RICE LEAF DISEASES DETECTION SYSTEM USING IMAGE PROCESSING AND CNN

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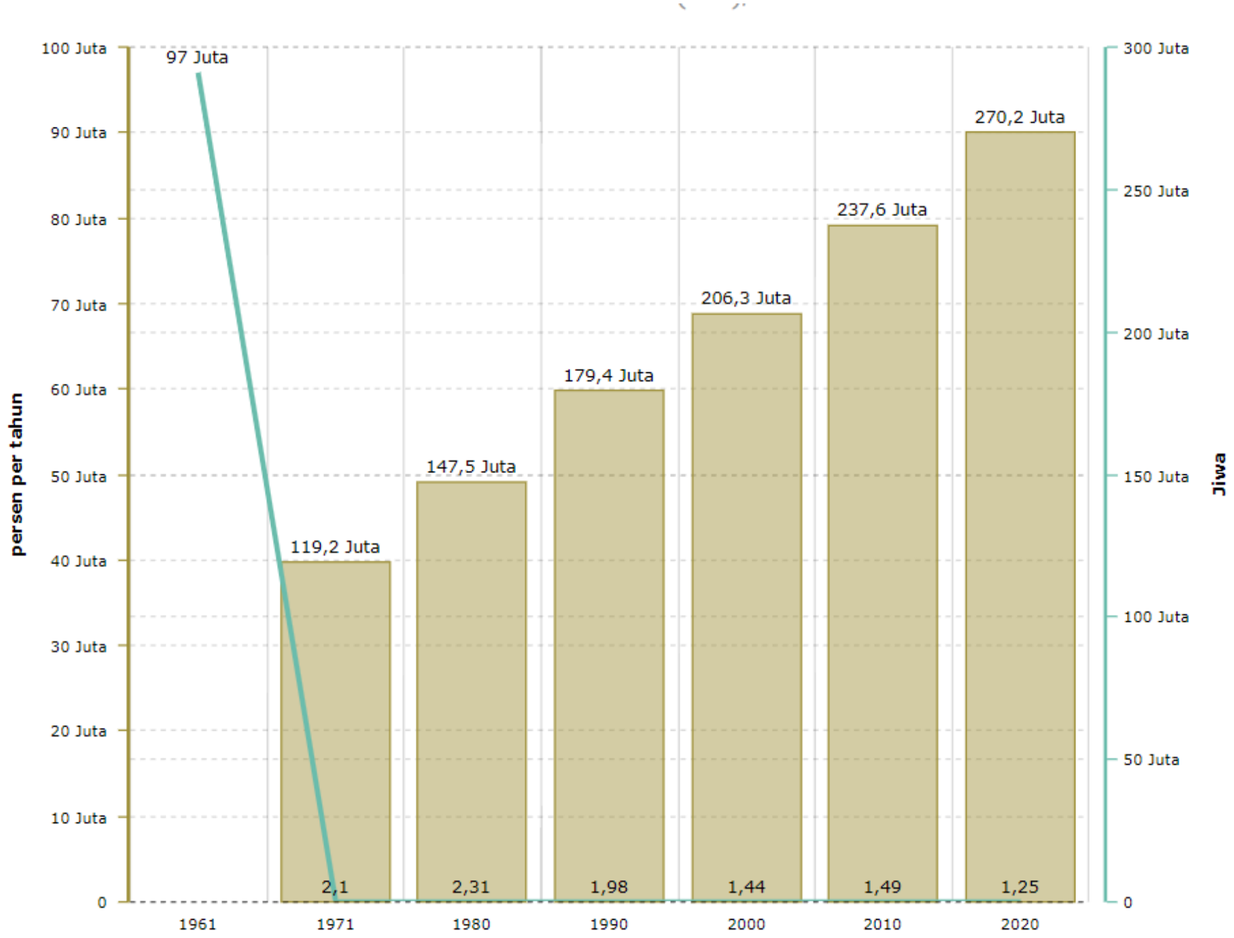
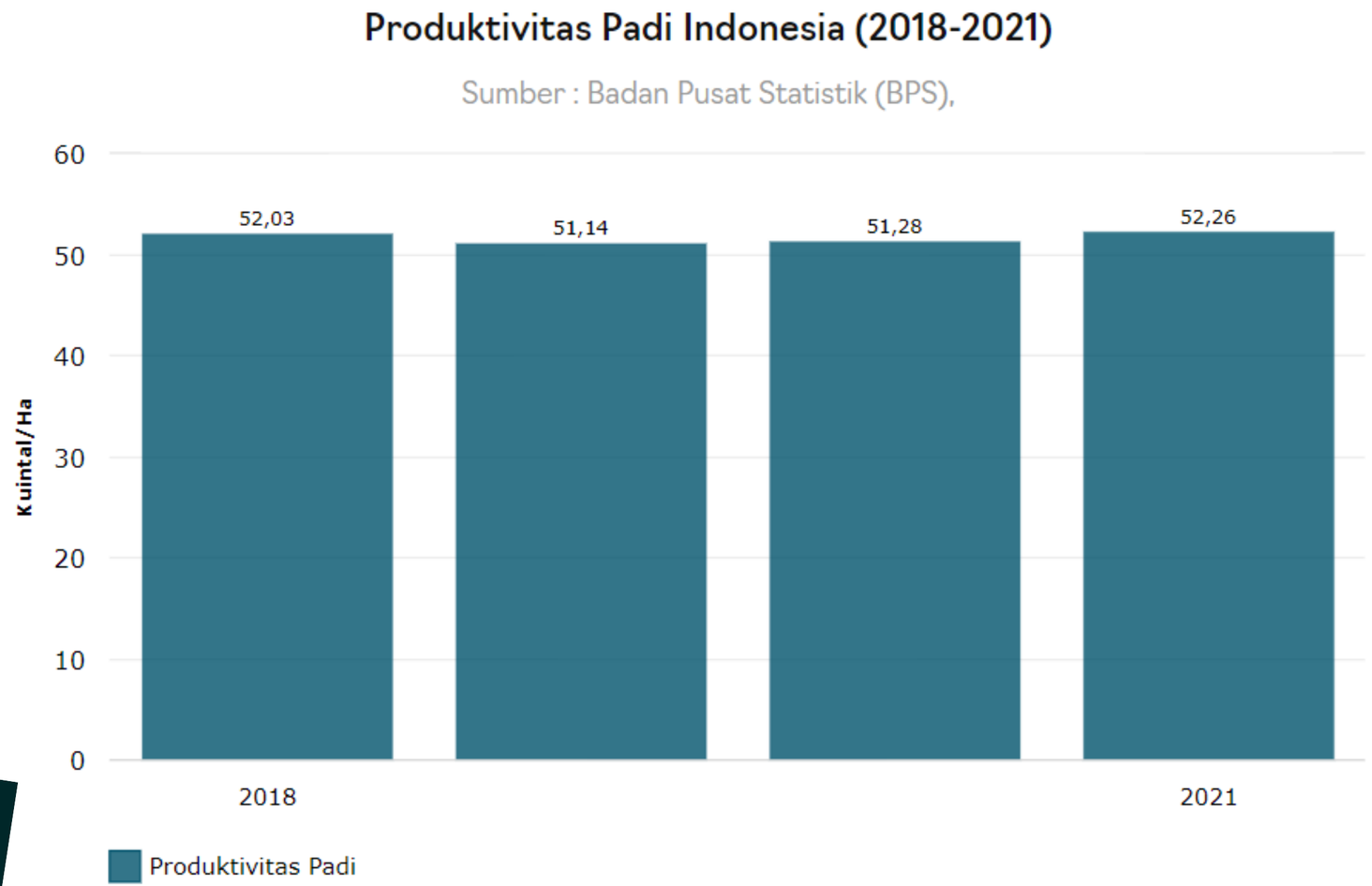
Latar Belakang

