DAFTAR PUSTAKA

Andono, P. N., T.Sutojo, & Muljono. (2017). *Pengolahan Citra Digital*. Penerbit Andi.

Aisha Safira, "Ini Bahaya Sampah Plastik di laut," bobo.grid.id. [Online]. Available:https://bobo.grid.id/read/08675417/ini-bahaya-sampah-plastik-di- laut?page=all. [Accessed: Desember 2022].

Arif, T. M. (2022). *Introduction to Deep Learning for Engineers: Using Python and Google Cloud Platform*. Springer Nature.

Aminullah Muhammad. 2021. "Perbandingan Performa Klasifikasi Machine Learning Dengan Teknik Resampling Pada Dataset Tidak Seimbang," 137.

Batubara, N. A., & Awangga, R. M. (2020). *TUTORIAL OBJECT DETECTION PLATE NUMBER WITH CONVOLUTION NEURAL NETWORK (CNN)*. Kreatif.

Bisong, Ekaba. 2019. *Building Machine Learning and Deep Learning Models on Google Cloud Platform: A Comprehensive Guide for Beginners*. Berkeley, CA: Apress. https://doi.org/10.1007/978-1-4842-4470-8.

Eckroth, Joshua. 2018. "Python Artificial Intelligence Projects for Beginners," 155.

Encord, 2022. YOLO v8 for Object Detection Explained -YOLO v8 Architecture. .URLhttps://medium.com/cord-tech/yolov8-for-object-detection-explaine-practical-example-23920f77f66a (accessed 25.7.23).

Eckroth, Joshua. 2018. "Python Artificial Intelligence Projects for Beginners,"155.

Endah. 2015. *Sampah Botol Plastik*. Diakses 5 Desember 2022. https://elib.unikom.ac.id.

Fenglei Han dkk, 2020. "Underwater Image Processing and Object Detection Based on Deep CNN Method." *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)* 650-656.

Gita Laras Widyaningrum, "Perilaku Manusia dan Dampak Sampah Plastikyang Menewaskan Hewan Laut," nationalgeographic.grid.id. [Online]. Available: https://nationalgeographic.grid.id/read/131244353/perilaku-manusia-dan-dampak-sampah-plastik-yang-menewaskan-hewan-Laut?page=all.[Accessed:Desember 2022].

Greeneration, "Sampah Plastik di Lautan," Greenation.org. [Online]. Available: https://www.greeneration.org/sampah-plastik-di-Lautan/.

Guo, Tianmei, Jiwen Dong, Henjian Li, and Yunxing Gao. 2017. “Simple convolu tional Neural Network on Image Classification,” 4.

Hidayatulloh, Muhammad Syarif. 2021. “Sistem Pengenalan Wajah Menggunakan Metode Yolo *(You Only Look Once)*,” 73.

Hule, “Underwater Image Processing For Object Detection”.2016.

Ibnu Gaury, "Sistem Deteksi Sampah Botol Plastik di Pantai Dengan MetodeDeep Learning".2020

Jalled, Fares, and Ilia Voronkov. 2016. “Object Detection Using Image Processing.” arXiv. http://arxiv.org/abs/1611.07791 (accessed 04.3.23).

Juan, Diana. 2023 " A Comprehensive Review of YOLO : From YOlOv1 to YOLOv8 and Beyond." arxiv. https://arxiv.org/pdf/2304.00501v1.pdf (accessed 01.8.23).

Jinwang Wang dkk, 2018. “Bottle Detection in the Wild Using Low-Altitude Unmanned Aerial Vehicles.” *2018 21st International Conference on Information Fusion (FUSION)* 510- 513.

Kurniawan, D. (2022). *Pengenalan Machine Learning dengan Python*. Elex Media Komputindo.

Kusuma, T. A. A. H., Usman, K., & Saidah, S. (2021). PEOPLE COUNTING FOR PUBLIC TRANSPORTATIONS USING YOU ONLY LOOK ONCE METHOD. *Jurnal Teknik Informatika (Jutif)*, *2*(1), Art. 1. https://doi.org/10.20884/1.jutif.2021.2.2.77.

L.P.De Lima, F. C. Boogaard, R.E. De Graaf, “Monitoring The Impacts Of Floating Structures On The Water Quality And Ecology Using An Underwater Drone”. 2015.

