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Deteksi Penyakit Tuberculosis Berdasarkan Citra X-Ray

KELOMPOK 2:

Novantio Bangun | 25/563064/PPA/07096

Ihlasul Amal | 24/551419/PPA/06974

M Ammar M | 25/569281/PPA/07167

Fikri Firstly Arrasyid H | 25/565922/PPA/07131

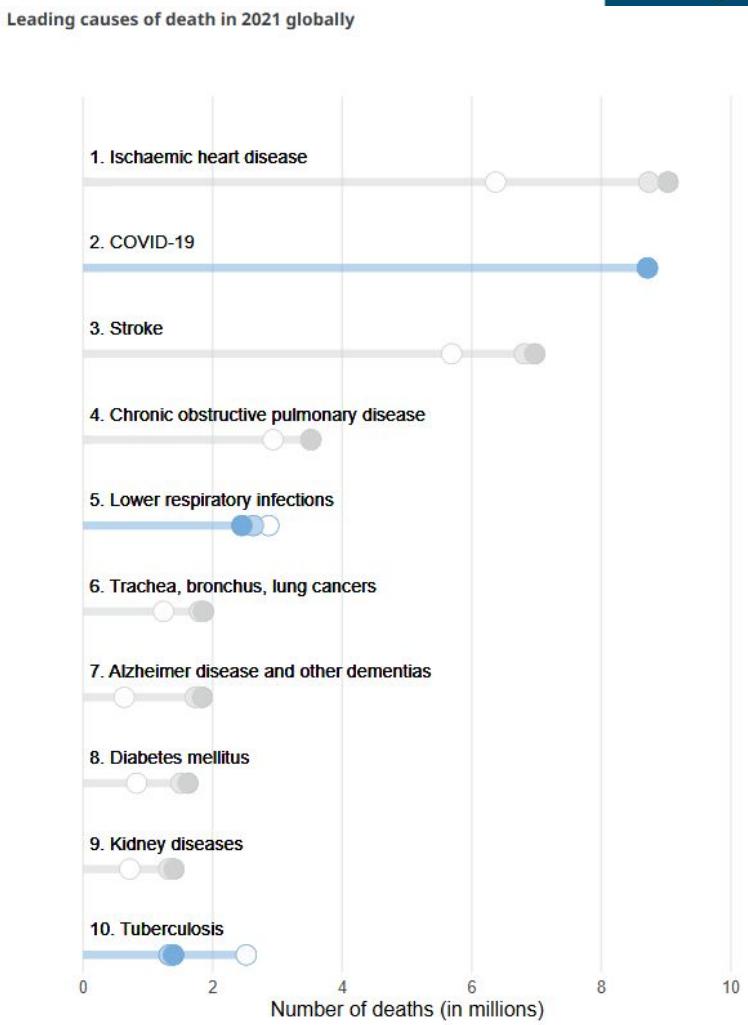
Tuberculosis: Tantangan Kesehatan Global

Tuberkulosis (TB) adalah penyakit yang dapat dicegah dan biasanya dapat disembuhkan.

Namun...

- lebih dari 10 juta orang masih terinfeksi TB setiap tahun.
- 1 juta orang meninggal akibat penyakit ini.

TB menjadi salah satu dari 10 penyebab kematian.



Keterbatasan Metode Diagnosis Konvensional

Variabilitas Interpretasi

Keterbatasan Sensitivitas

Beban Kerja Tinggi

Sistem klasifikasi TB berbasis CXR

Kemajuan computer vision dan AI mendorong penggunaan CAD untuk deteksi kelainan paru pada CXR secara objektif. Model berbasis fitur citra menawarkan opsi yang lebih ringan dan mudah dijelaskan dibandingkan deep learning.

01

Pra-pemrosesan Citra

Konversi grayscale dan peningkatan kontras menggunakan CLAHE

02

Segmentasi Paru

Thresholding adaptif, median filtering, dan operasi morfologi

03

Ekstraksi Fitur

GLCM dan LBP untuk merepresentasikan pola tekstur

04

Klasifikasi ML

Random Forest, SVM, dan KNN untuk klasifikasi biner

Dataset

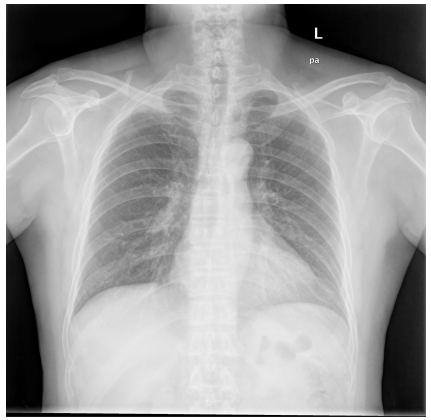
Tuberculosis Chest X-rays (Shenzhen)

