

Projek Akhit

Peningkatan Kualitas Citra untuk Deteksi Tuberkulosis pada Paru-paru

Kelompok 6 2022 B

Program Studi Sains Data



KELOMPOK 6

Nama Anggota Kelompok

Riva Dian Ardiansyah

22031554043



Faiz Dwi Febriansyah

22031554023



Daffa Fazly Rashidan

2201554006



Latar Belakang

Tuberkulosis (TB) adalah masalah kesehatan global dan deteksi dini sangat penting. Metode deteksi saat ini memiliki keterbatasan, sementara radiografi paru-paru menawarkan potensi yang belum sepenuhnya dimanfaatkan karena interpretasinya memerlukan keahlian khusus dan seringkali subjektif. Proyek ini bertujuan untuk mengatasi tantangan tersebut dengan meningkatkan kualitas citra radiografi paru-paru dan mengembangkan metode deteksi TB yang lebih baik, sehingga dapat meningkatkan efisiensi diagnosis dan pengobatan TB.



Tujuan

Meningkatkan kualitas citra paru-paru yang akan digunakan dalam deteksi tuberkulosis.

Menggunakan suatu algoritma atau metode yang efisien dan efektif untuk deteksi tuberkulosis pada citra paru-paru.

Meningkatkan akurasi dan kecepatan diagnosis tuberkulosis, sehingga dapat memberikan pengobatan yang tepat waktu dan efektif bagi pasien.

Tujuan

PROPOSAL KEGIATAN



Exploring the effect of image enhancement techniques on COVID-19 detection using chest X-ray images

Tawsifur Rahman^a, Amith Khandakar^a, Yazan Qiblawey^a, Anas Tahir^a, Serkan Kiranyaz^a, Saad Bin Abul Kashem^b, Mohammad Tariqul Islam^c, Somaya Al Maadeed^d, Susu M. Zughaier^e, Muhammad Salman Khan^f, Muhammad E.H. Chowdhury^{a,*}

^a Department of Electrical Engineering, Qatar University, Doha, 2713, Qatar

^b Faculty of Robotics and Advanced Computing, Qatar Armed Forces Academic Bridge Program, Qatar Foundation, Doha, 24404, Qatar

^c Dept. of Electrical, Electronics and Systems Engineering, Universiti Kebangsaan Malaysia, Bangi, Selangor, 43600, Malaysia

^d Department of Computer Science and Engineering, Qatar University, Doha, 2713, Qatar

^e Department of Basic Medical Sciences, College of Medicine, Biomedical and Pharmaceutical Research Unit, QU Health, Qatar University, Doha, 2713, Qatar

^f Department of Electrical Engineering (JC), University of Engineering and Technology, Peshawar, Pakistan

ARTICLE INFO

Keywords:
COVID-19
Image enhancement
Chest X-ray images
Convolutional neural networks
Lung segmentation

ABSTRACT

Computer-aided diagnosis for the reliable and fast detection of coronavirus disease (COVID-19) has become a necessity to prevent the spread of the virus during the pandemic to ease the burden on the healthcare system. Chest X-ray (CXR) imaging has several advantages over other imaging and detection techniques. Numerous works have been reported on COVID-19 detection from a smaller set of original X-ray images. However, the effect of image enhancement and lung segmentation of a large dataset in COVID-19 detection was not reported in the literature. We have compiled a large X-ray dataset (COVQU) consisting of 18,479 CXR images with 8851 normal, 6012 non-COVID lung infections, and 3616 COVID-19 CXR images and their corresponding ground truth lung masks. To the best of our knowledge, this is the largest public COVID positive database and the lung masks. Five different image enhancement techniques: histogram equalization (HE), contrast limited adaptive histogram equalization (CLAHE), image complement, gamma correction, and balance contrast enhancement technique (BCET) were used to investigate the effect of image enhancement techniques on COVID-19 detection. A novel U-Net model was proposed and compared with the standard U-Net model for lung segmentation. Six different pre-trained Convolutional Neural Networks (CNNs) (ResNet18, ResNet50, ResNet101, InceptionV3, DenseNet201, and ChexNet) and a shallow CNN model were investigated on the plain and segmented lung CXR images. The novel U-Net model showed an accuracy, Intersection over Union (IoU), and Dice coefficient of 98.63%, 94.3%, and 96.94%, respectively for lung segmentation. The gamma correction-based enhancement technique outperforms other techniques in detecting COVID-19 from the plain and the segmented lung CXR images. Classification performance from plain CXR images is slightly better than the segmented lung CXR images; however, the reliability of network performance is significantly improved for the segmented lung images, which was observed

Referensi

Pdf

Metode

Histogram equization

Teknik yang digunakan untuk meningkatkan kontras gambar dengan mendistribusikan kembali nilai intensitas piksel secara merata pada histogram.
(Skimage)

Gamma Correction

Gamma menentukan bagaimana perubahan nilai input (nilai intensitas piksel) diubah menjadi nilai output (kecerahan yang ditampilkan di layar).
Nilai Gamma: 1.4 (Optimal yang kami gunakan)

Sharpening

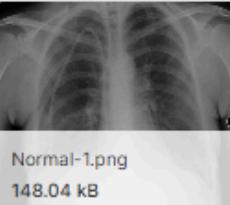
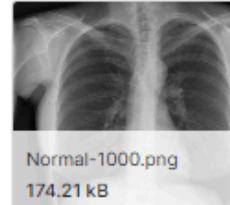
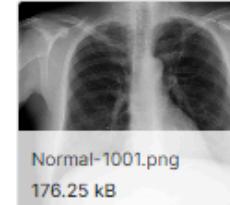
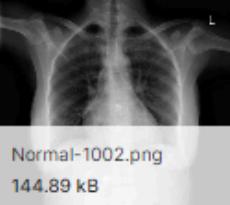
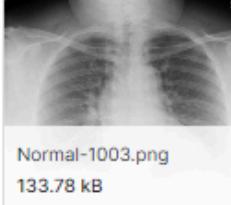
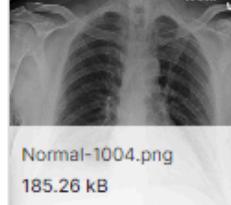
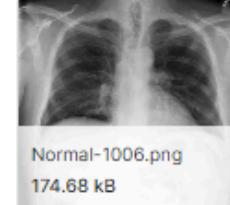
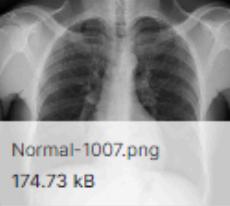
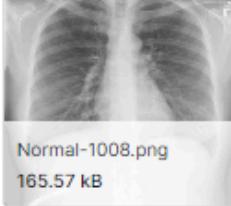
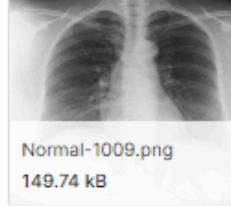
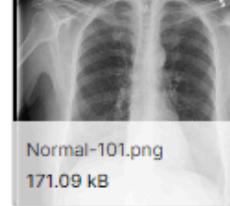
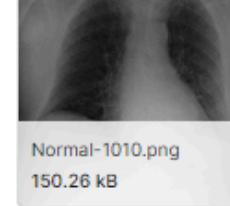
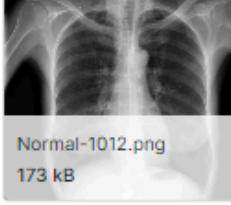
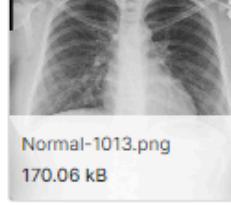
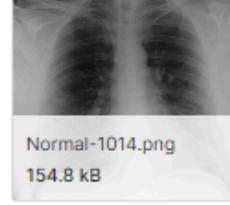
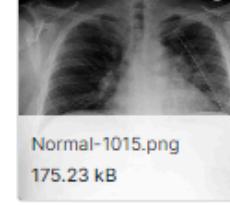
Meningkatkan ketajaman detail dan garis tepi pada sebuah gambar. Teknik ini membantu membuat gambar terlihat lebih tajam dan jelas.
(Library Skimage dan Matrix)