01 Peningkatan Jumlah Penduduk



Latar Belakang

02 Stagnannya Produksi Padi



Latar Belakang

03 Kurangnya Pengetahuan Petani Dalam Mengidentifikasi dan Menangani Penyakit Pada Padi

Solusi

Home Paddy Predict Articles

Heal your crops and reap higher yields with the PadDoc

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut ultrices metus a eros mollis, eleifend cursus sem tempus. Quisque dapibus, diam nec suscipit interdum, urna quam tincidunt risus, sit amet rhoncus tortor diam quis orci. Nam tristique massa a volutpat varius. Donec ultricies tristique purus, et semper lorem blandit at. Suspendisse diam nunc, consectetur nec turpis suscipit, hendrerit imperdiet metus. Nam neque justo, semper vel odio et, accumsan eleifend enim. Phasellus fermentum mauris vitae aliquam convallis. Nam molestie lorem et placerat cursus. Suspendisse turpis orci, maximus id convallis vitae, ornare sed mi. Nunc sed ante a felis accumsan tempor et ac lorem. Sed porta lacus eget convallis accumsan. Nunc mattis libero eget massa sollicitudin, quis convallis nibh semper. Proin id volutpat nibh. Aenean eget lacus at sapien rutrum dignissim. Fusce ac ipsum viverra, interdum tellus at, dictum arcu.