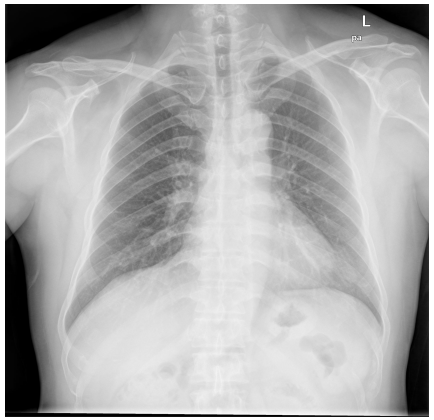
Penelitian menggunakan dataset dari Kaggle berisi 662 citra radiografi dada yang terbagi menjadi:

- 326 citra paru normal
- 336 citra paru dengan infeksi TB

Dataset dibagi menjadi subset training, testing, dan validasi untuk evaluasi objektif model klasifikasi.

Source: Tuberculosis Chest X-rays (Shenzhen)

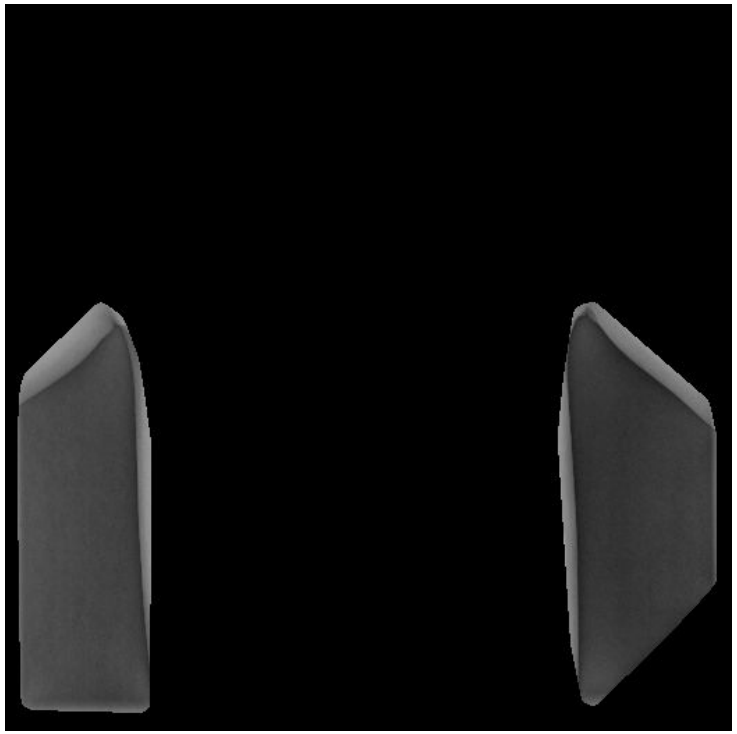




Common Problem Error Segmentasi

Upper Breakout

Lower Breakout

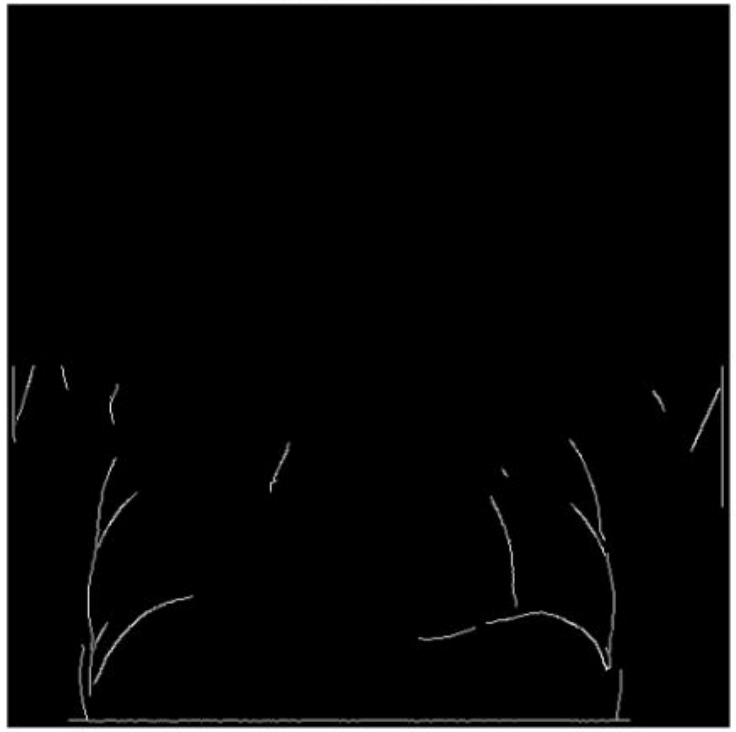


Wrong Detection

Metode Segmentasi

01. Original + Border

02. Canny Bottom

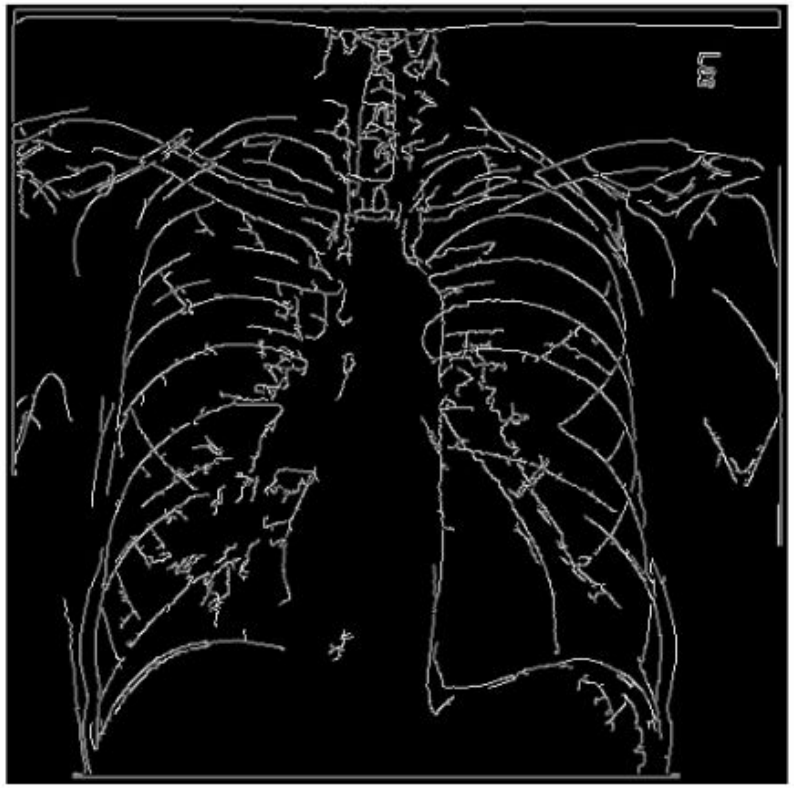


03. Overlay Edges

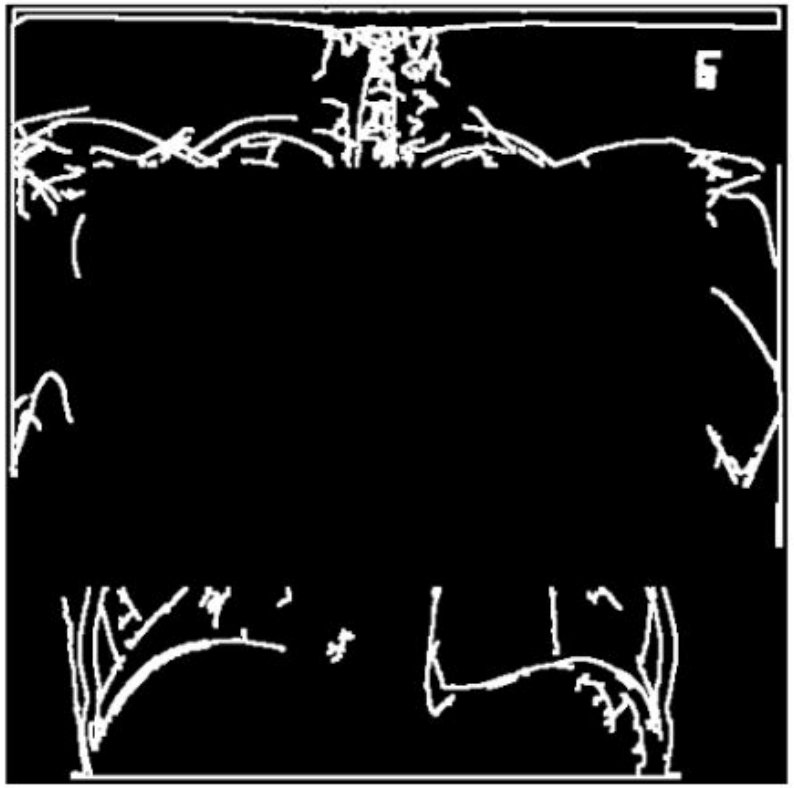
Metode Segmentasi (2)