Dataset

Kaggle

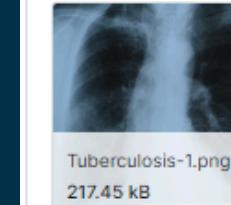
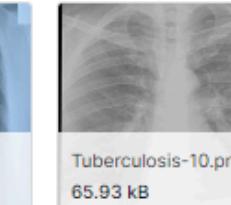
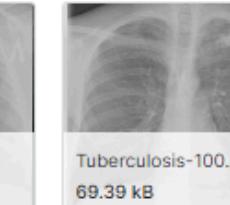
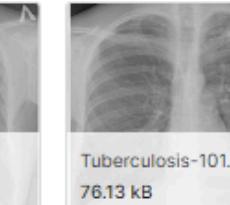
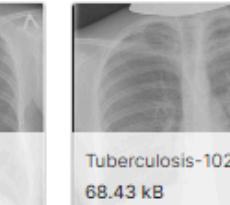
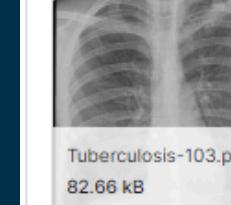
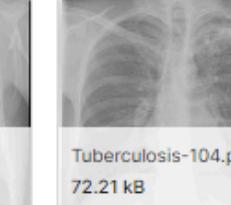
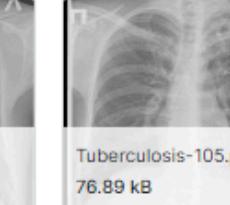
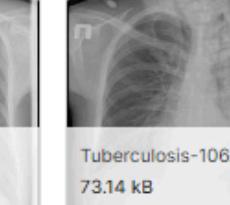
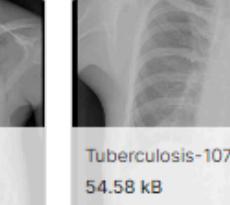
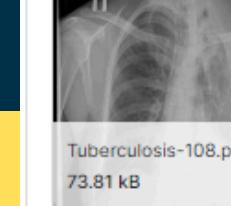
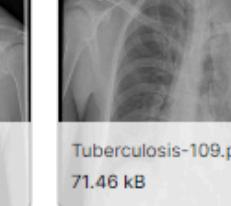
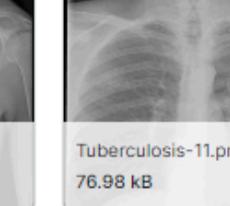
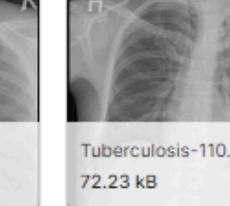
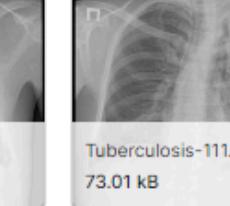
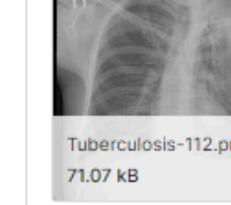
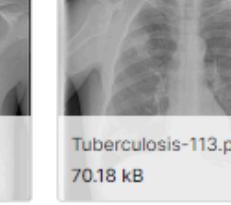
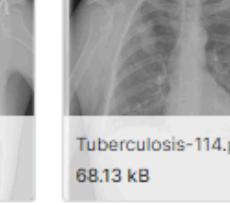
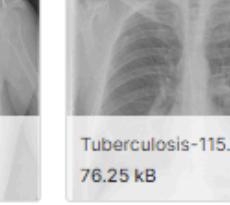
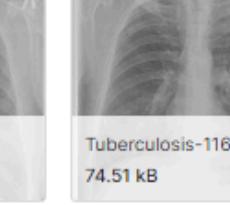
Normal (3500 files) [] >

About this directory
Normal CXR

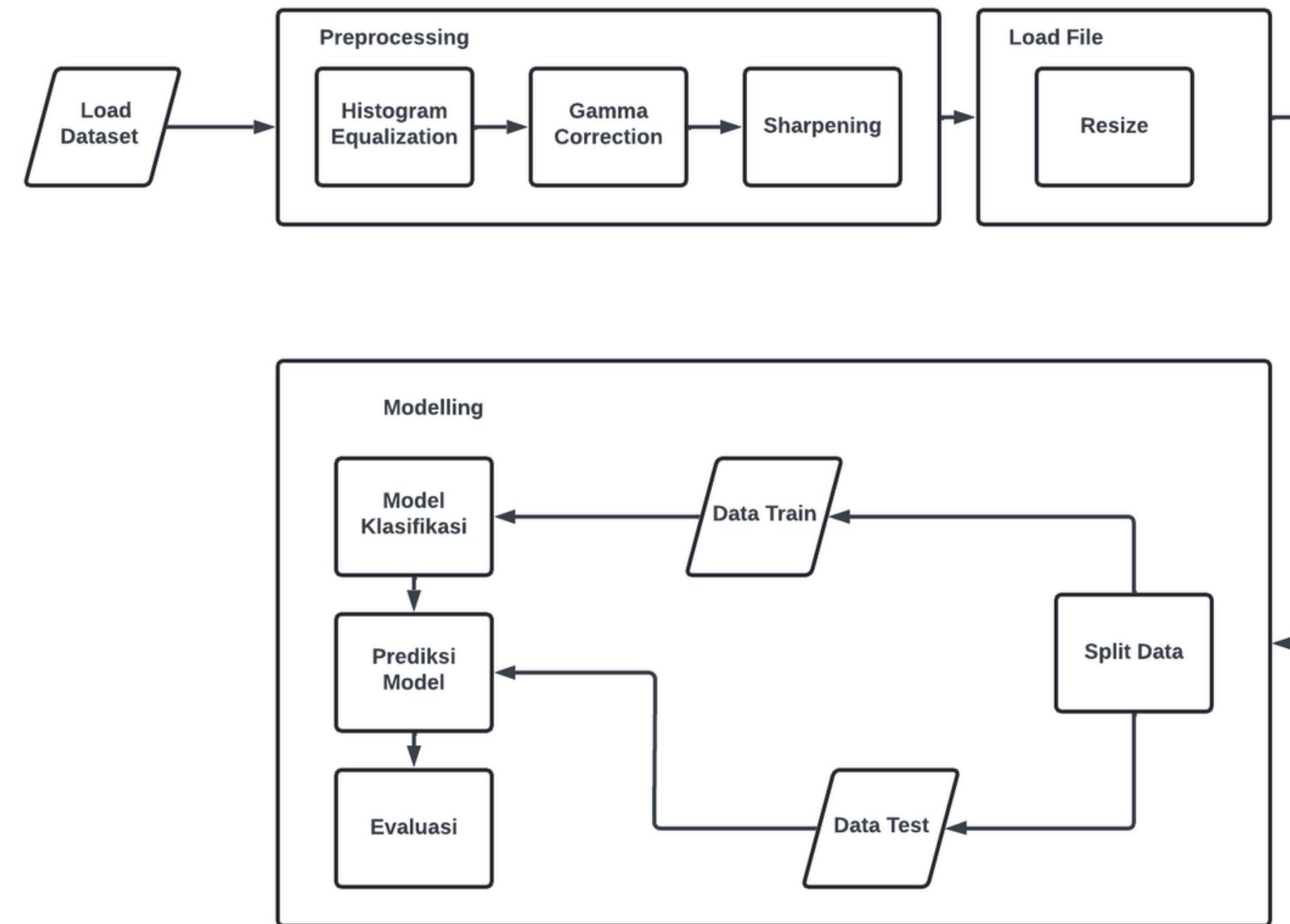
 Normal-1.png 148.04 kB	 Normal-10.png 176.03 kB	 Normal-100.png 147.68 kB	 Normal-1000.png 174.21 kB	 Normal-1001.png 176.25 kB
 Normal-1002.png 144.89 kB	 Normal-1003.png 133.78 kB	 Normal-1004.png 185.26 kB	 Normal-1005.png 167.46 kB	 Normal-1006.png 174.68 kB
 Normal-1007.png 174.73 kB	 Normal-1008.png 165.57 kB	 Normal-1009.png 149.74 kB	 Normal-101.png 171.09 kB	 Normal-1010.png 150.26 kB
 Normal-1011.png 191.5 kB	 Normal-1012.png 173 kB	 Normal-1013.png 170.06 kB	 Normal-1014.png 154.8 kB	 Normal-1015.png 175.23 kB