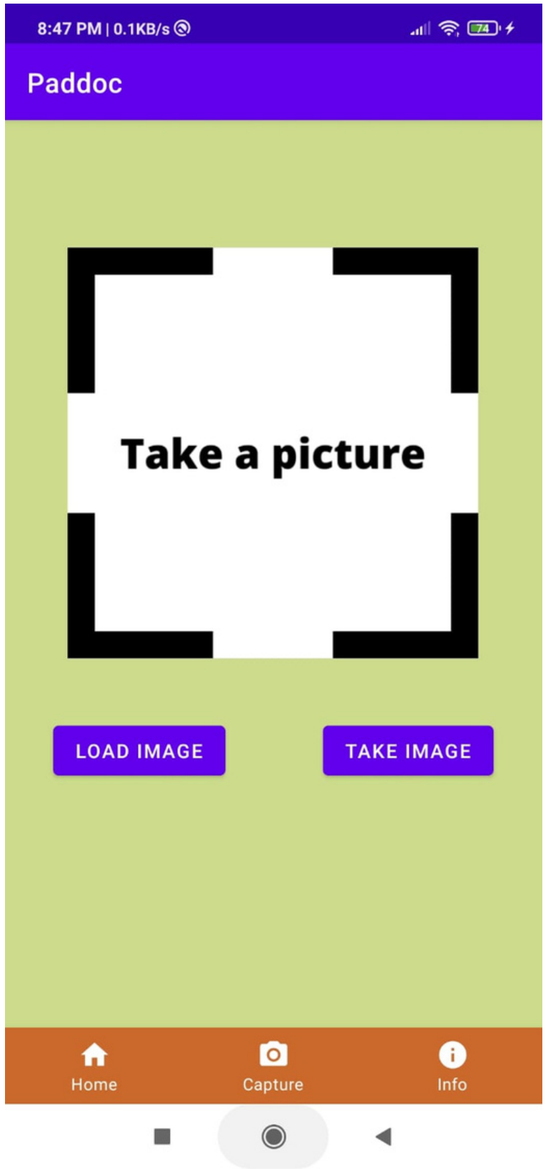
Our Developer

Hosea Natalius
Web Designer & FrontEnd

Ricky Pratama
Team Lead & Model Trainer

Natalis Felix
BackEnd Engineer

Solusi


8:47 PM | 0.1KB/s
Paddoc
Take a picture
LOAD IMAGE
TAKE IMAGE
Home
Capture
Info

Paddy Diseases

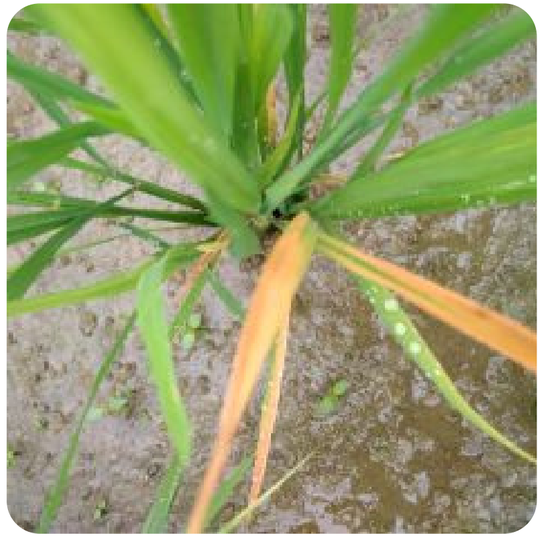
Bacterial Leaf Blight

Brown Spot

Leaf Smut

Paddy Diseases

Blast



Tungro

Sumber Data

kaggle

https://www.kaggle.com/datasets/vbookshelf/rice-leaf-diseases

Bacterial Leaf Blight

Brown Spot

Leaf Smut

Mendeley Data

https://data.mendeley.com/datasets/fwcj7stb8r/1

Bacterial Leaf Blight

Brown Spot

Blast

Tungro

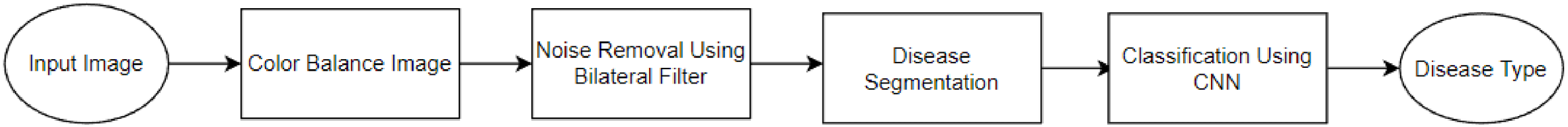
Sumber Kode

kaggle

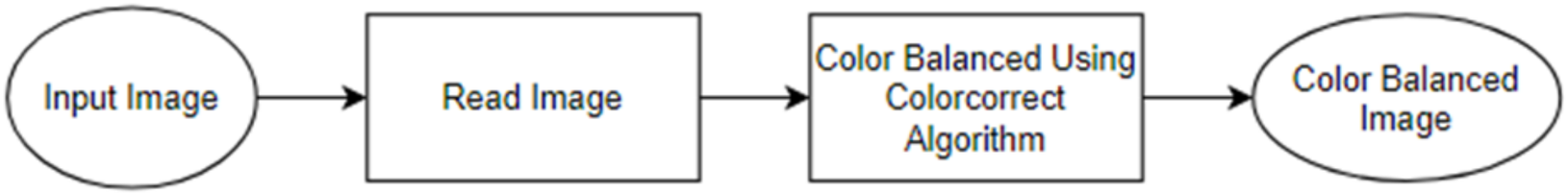
https://www.kaggle.com/code/raahulg/paddy-leaf-disease-classifier

https://github.com/ejmmedina/rice-disease-classification/blob/master/riceimg-clf-ml2.ipynb

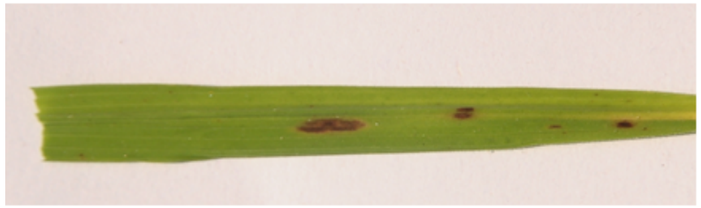
Rice Leaf Diseases Detection System
Proposed Methodology