04. CLAHE

05a. Canny After CLAHE

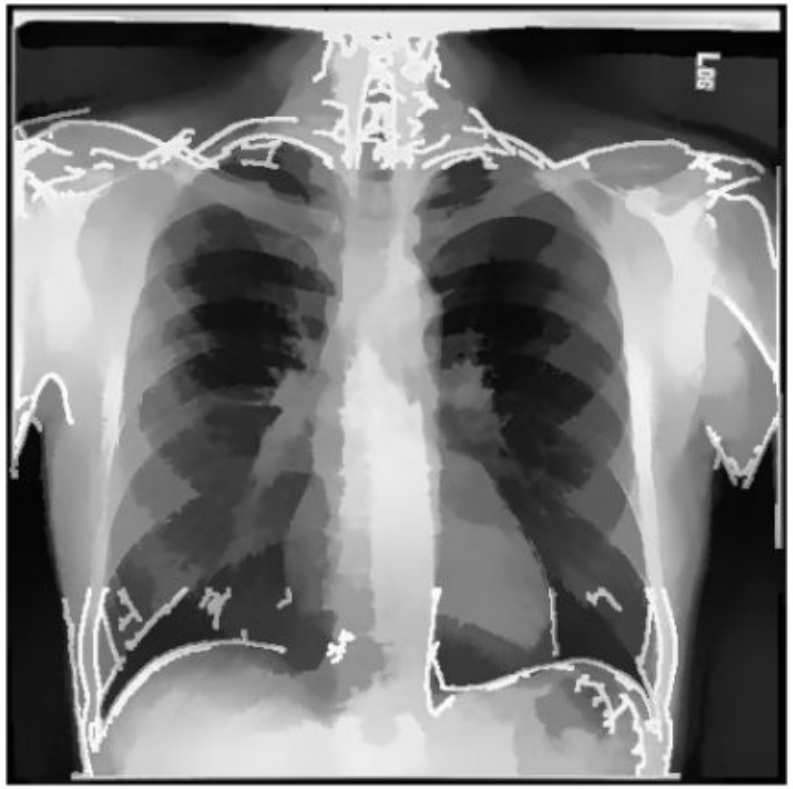


05b. Top20 + Bot25 + lr 5

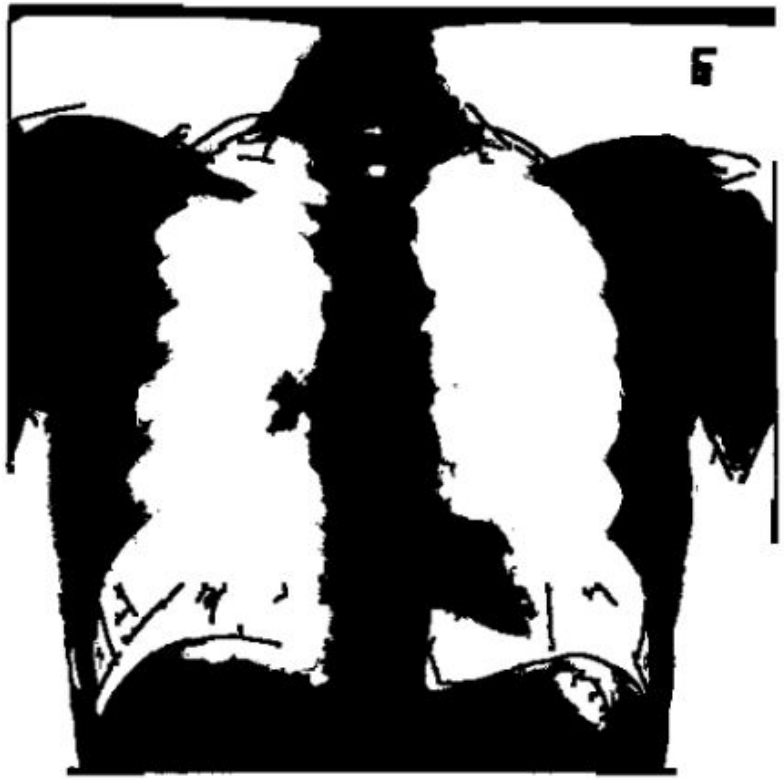


Metode Segmentasi (3)