Tuberculosis (700 files) [] >

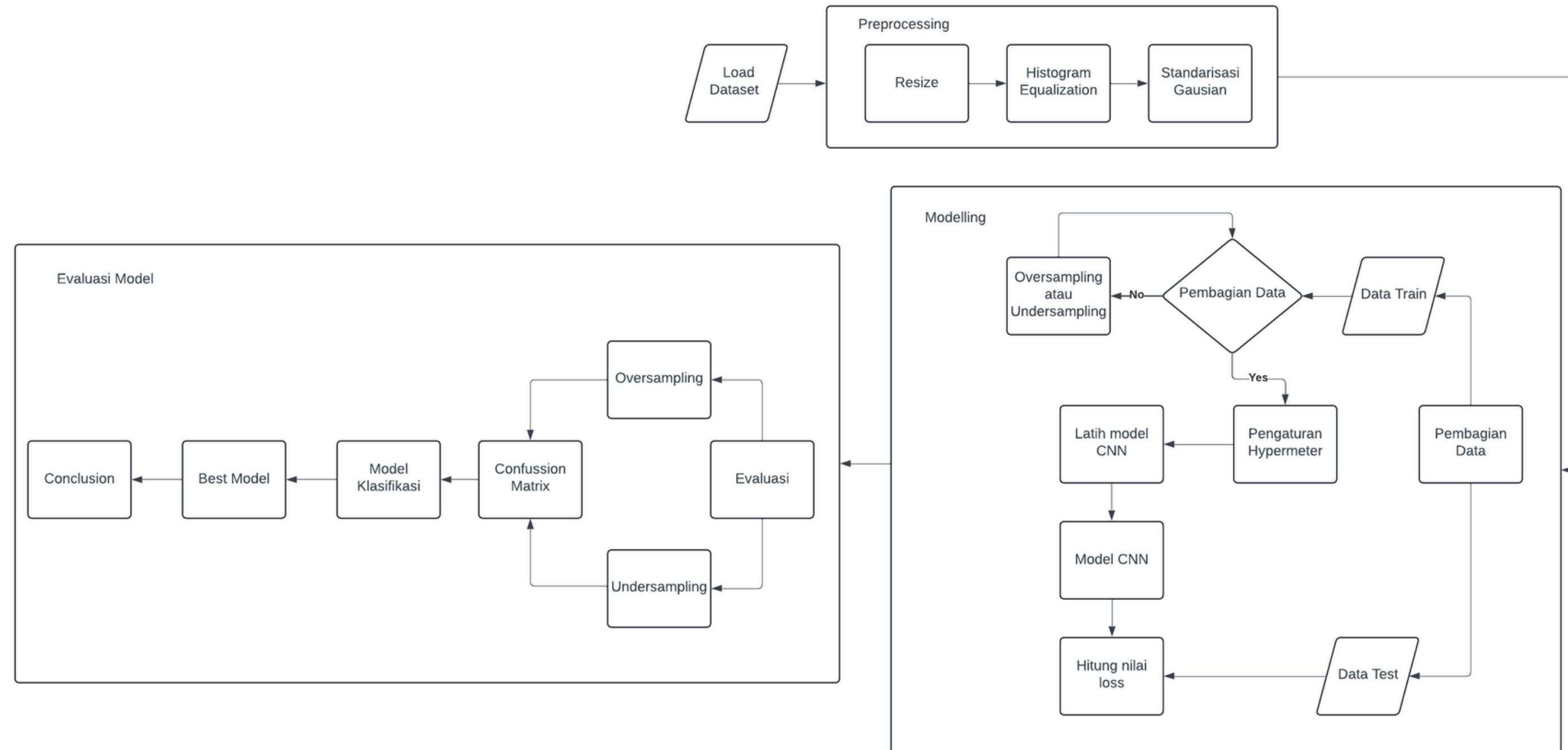
About this directory
Tuberculosis (TB) CXR

 Tuberculosis-1.png 217.45 kB	 Tuberculosis-10.png 65.93 kB	 Tuberculosis-100.png 69.39 kB	 Tuberculosis-101.png 76.13 kB	 Tuberculosis-102.png 68.43 kB
 Tuberculosis-103.png 82.66 kB	 Tuberculosis-104.png 72.21 kB	 Tuberculosis-105.png 76.89 kB	 Tuberculosis-106.png 73.14 kB	 Tuberculosis-107.png 54.58 kB
 Tuberculosis-108.png 73.81 kB	 Tuberculosis-109.png 71.46 kB	 Tuberculosis-11.png 76.98 kB	 Tuberculosis-110.png 72.23 kB	 Tuberculosis-111.png 73.01 kB
 Tuberculosis-112.png 71.07 kB	 Tuberculosis-113.png 70.18 kB	 Tuberculosis-114.png 68.13 kB	 Tuberculosis-115.png 76.25 kB	 Tuberculosis-116.png 74.51 kB