Lu, Huimin, Li, Yujie, Li, Jianru “Underwater Image De-scattering and Classification by Deep Neural Network”. 2016.

Lee, S.-J., Roh, M.-I., Lee, H., Ha, J.-S., & Woo, I.-G. (2018, Juni 13). *Image-based Ship Detection and Classification for Unmanned Surface Vehicle Using Real Time Object Detection Neural Networks*.

LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton. 2015. “Deep Learning.” *Nature* 521 (7553): 436–44. https://doi.org/10.1038/nature14539.

Putra, D. (2010). *Pengolahan Citra Digital*. Penerbit Andi.

Redmon, Joseph, Santosh Divvala, Ross Girshick, and Ali Farhadi. 2016. “You Only Look Once: Unified, Real Time Object Detection.” In *2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 779–88. Las Vegas, NV, USA: IEEE. https://doi.org/10.1109/CVPR.2016.91.

Redmon, Joseph, and Ali Farhadi. 2016. “YOLO9000: Better, Faster, Stronger.” arXiv. http://arxiv.org/abs/1612.08242.

R. C. Gonzalez and R. E. Woods. 2017. “Digital Image Processing”, *IEEE Transactions on Image Processing* 965–976.

Sharma, S. (2017). *Activation Functions in Neural Networks*. Medium. https://towardsdatascience.com/activation-functions-neural-networks-lcbd 9f8d91d6.

Stereolabs. (2020). *Stereolabs Docs: API Reference, Tutorials, and Integration | Stereolabs*. https://www.stereolabs.com/docs/.

Sun Xin, Shi Junyu, Liu Lipeng, “Transferring deep knowledge for objectr ecognition in Low-quality underwater videos”. 2018.

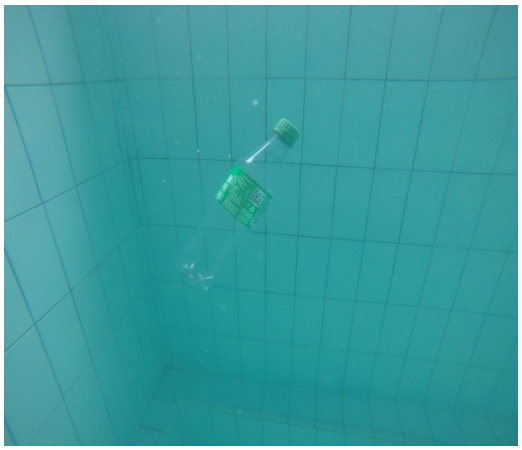
Utami, E., Raharjo, S., & Amikom, U. (2004). *Logika Algoritma dan Implementasinya dalam Bahasa Python di Gnu/Linux*. Penerbit Andi.

Xiaoyu Liang, Liangyan Dong, Youyu Wu, “Research on Surface Defect Detection Algorithm of Tube-Type Bottle Based on Machine Vision”. 2017.

Wayan Dadang, 2018. *Pengaplikasian Deep Learning*. Jakarta.

LAMPIRAN

Lampiran 1 Beberapa contoh Dataset Primer




AQUA


Nestlé
PureLife


Good Day


FANTA

Lampiran 2 Source Code

File Model YOLOv8

```
!nvidia-smi

import os
HOME = os.getcwd()
print(HOME)

# Pip install method (recommended)

!pip install ultralytics==8.0.20

from IPython import display
display.clear_output()

import ultralytics
ultralytics.checks()

# %cd {HOME}
# !git clone github.com/ultralytics/ultralytics
# %cd {HOME}/ultralytics
# !pip install -e .

# from IPython import display
# display.clear_output()

# import ultralytics
# ultralytics.checks()

from ultralytics import YOLO

from IPython.display import display, Image

!mkdir {HOME}/datasets
# %cd {HOME}/datasets

!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="EoHPhIblkojK2pi9PrA4")
project = rf.workspace("unhas-qvw0h").project("plastic-bottle-waste")
dataset = project.version(28).download("yolov8")

# %cd {HOME}

!yolo task=detect mode=train model=yolov8s.pt data={dataset.location}/data.yaml
epochs=25 imgsz=640 plots=True

!ls {HOME}/runs/detect/train/
```

```
# %cd {HOME}
Image(filename=f'{HOME}/runs/detect/train/confusion_matrix.png', width=600)

# %cd {HOME}
Image(filename=f'{HOME}/runs/detect/train/results.png', width=600)

# %cd {HOME}
Image(filename=f'{HOME}/runs/detect/train/val_batch0_pred.jpg', width=600)

# %cd {HOME}

!yolo task=detect mode=val model={HOME}/runs/detect/train/weights/best.pt
data={dataset.location}/data.yaml

# %cd {HOME}
!yolo task=detect mode=predict model={HOME}/runs/detect/train/weights/best.pt conf=0.25
source={dataset.location}/test/images save=True

import glob
from IPython.display import Image, display

for image_path in glob.glob(f'{HOME}/runs/detect/predict/*.jpg'):
    display(Image(filename=image_path, width=600))
    print("\n")

from google.colab import drive
drive.mount('/content/drive')

project.version(dataset.version).deploy(model_type="yolov8",
model_path=f"{HOME}/runs/detect/train2/")

# #load model
# model = project.version(dataset.version).model

# #choose random test set image
# import os, random
# test_set_loc = dataset.location + "/test/images/"
# random_test_image = random.choice(os.listdir(test_set_loc))
# print("running inference on " + random_test_image)

# pred = model.predict(test_set_loc + random_test_image, confidence=40,
overlap=30).json()
# pred
```