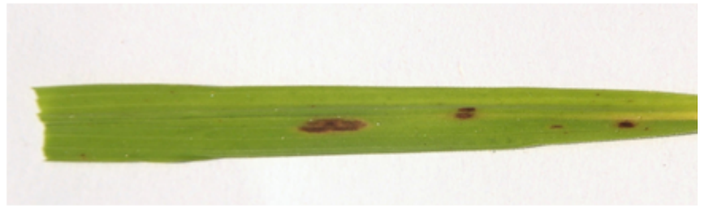


Color Balancing

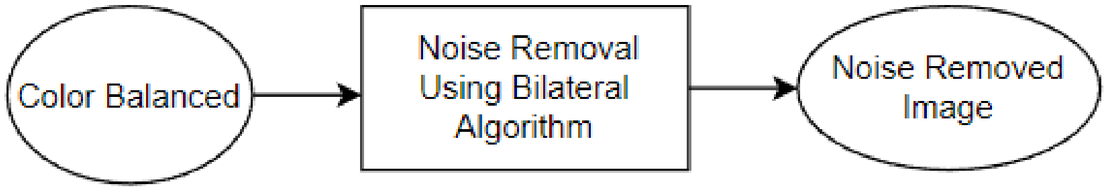


Color Balancing





Noise Removal



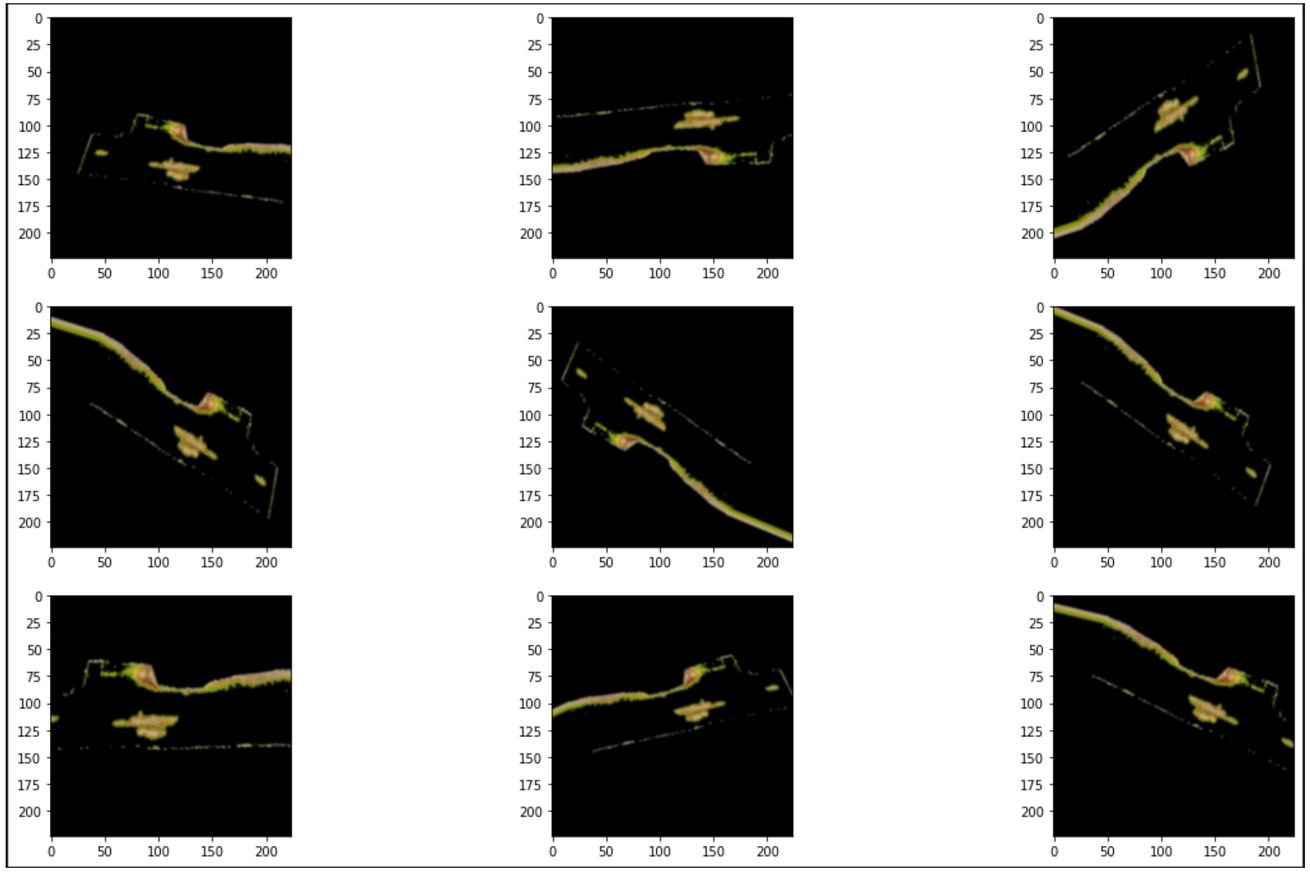
Noisy Image

Noise Removed Image

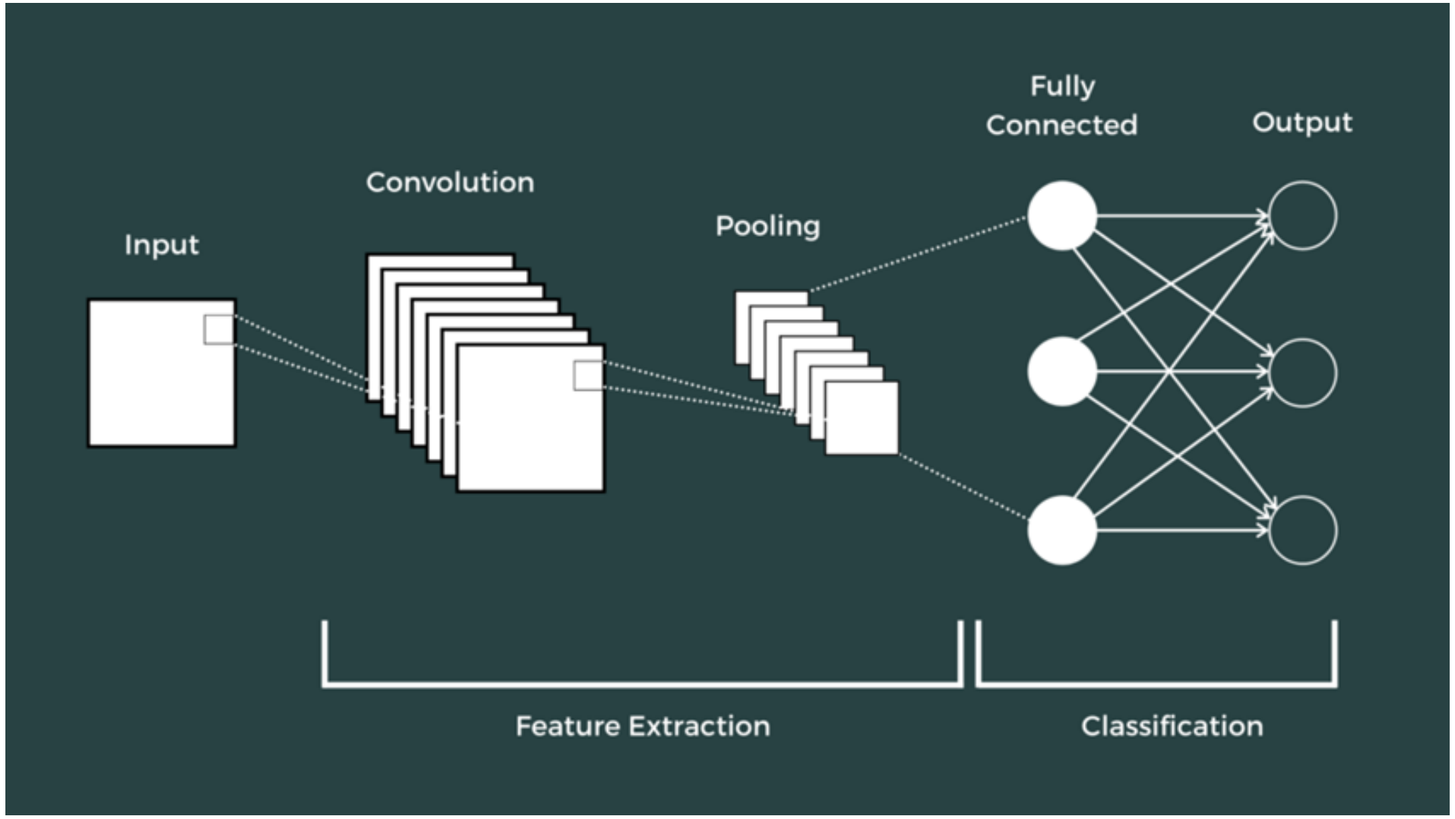
Disease Segmentation

Data Augmentation

Data Augmentation adalah teknik yang dapat digunakan untuk memperluas ukuran set pelatihan secara artifisial dengan membuat data yang dimodifikasi dari yang sudah ada.



Classifier


Input
Convolution
Pooling
Fully Connected
Output
Feature Extraction
Classification