Flowchart

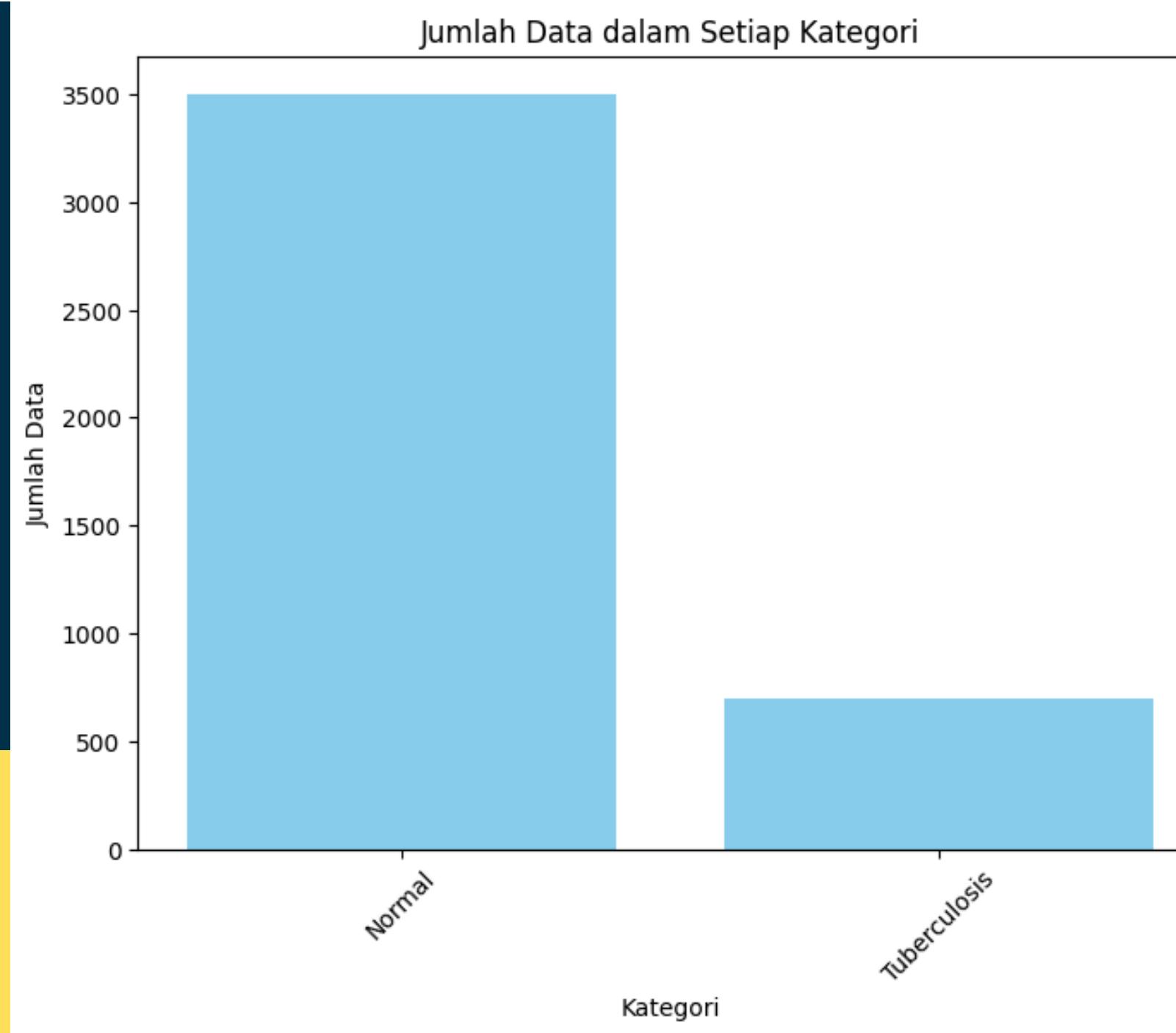


Metode



Dataset

Kaggle

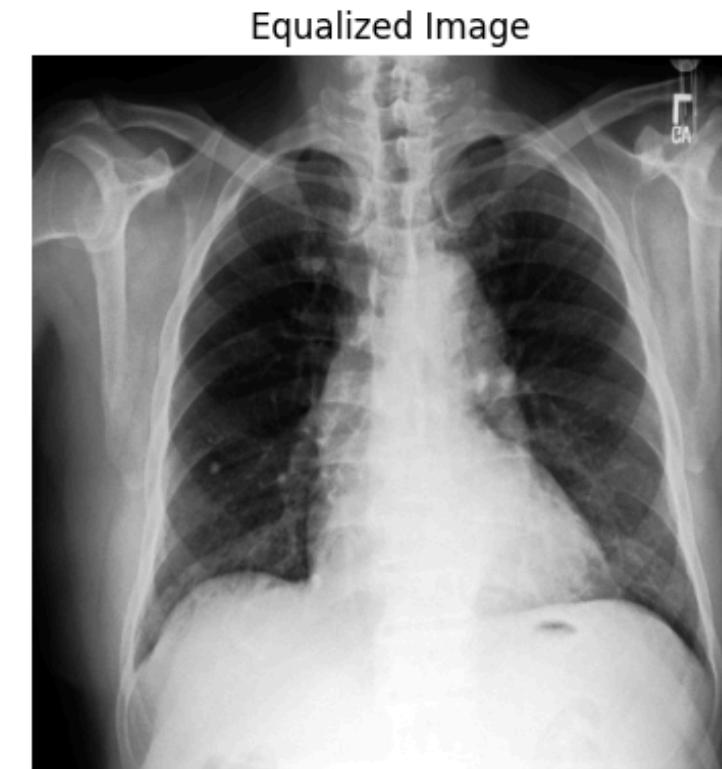
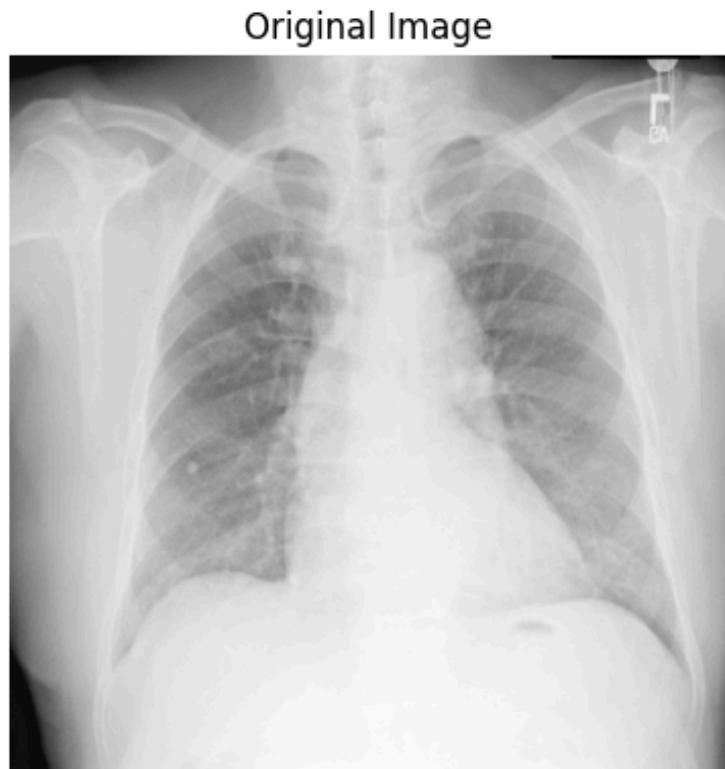


Preprocessing Gambar

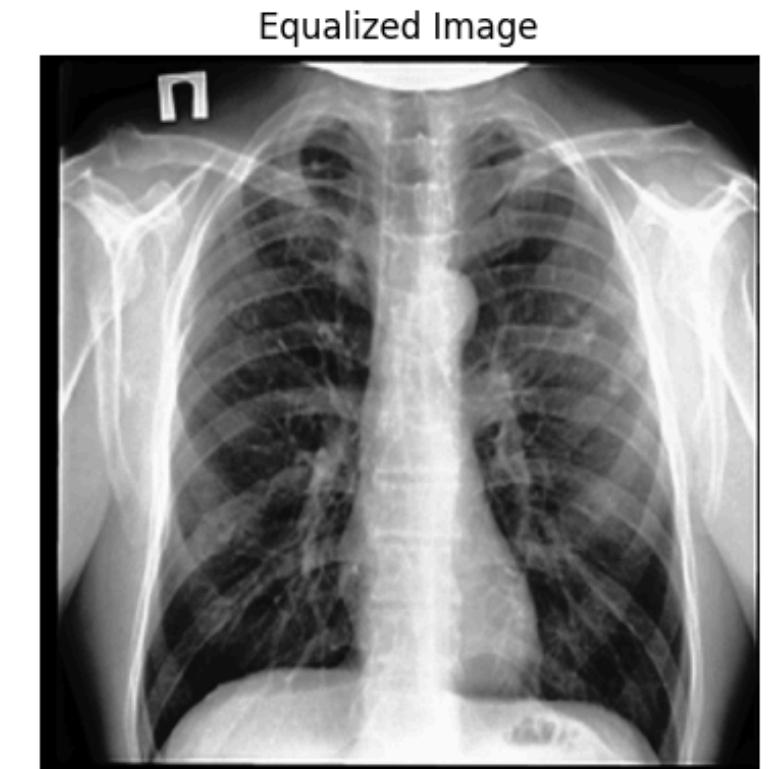
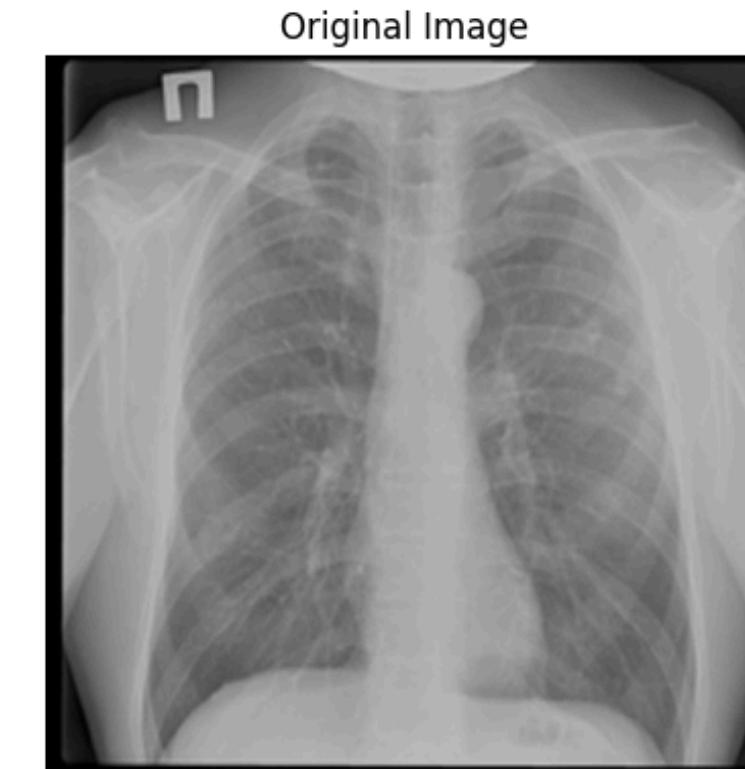
Histogram Ekualisasi

Mengubah kecerahan dan kontras gambar gelap dan kontras rendah untuk meningkatkan kualitas gambar

Gambar Normal



Gambar Tuberkulosis

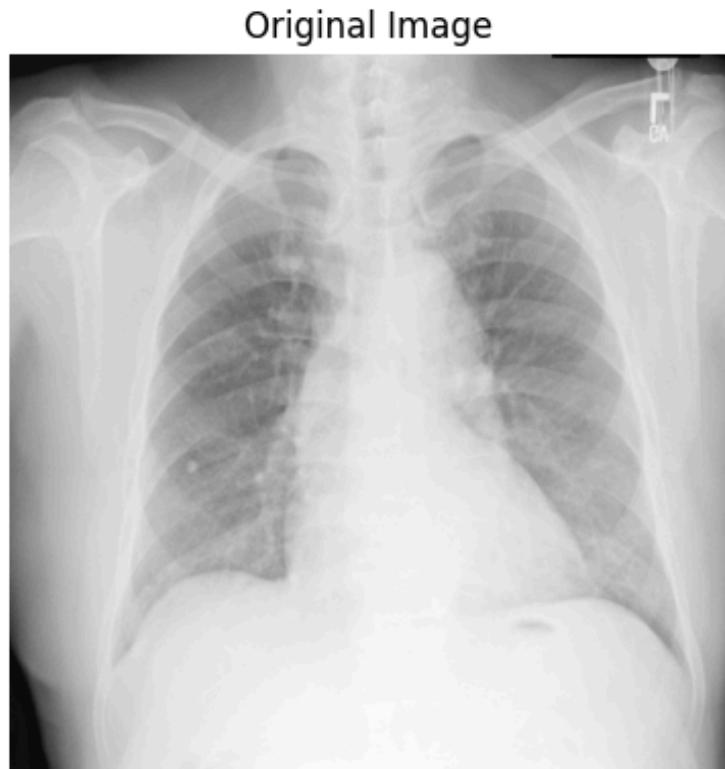


Preprocessing Gambar

Gamma Correction

Koreksi gamma mengganti nilai piksel untuk menyempurnakan gambar menggunakan hubungan proyeksi antara nilai piksel dan nilai gamma.