File Deploy Model YOLOv8

```
from ultralytics import YOLO
from ultralytics.yolo.v8.detect.predict import DetectionPredictor
import cv2
```

```
# model = YOLO("D:\ultralytics-8.0.119\ecaa.pt")
model = YOLO("/Users/muhammadrezaldi/Downloads/ultralytics-8.0.119/ecaa.pt")
model.predict(source="1", show=True,conf=0.5) # accepts all formats
```

File Requirements Deploy Model

```
# Base ----------------------------------------
matplotlib>=3.2.2
opencv-python>=4.6.0
Pillow>=7.1.2
PyYAML>=5.3.1
requests>=2.23.0
scipy>=1.4.1
torch>=1.7.0
torchvision>=0.8.1
tqdm>=4.64.0

# Logging -------------------------------------
# tensorboard>=2.13.0
# dvclive>=2.11.0
# clearml
# comet

# Plotting ------------------------------------
pandas>=1.1.4
seaborn>=0.11.0

# Export --------------------------------------
# coremltools>=6.0  # CoreML export
# onnx>=1.12.0  # ONNX export
# onnxsim>=0.4.1  # ONNX simplifier
# nvidia-pyindex  # TensorRT export
# nvidia-tensorrt  # TensorRT export
# scikit-learn==0.19.2  # CoreML quantization
# tensorflow>=2.4.1  # TF exports (-cpu, -aarch64, -macos)
# tflite-support
# tensorflowjs>=3.9.0  # TF.js export
# openvino-dev>=2022.3  # OpenVINO export

# Extras --------------------------------------
psutil  # system utilization
# thop>=0.1.1  # FLOPs computation
# ipython  # interactive notebook
# albumentations>=1.0.3
# pycocotools>=2.0.6  # COCO mAP
# roboflow
```