06. MeanShift



07. Threshold



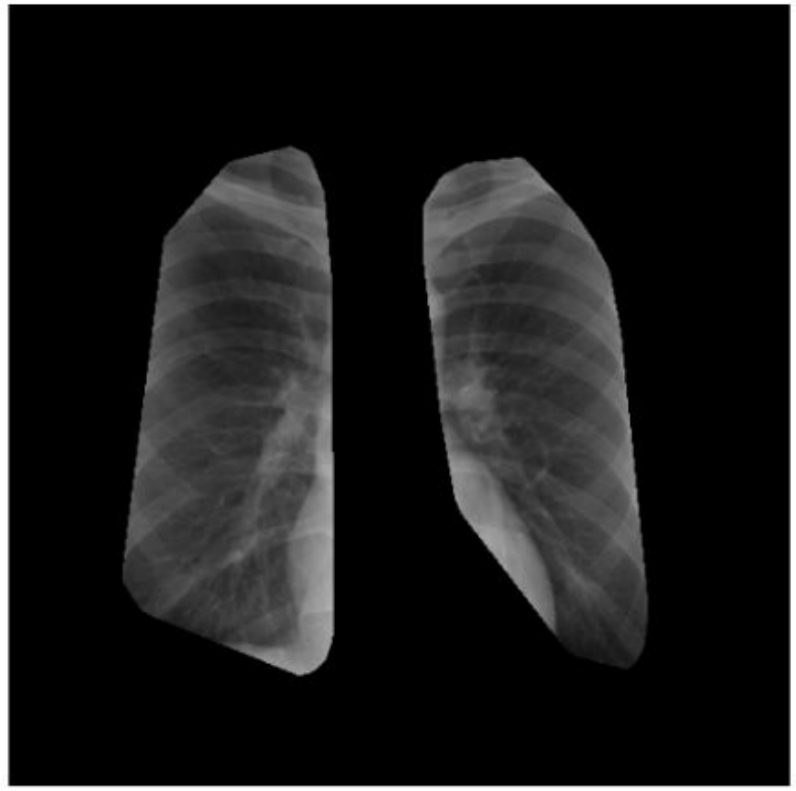
08. Morphology

Metode Segmentasi (4)