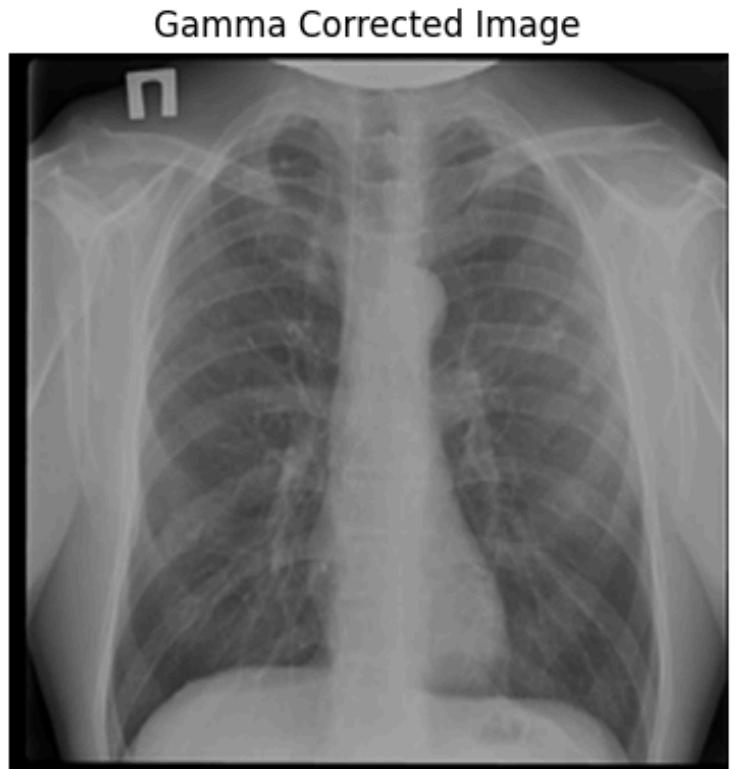
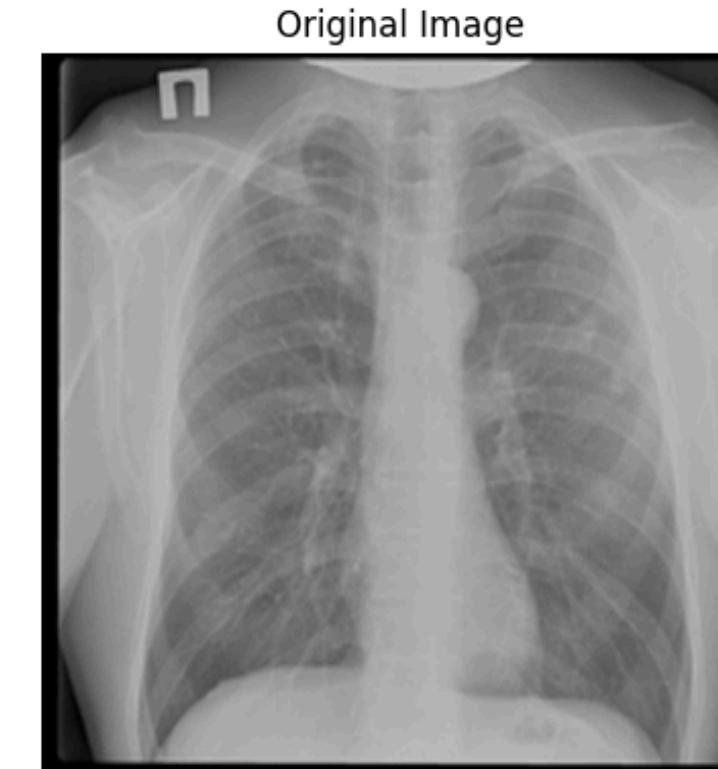
Gambar Normal



Gamma = 1.4



Gambar Tuberkulosis

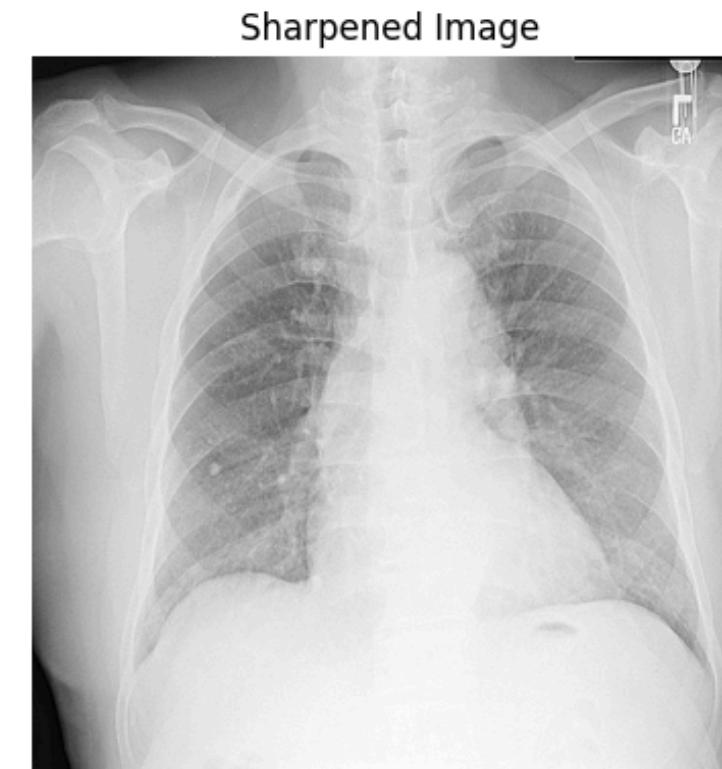


Preprocessing Gambar

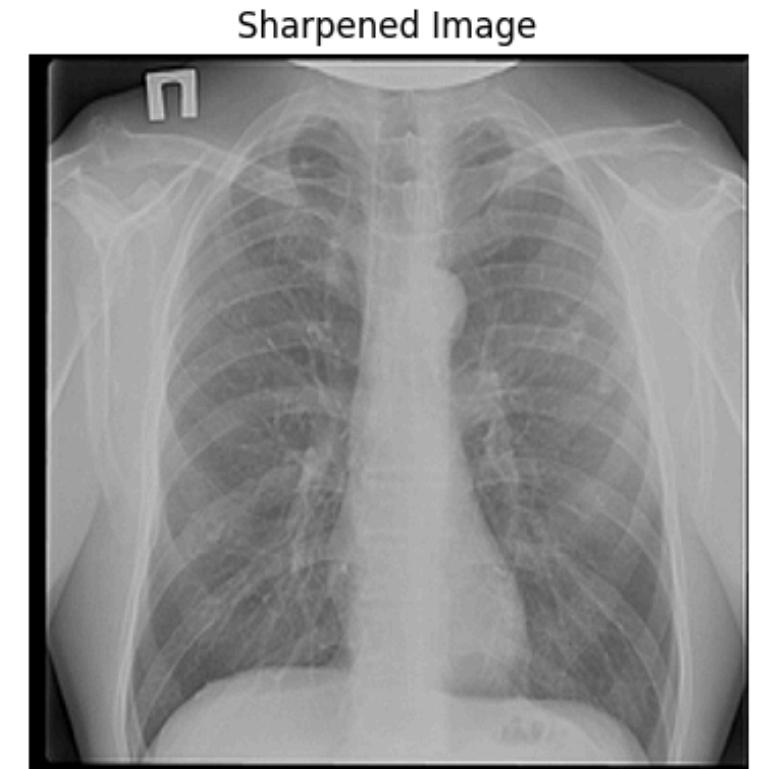
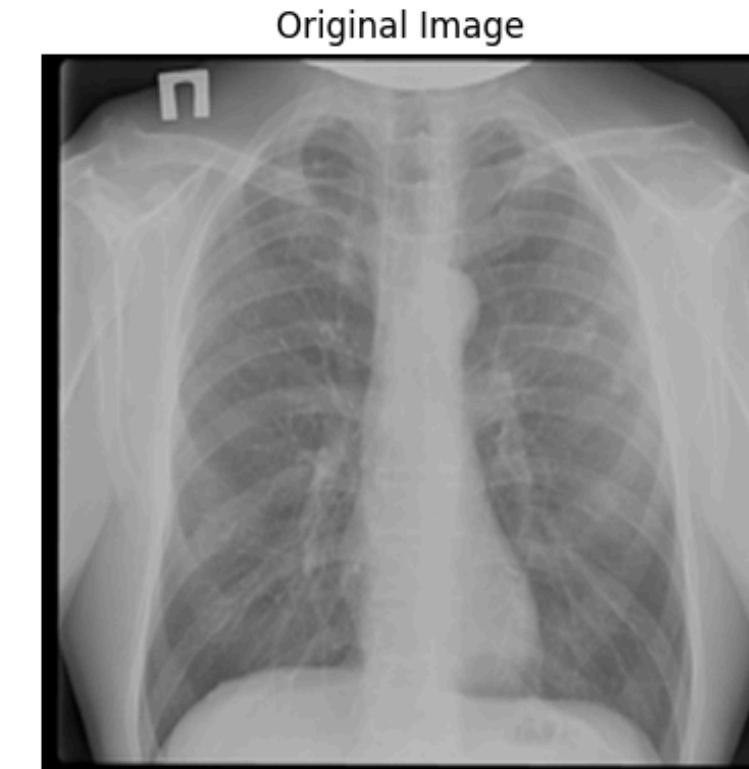
Sharpening (penajaman)

Teknik metode sharpening bertujuan untuk meningkatkan ketajaman gambar dengan menonjolkan detail-detail tepi (edge) dalam gambar tersebut. Pada konteks medis, seperti dalam perbandingan antara paru-paru normal dan paru-paru yang terkena tuberkulosis (TBC), teknik sharpening digunakan untuk memperjelas perbedaan antara struktur jaringan yang sehat dan yang terinfeksi.