Lampiran 3 Evaluasi model 25 Epoch di Google Colab

epoch	train/box_loss	train/cls_loss	train/dfl_loss	metrics/precision(B)	metrics/recall(B)	metrics/mAP50(B)	metrics/mAP50-95(B)	val/box_loss	val/cls_loss	val/dfl_loss	lr/pg0	lr/pg1	lr/pg2
0	1.0227	2.3971	1.2699	0.51373	0.54919	0.53654	0.43415	1.0472	1.6216	1.2363	0.070349	0.00329 46	0.00329 46
1	0.76916	0.99979	1.0499	0.86819	0.93492	0.96901	0.8676	0.58197	0.61773	0.87382	0.040086	0.006365 4	0.006365 4
2	0.80845	0.94528	1.0564	0.74371	0.84167	0.86902	0.67511	876	0.88694	1.0495	0.009559 9	0.009172 3	0.009172 3
3	0.83664	0.94743	1.0689	0.44503	0.67484	0.54766	0.3629	1.3589	1.8223	1.4014	0.008812	0.008812	0.008812
4	0.86094	0.95961	1.0877	0.72711	0.7212	0.77631	0.58511	0.7649	1.2548	1.0007	0.008812	0.008812	0.008812
5	0.84228	0.8807	1.0856	0.87202	0.90445	0.92661	0.75089	0.70908	0.71693	0.98595	0.008416	0.008416	0.008416
6	0.80503	0.78798	1.0667	0.90644	0.84069	0.96066	0.81428	0.64554	0.64494	0.93588	0.00802	0.00802	0.00802
7	0.78845	0.79126	1.0701	0.92842	0.94734	0.97218	0.79245	0.67191	0.59564	0.95031	0.007624	0.007624	0.007624
8	0.7606	729	1.0566	0.87317	0.97852	0.9684	0.83938	0.50689	0.50619	0.87871	0.007228	0.007228	0.007228
9	0.73194	0.71101	1.0304	0.93232	0.91788	0.95772	0.77163	0.69978	0.55911	0.9535	0.006832	0.006832	0.006832
10	0.72774	0.67357	1.0323	0.92641	0.96566	0.96718	0.87813	0.46905	0.44028	0.84674	0.006436	0.006436	0.006436
11	0.6994	0.64492	1.0211	0.94663	0.96599	0.99426	0.87547	0.56043	0.43545	0.89197	0.00604	0.00604	0.00604
12	0.67347	0.64657	1.0021	0.95124	0.99516	0.98681	0.89849	0.48168	0.40796	0.86871	0.005644	0.005644	0.005644
13	0.65911	0.58307	1.0054	0.96976	0.9774	0.99455	0.8919	0.49322	0.33792	0.86029	0.005248	0.005248	0.005248
14	0.64005	0.57492	1.0007	0.98324	0.96579	0.98345	0.89399	0.47578	0.41621	0.86018	0.004852	0.004852	0.004852

15	0.42828	0.35891	0.85289	0.9759	0.95343	0.99235	0.85894	0.5364	0.37813	0.89267	0.004456	0.004456	0.004456
16	0.41587	0.34476	0.85337	0.99528	0.99286	995	0.93353	0.36308	0.28622	0.81427	0.00406	0.00406	0.00406
17	0.39501	0.31527	0.83727	0.96667	0.97922	0.99205	0.89114	0.48862	0.32833	0.8617	0.003664	0.003664	0.003664
18	0.38293	0.30241	0.83264	0.94663	0.99552	0.99483	0.9572	0.35413	0.28392	0.80565	0.003268	0.003268	0.003268
19	0.35537	0.28466	0.82554	0.98746	0.99838	995	0.94932	0.36473	0.25699	0.81036	0.002872	0.002872	0.002872
20	0.34605	0.27334	0.82452	0.98082	0.97295	0.99124	0.86317	0.60219	0.36343	0.88543	0.002476	0.002476	0.002476
21	0.32626	0.2602	0.81307	0.9954	1	995	0.94507	0.36459	0.23253	0.81336	0.00208	0.00208	0.00208
22	0.31372	0.24194	0.81202	0.99698	1	995	0.96831	0.30702	0.20404	0.80198	0.001684	0.001684	0.001684
23	0.30023	0.2307	0.81306	0.99749	1	995	0.96749	0.31034	0.20124	0.80288	0.001288	0.001288	0.001288
24	0.28229	0.20808	0.80174	0.99564	1	995	0.97662	0.28356	0.18818	0.79697	0.000892	0.000892	0.000892

DAFTAR PERBAIKAN

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Sistem Pendeteksi Sampah Botol Plastik Di Bawah Laut Menggunakan Metode Deep Learning Secara Real Time

Analisis & jelaskan penyebab turunnya nilai grafik mAP 50-95 pada grafik evaluasi model	BAB IV Halaman 62
Jelaskan mengenai botol type 1,2,3 itu seperti apa	BAB III Halaman 45
Tambahkan penjelasan pada gambar data testing	BAB IV Halaman 65
Dokumentasi Arsitekur YOLOv8	BAB III Halaman 53
Perbaikan Kesimpulan	BAB V Halaman 75

LEMBAR PERBAIKAN SKRIPSI

"SISTEM PENDETEKSI SAMPAH BOTOL PLASTIK DI BAWAH LAUT MENGGUNAKAN METODE DEEP LEARNING SECARA REAL TIME"

OLEH:

MUHAMMAD REZALDI YANATA PUTRA
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Skripsi ini telah dipertahankan pada Ujian Akhir Sarjana tanggal 27 September 2023.

Telah dilakukan perbaikan penulisan dan isi skripsi berdasarkan usulan dari penguji dan pembimbing skripsi.

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