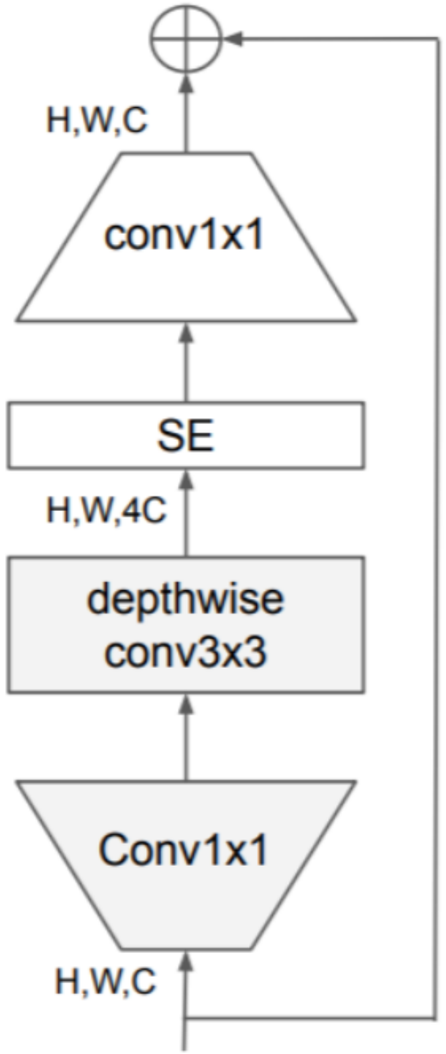
CNN Modelling

EfficientnetV2B0 Model

Stage	Operator	Stride	#Channels	#Layers
0	Conv3x3	2	24	1
1	Fused-MBConv1, k3x3	1	24	2
2	Fused-MBConv4, k3x3	2	48	4
3	Fused-MBConv4, k3x3	2	64	4
4	MBConv4, k3x3, SE0.25	2	128	6
5	MBConv6, k3x3, SE0.25	1	160	9
6	MBConv6, k3x3, SE0.25	2	256	15
7	Conv1x1 & Pooling & FC	-	1280	1

```
Total params: 5,919,312
Trainable params: 0
Non-trainable params: 5,919,312
```

CNN Modelling



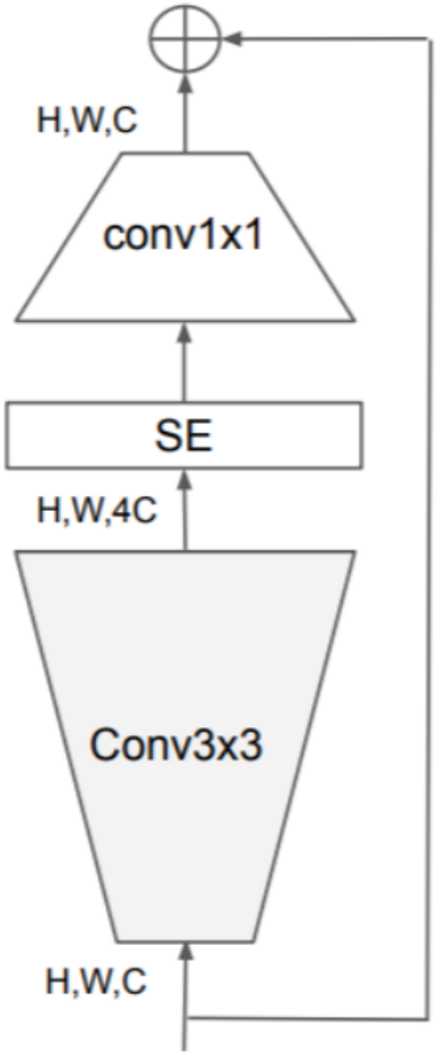
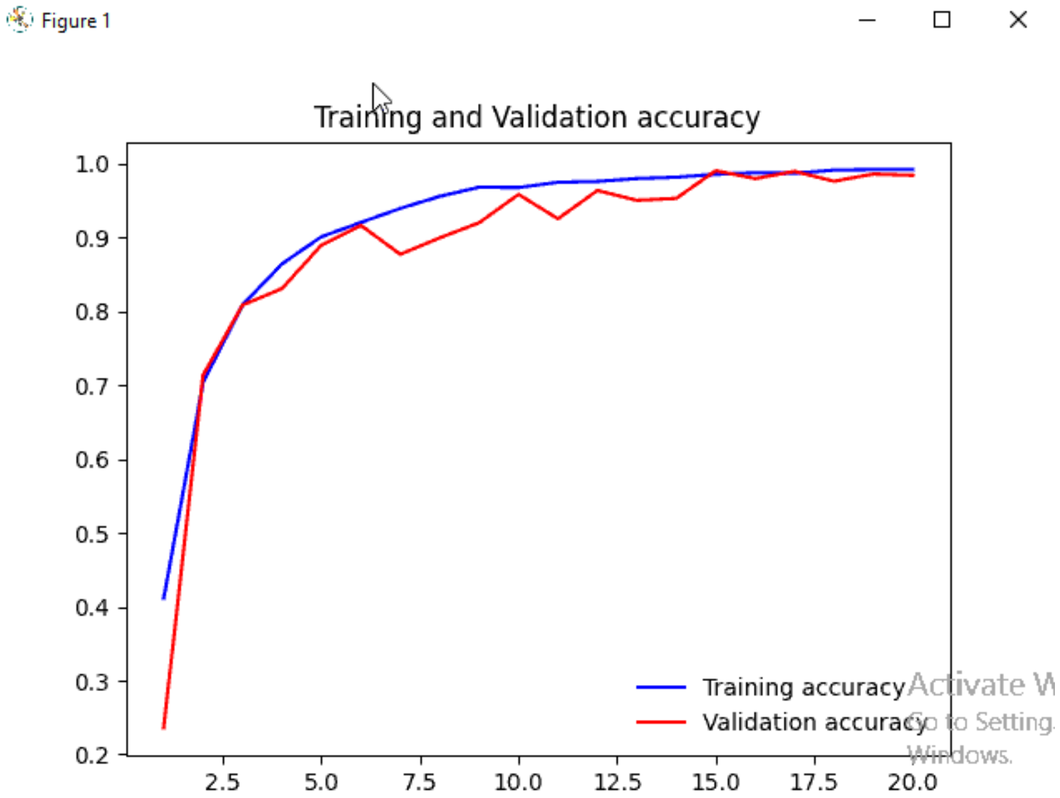
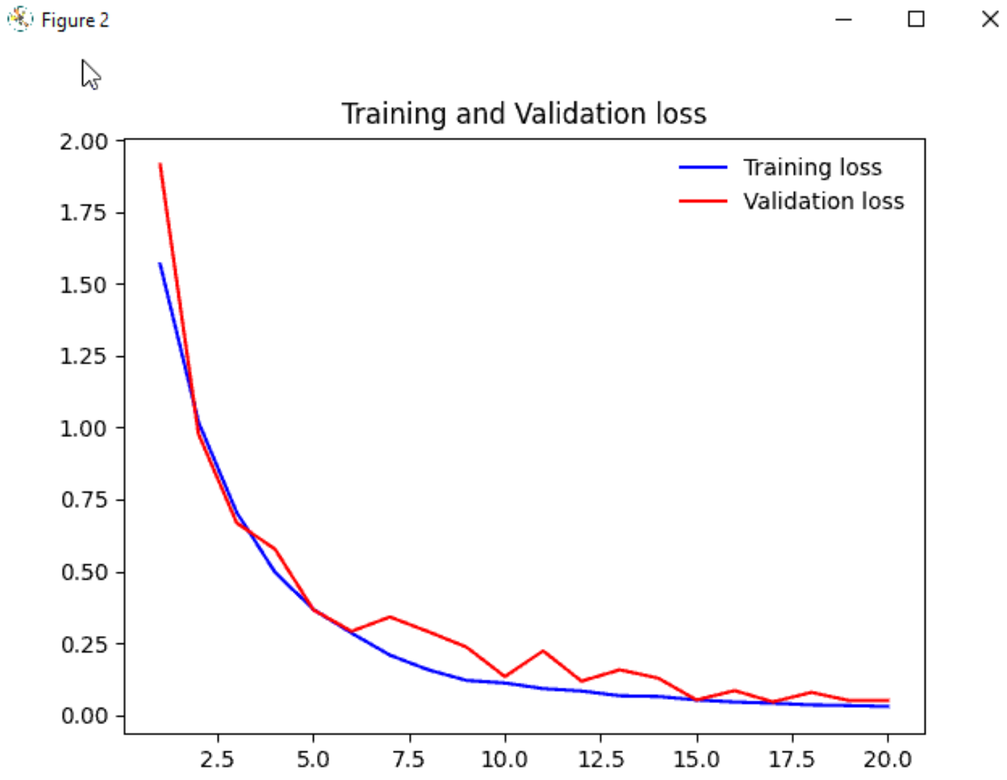