Gambar Normal



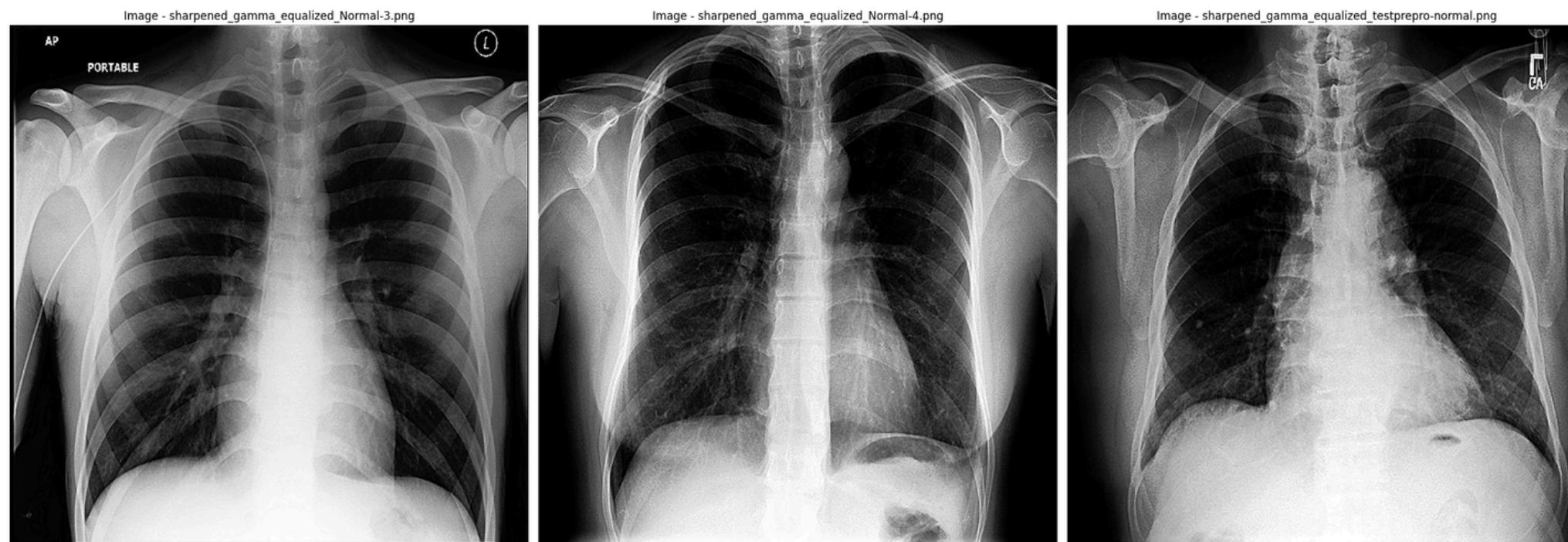
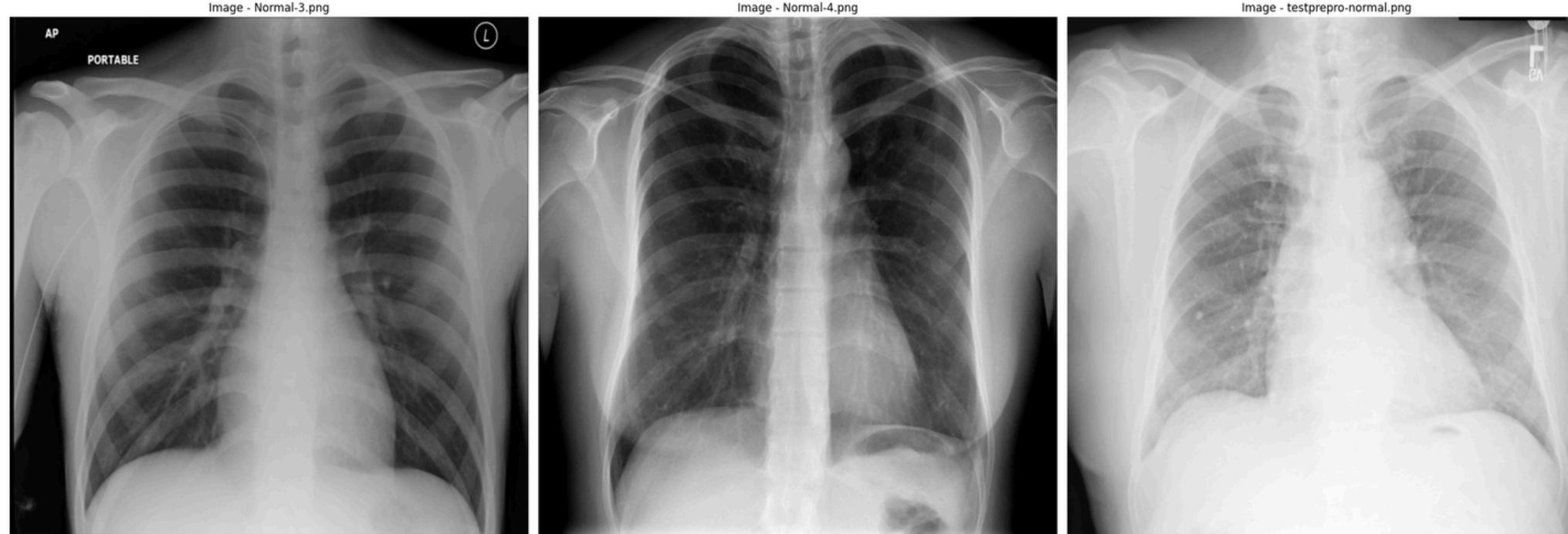
Gambar Tuberkulosis