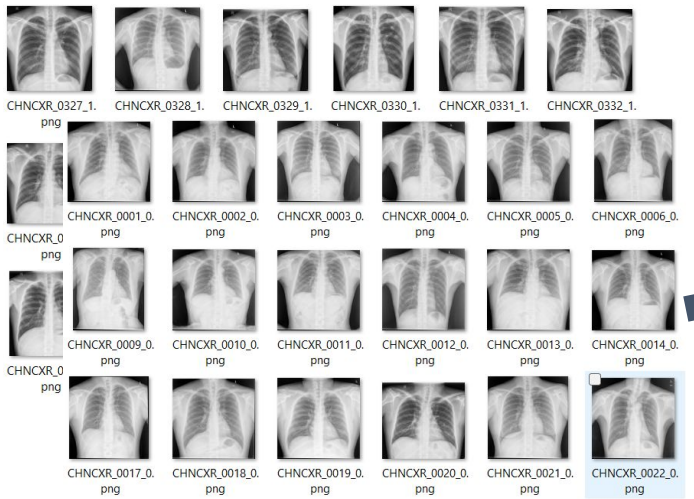
9a. Candidates Left/Right Overlay

09b. Convex Hull Overlay

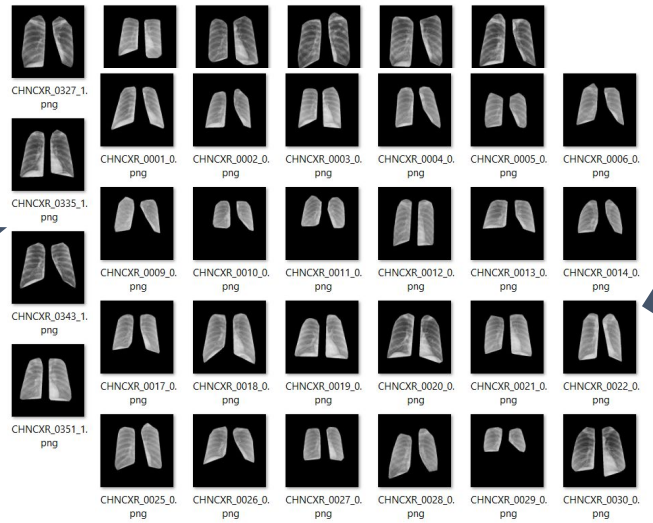
10. Convex Hull Masked



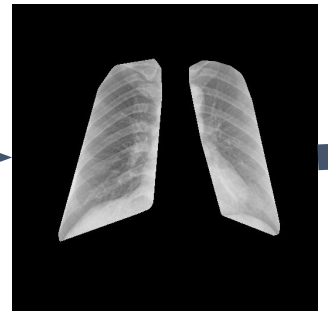
Metode Training & Test

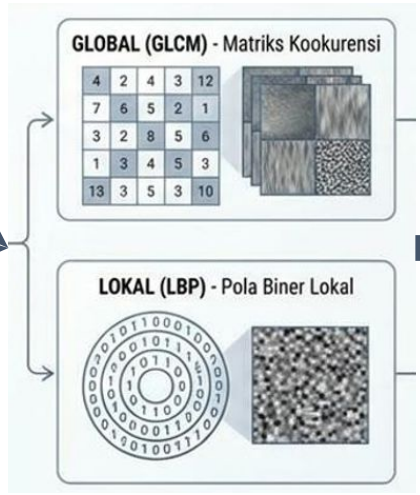


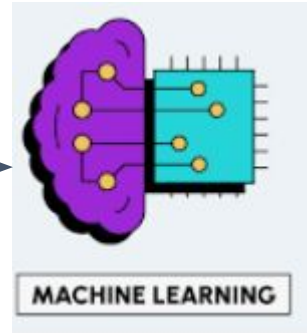
Training



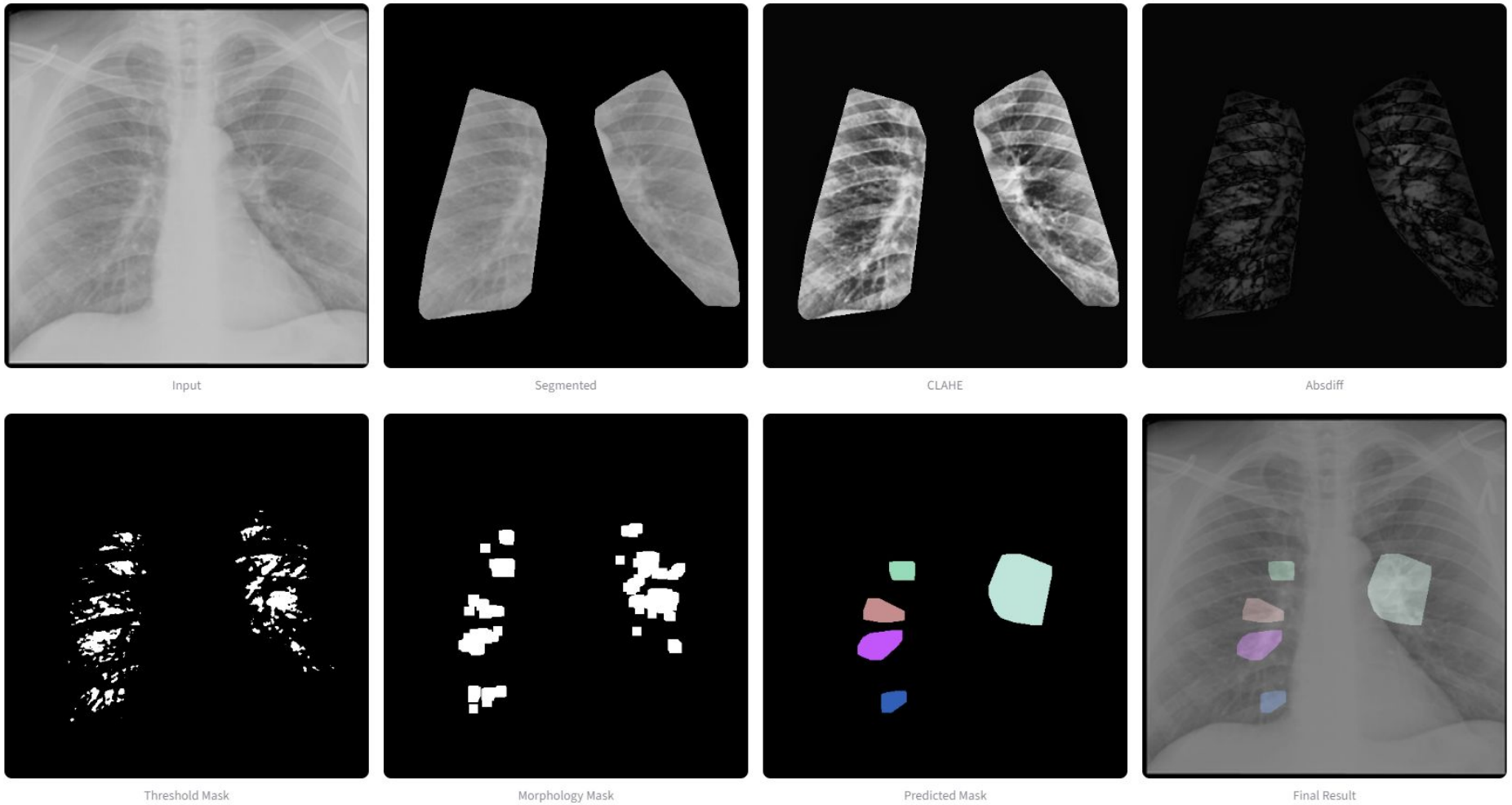
Test



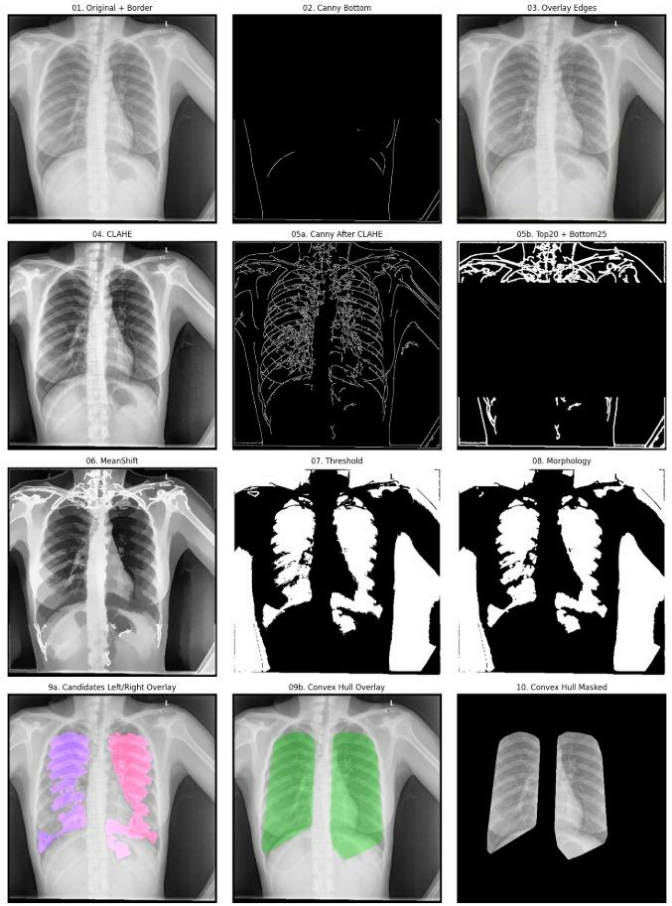




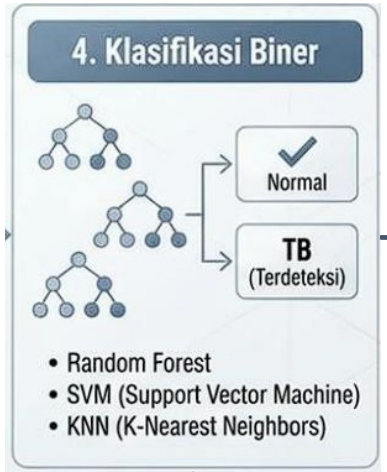
Metode TB Location



Hasil



Preprocessing Result



Random Forest

n_estimators=100,

random_state=42

Support Vector Machine

kernel='rbf', C=1.0,

gamma='scale

K-Nearest Neighbor

n_neighbors=5

Hasil

SVM RESULT

```
=== SVM (Normalized) ===
Accuracy: 0.8120300751879699

Confusion Matrix:
 [[48 19]
 [ 6 60]]

Classification Report:
              precision    recall  f1-score   support

           0       0.89      0.72      0.79        67
           1       0.76      0.91      0.83        66

    accuracy                           0.81       133
   macro avg       0.82      0.81      0.81       133
weighted avg       0.82      0.81      0.81       133
```