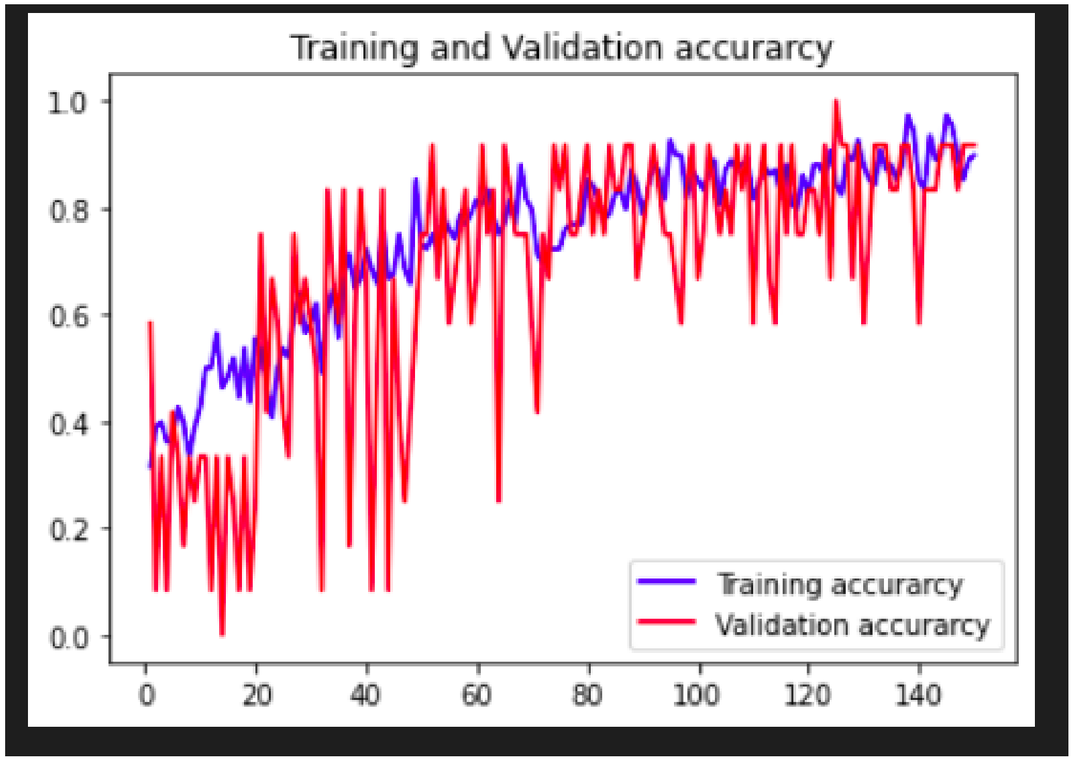
Figure-2: Structure of MBConv and Fused-MBConv.