Preprocessing Gambar

Normal

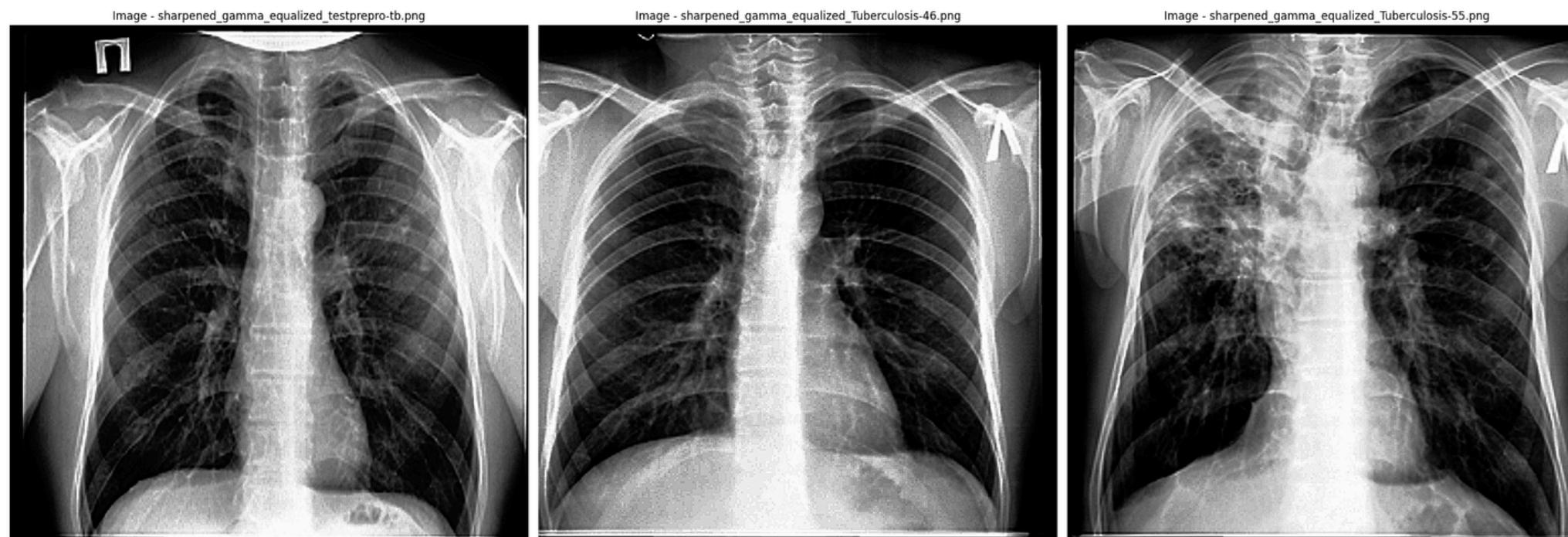
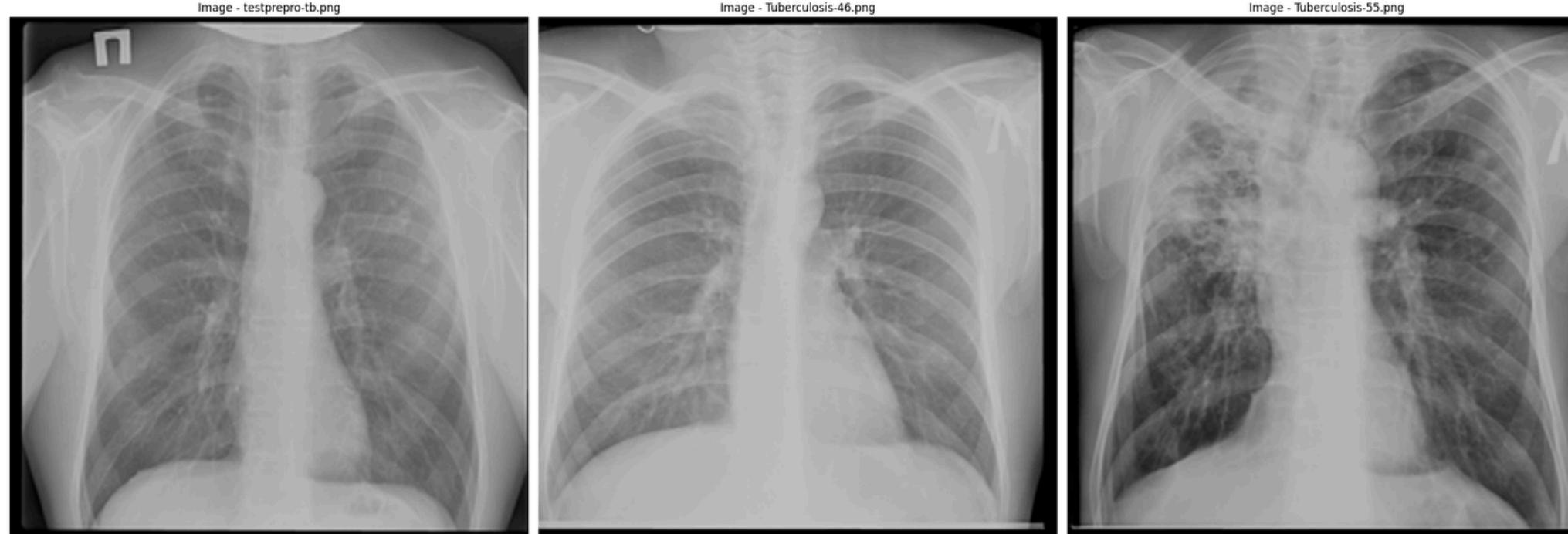
Sample Images and Their Histograms from Each Folder



