy

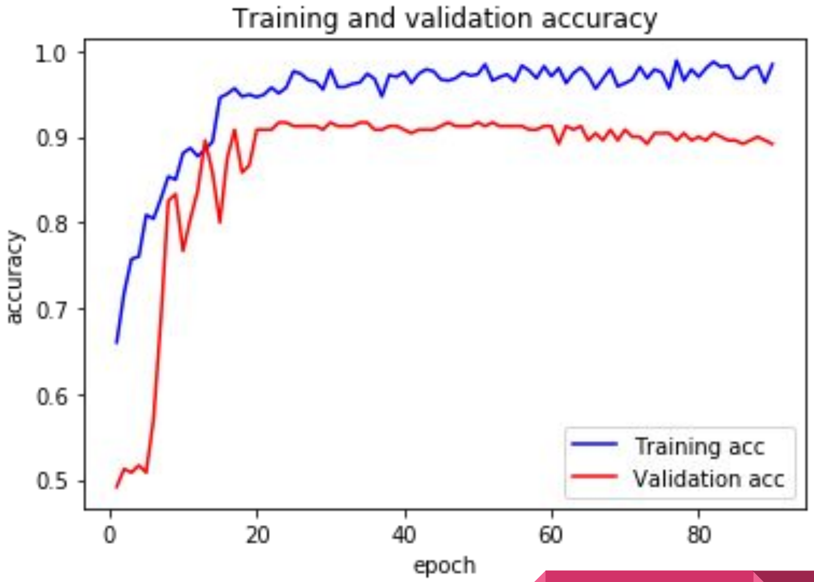
Experimental Analysis

Table 3 : Performance Report

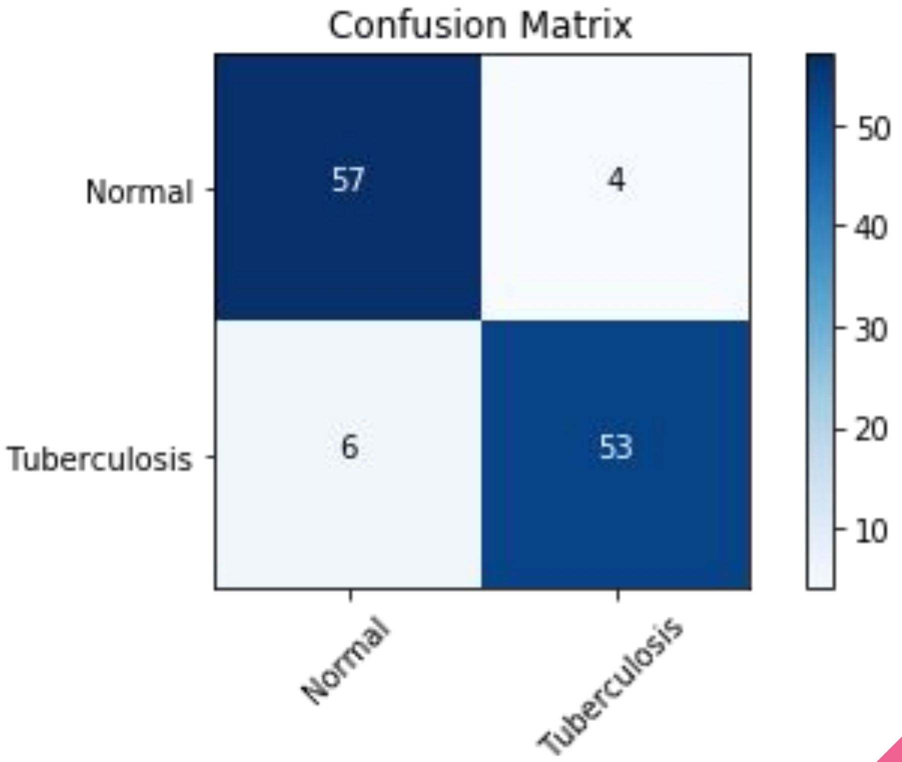
Model	Validation Accuracy	AUC
DenseNet 169	0.916	0.915
MobileNet	0.899	0.907
Xception	0.871	0.879
InceptionV3	0.899	0.907

Experimental Analysis





Experimental Analysis



Limitations

- Overfitting problem
- Small dataset

Conclusion

Future Work

References

1. R. Hooda, S. Sofat, S. Kaur, A. Mittal, and F. Meriaudeau, "Deep-learning: A potential method for tuberculosis detection using chest radiography," in 2017 IEEE International Conference on Signal and Image Processing Applications (ICSIPA) . IEEE, 2017, pp. 497–502.

2. S. Hwang, H.-E. Kim, J. Jeong, and H.-J. Kim, "A novel approach fortuberculosis screening based on deep convolutional neural networks," inMedical imaging 2016: computer-aided diagnosis, vol. 9785. Interna-tional Society for Optics and Photonics, 2016, p. 97852W.

References

3. S. Jaeger, S. Candemir, S. Antani, Y.-X. J. W ́ang, P.-X. Lu, and G. Thoma, “Two public chest x-ray datasets for computer-aided screening of pulmonary diseases,” Quantitative imaging in medicine and surgery , vol. 4, no. 6, p. 475, 2014.

4. M. B. Mizan, M. A. M. Hasan and S. R. Hassan, "A Comparative Study of Tuberculosis Detection Using Deep Convolutional Neural Network," *2020 2nd International Conference on Advanced Information and Communication Technology (ICAICT)*, Dhaka, Bangladesh, 2020, pp. 157-161, doi: 10.1109/ICAICT51780.2020.9333464.

References

5. K. K. Pal and K. Sudeep, “Preprocessing for image classification by convolutional neural networks,” in 2016 IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT). IEEE, 2016, pp. 1778–1781.

Thank you