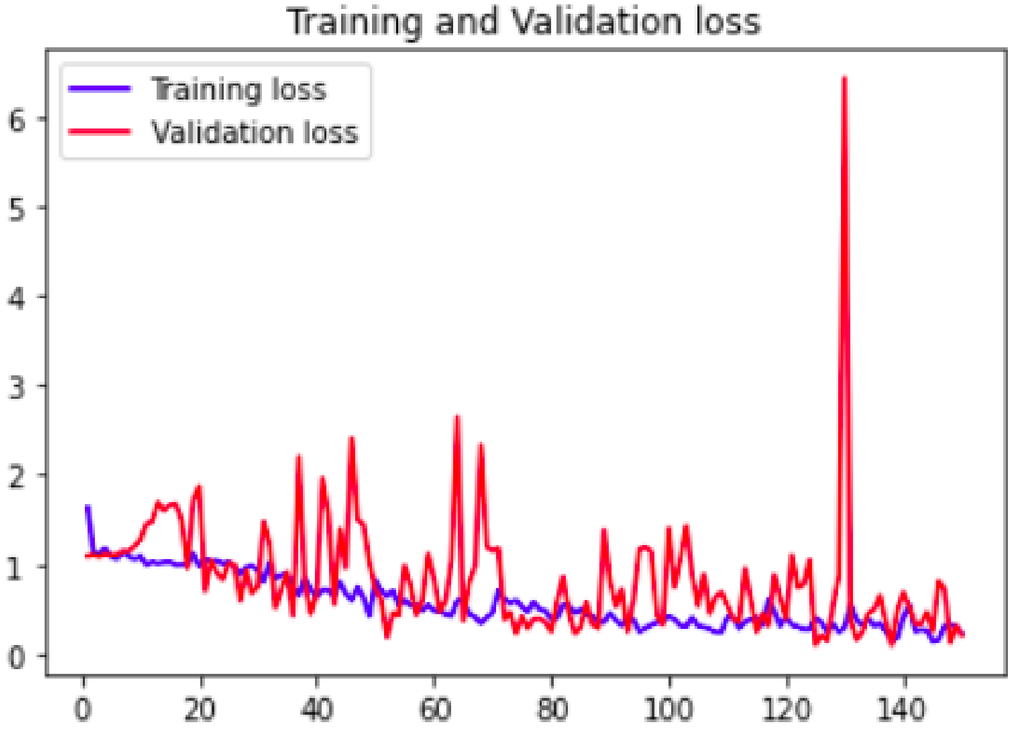
Result
EfficientnetV2B0





Result Alexnet





Testing Result

```
# T0 print the Classification Report
y_pred = loaded_model.predict(test)
y_pred = np.argmax(y_pred, axis=1)
print(classification_report(test.classes, y_pred))
```

[12] ✓ 56.2s

```
...                  precision    recall  f1-score   support

           0       0.69      0.96      0.80       252
           1       0.94      0.75      0.84       252
           2       0.92      0.91      0.91       252
           3       1.00      1.00      1.00       108
           4       0.00      0.00      0.00         6
           5       0.92      0.77      0.84       252

    accuracy                           0.86      1122
   macro avg       0.74      0.73      0.73      1122
weighted avg       0.87      0.86      0.86      1122
```

Demo Paddoc Web and Android App

Benefits

- Model memiliki kemampuan generalisasi yang lebih baik (mencegah overfitting)
- Mampu mendeteksi secara otomatis fitur-fitur yang penting dari image
- Komputasi lebih ringan dan efisien dengan CNN

Downside

- Training per epoch cukup lama (±36 menit)
- Segmentasi penyakit masih dilakukan secara manual
- Computationally intensive, sehingga membutuhkan CPU yang mumpuni dan memori yang cukup besar
- Butuh parameter tuning untuk memberikan result yang baik
- Untuk hasil akurasi prediksi Android App masih kurang bagus karena konversi model ke tflite

Future Works

- Real-time disease detection for android app
- Buat website dan android app bisa menyimpan foto yang diupload oleh user dalam server untuk nantinya digunakan untuk training model
- Menambahkan jumlah penyakit yang bisa dideteksi
- Mengembangkan fungsi hue segmentasi penyakit yang lebih baik dan bisa bekerja secara otomatis
- Mengembangkan model CNN yang lebih cepat, akurat, dan efisien untuk memprediksi penyakit pada padi

Team Contribution

- Developing Front-end Website Paddoc

- Model Training and Testing
- Adding fix extension function
- Adding hue segmentation function
- Adding color balancing function

- Creating paddoc android application

- Adding bilateral filter function

References

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- Prajapati, H. B., Shah, J. P., & Dabhi, V. K. (2017). Detection and classification of rice plant diseases. Intelligent Decision Technologies, 11(3), 357–373. https://doi.org/10.3233/IDT-170301
- Tan, M., & Le, Q. v. (2021). EfficientNetV2: Smaller Models and Faster Training. http://arxiv.org/abs/2104.00298
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Thank You

Access Our Project Here:
https://github.com/paddy-farmer/Padi