Preprocessing Gambar

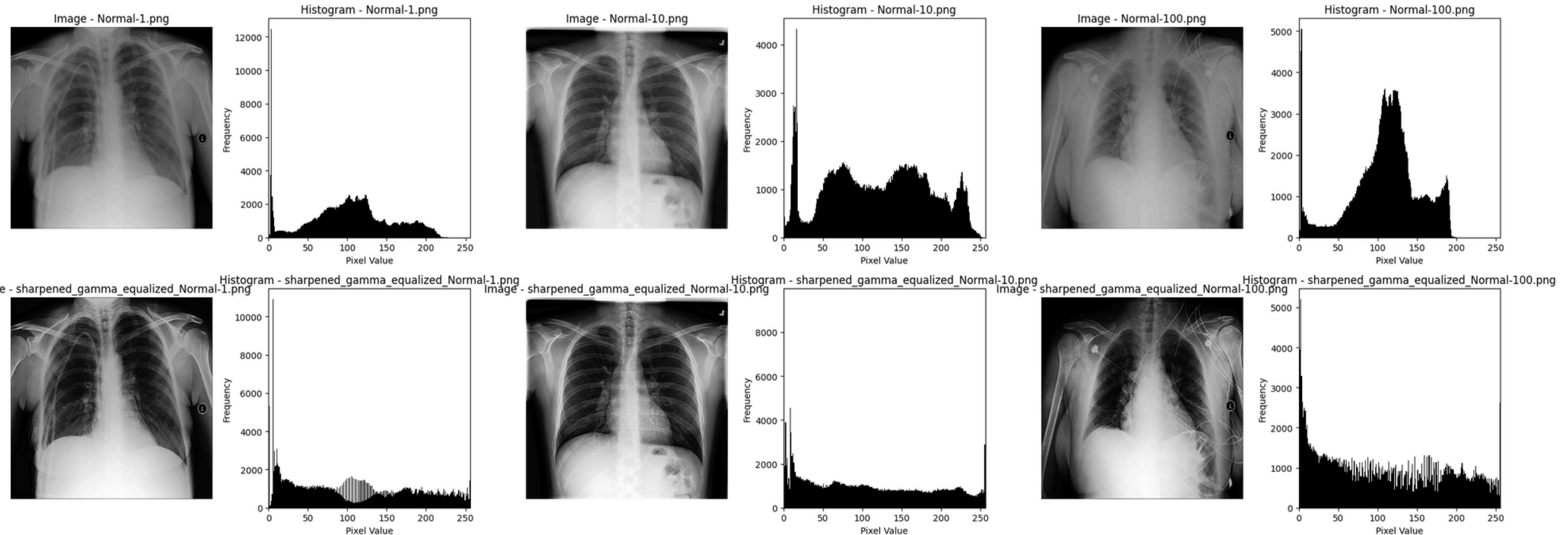
Tuberkulosis

Sample Images and Their Histograms from Each Folder



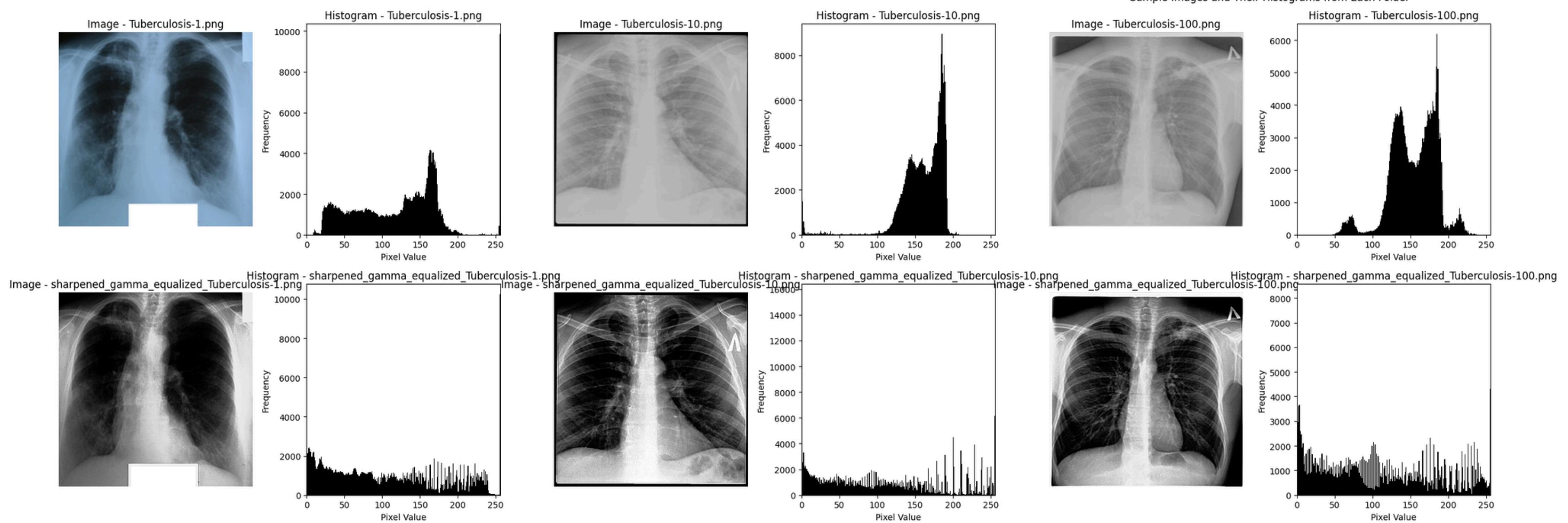
Preprocessing Gambar

Normal



Preprocessing Gambar

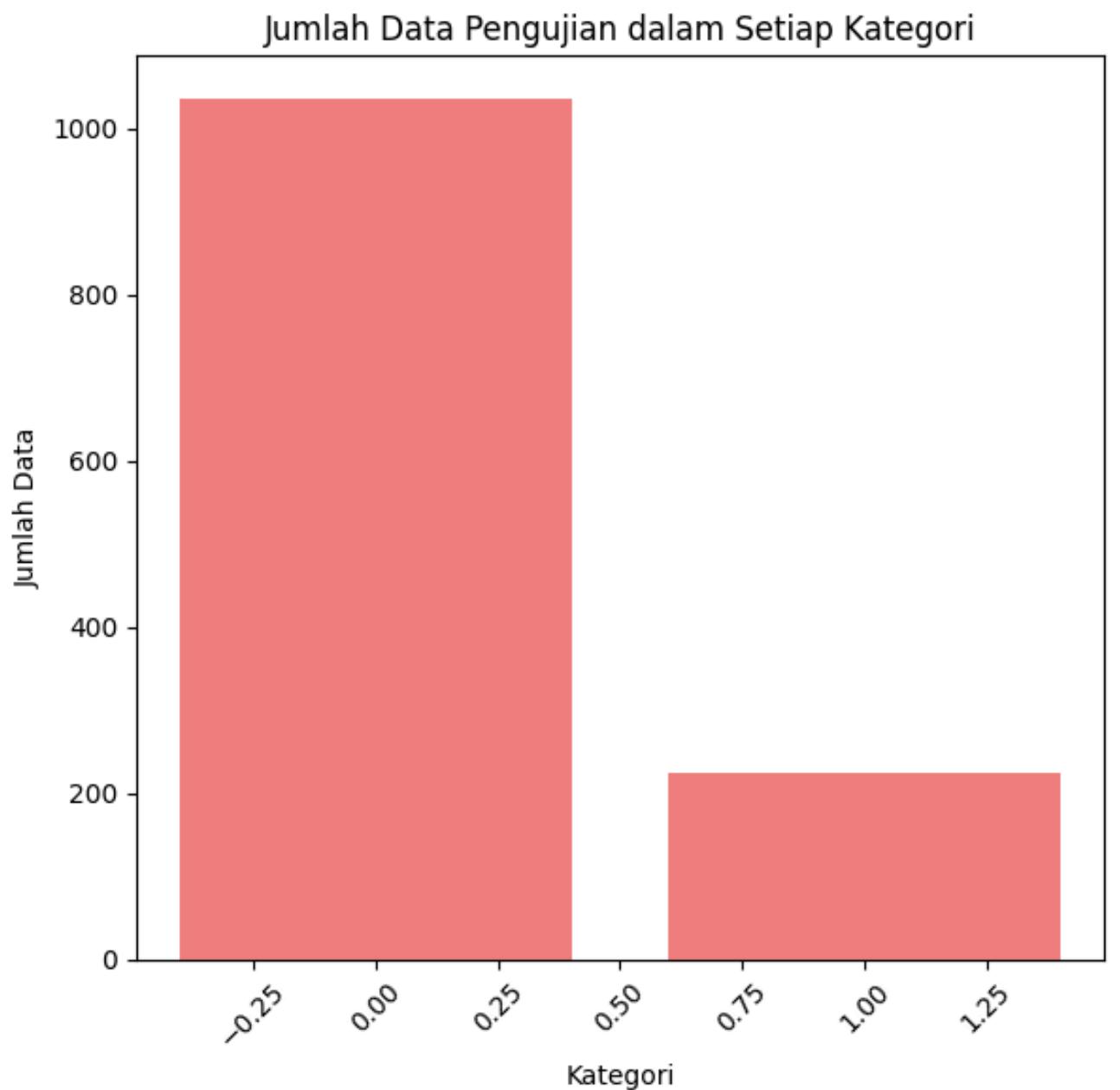
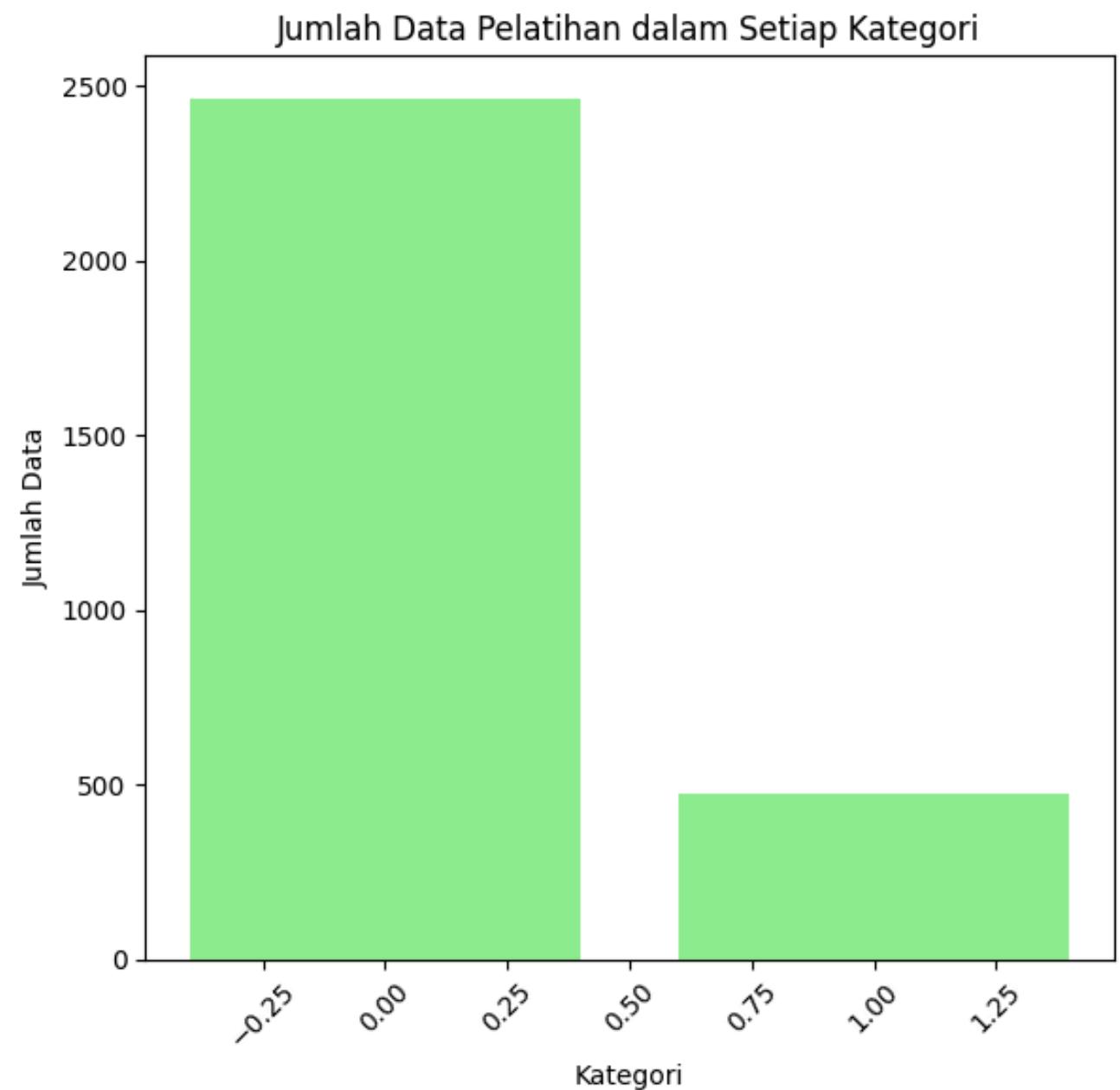
Tuberkulosis



Distribusi ini lebih merata dan memiliki puncak yang kurang menonjol dibandingkan histogram sebelum diproses.

KELOMPOK 6

Split data



test_size=0.3, random_state=123

untuk data train didapat 2940 dengan rincian

Normal = 2464, dan Tb = 476

Hasil Model

Data sebelum preprosesing

SUPPORT VECTOR MACHINE ACCURACY: 0.9817460317460317				
	precision	recall	f1-score	support
Normal	0.98	0.99	0.99	1036
Tuberculosis	0.97	0.92	0.95	224
accuracy			0.98	1260
macro avg	0.98	0.96	0.97	1260
weighted avg	0.98	0.98	0.98	1260

Data setelah preprosesing

SUPPORT VECTOR MACHINE ACCURACY: 0.9738095238095238				
	precision	recall	f1-score	support
Normal	0.98	0.99	0.98	1036
Tuberculosis	0.94	0.91	0.93	224
accuracy			0.97	1260
macro avg	0.96	0.95	0.95	1260
weighted avg	0.97	0.97	0.97	1260

Kesimpulan

**Penurunan akurasi terjadi disebabkan oleh
pemrosesan gambar yang membuat nilai
array berubah**

KELOMPOK 6



TERIMA KASIH
Atas Perhatiannya

PROGRAM STUDI SAINS DATA