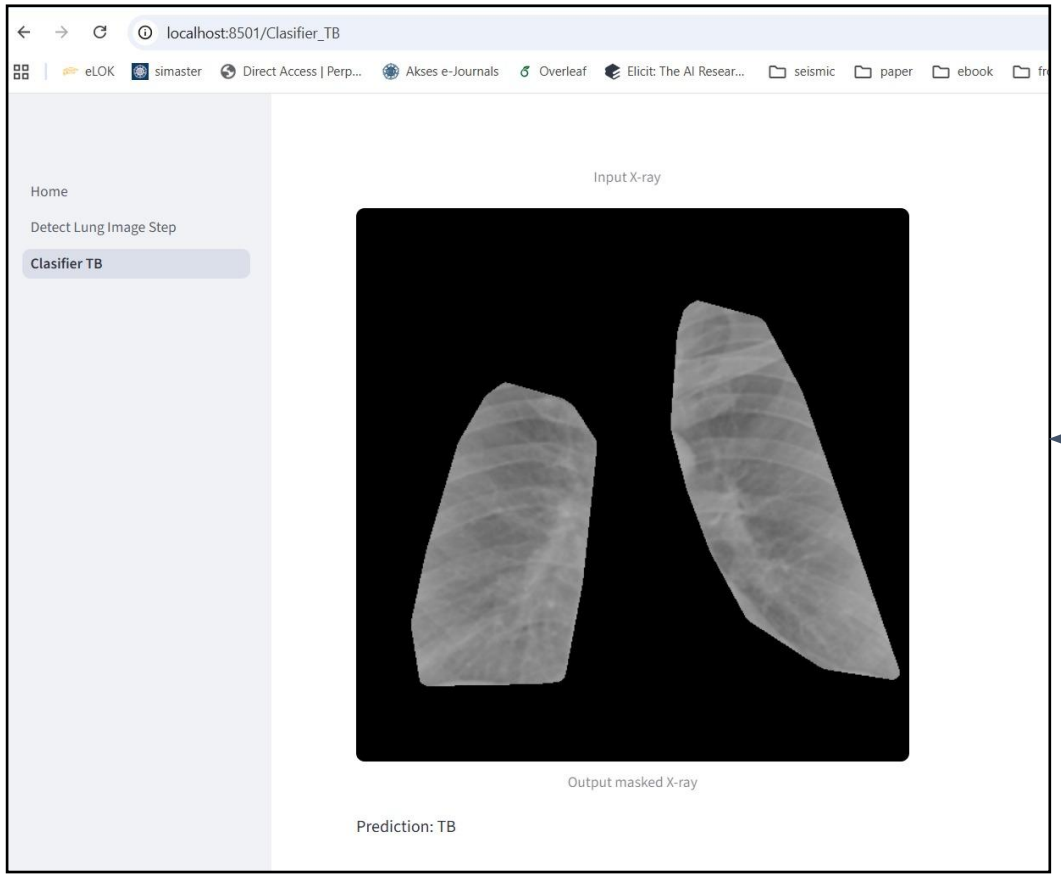
```
=== RANDOM FOREST ===
Accuracy: 0.8045112781954887

Confusion Matrix:
 [[52 15]
 [11 55]]

Classification Report:
              precision    recall  f1-score   support

           0       0.83      0.78      0.80        67
           1       0.79      0.83      0.81        66

    accuracy                           0.80       133
   macro avg       0.81      0.80      0.80       133
weighted avg       0.81      0.80      0.80       133
```

RF RESULT

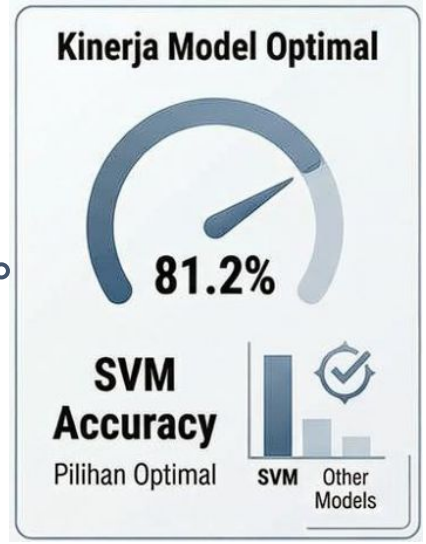
```
=== KNN ===
Accuracy: 0.7293233082706767

Confusion Matrix:
 [[46 21]
 [15 51]]

Classification Report:
              precision    recall  f1-score   support

           0       0.75      0.69      0.72        67
           1       0.71      0.77      0.74        66

    accuracy                           0.73       133
   macro avg       0.73      0.73      0.73       133
weighted avg       0.73      0.73      0.73       133
```

K-NN RESULT

Hasil



Model Develop



Kesimpulan

- SVM dengan fitur GLCM-LBP mencapai akurasi 81.2% lalu

  Random Forest dengan 80.4% dan KNN 72.9%

- Ada potensi untuk dijadikan alat bantu diagnosis

- Pipeline yang ringan, interpretatif, dan efisien secara komputasi

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Terima Kasih