

Model Development Phase

Date	15 March 2024
Team ID	739675
Project Title	Cleantech: Transforming Waste Management With Transfer Learning
Maximum Marks	10 Marks

Initial Model Training Code, Model Validation and Evaluation Report Initial

Model Training Code (5 marks):

```
vgg16.compile(optimizer=Adam(learning_rate=1e-5), loss='categorical_crossentropy', metrics=['accuracy'])

early_stopping = EarlyStopping(monitor='val_loss', patience=3, restore_best_weights=True)

# Fit the model using the extracted data
history = vgg16.fit(
    X_train, y_train,
    validation_data=(X_val, y_val),
    epochs=50,
    callbacks=[early_stopping]
)
```

Model Validation and Evaluation Report (5 marks):

Model	Summary	Training and Validation Performance Metrics																											
Model 1 (vgg16)	<div><div>vgg16.summary()</div><div>Model: "functional"</div><table><tr><th>Layer (type)</th><th>Output Shape</th><th>Param #</th></tr><tr><td>input_layer (InputLayer)</td><td>(None, 224, 224, 3)</td><td>0</td></tr><tr><td>block1_conv1 (Conv2D)</td><td>(None, 224, 224, 64)</td><td>1,792</td></tr><tr><td>block1_conv2 (Conv2D)</td><td>(None, 224, 224, 64)</td><td>36,928</td></tr><tr><td>block1_pool (MaxPooling2D)</td><td>(None, 112, 112, 64)</td><td>0</td></tr><tr><td>block2_conv1 (Conv2D)</td><td>(None, 112, 112, 128)</td><td>73,856</td></tr><tr><td>block2_conv2 (Conv2D)</td><td>(None, 112, 112, 128)</td><td>147,584</td></tr><tr><td>block2_pool (MaxPooling2D)</td><td>(None, 56, 56, 128)</td><td>0</td></tr><tr><td>dense (Dense)</td><td>(None, 3)</td><td>75,267</td></tr></table><div>Total params: 14,948,491 (56.99 MB) Trainable params: 75,267 (294.01 KB) Non-trainable params: 14,714,688 (56.13 MB)</div></div>	Layer (type)	Output Shape	Param #	input_layer (InputLayer)	(None, 224, 224, 3)	0	block1_conv1 (Conv2D)	(None, 224, 224, 64)	1,792	block1_conv2 (Conv2D)	(None, 224, 224, 64)	36,928	block1_pool (MaxPooling2D)	(None, 112, 112, 64)	0	block2_conv1 (Conv2D)	(None, 112, 112, 128)	73,856	block2_conv2 (Conv2D)	(None, 112, 112, 128)	147,584	block2_pool (MaxPooling2D)	(None, 56, 56, 128)	0	dense (Dense)	(None, 3)	75,267	<div><div>Class weights: {0: np.float64(1.0), 1: np.float64(1.0), 2: np.float64(1.0)}</div><div>Epoch 1/50</div><div>1/1 13s 13s/step - accuracy: 0.2812 - loss: 1.12783 - val_accuracy: 0.4688 - val_loss: 1.8758</div><div>Epoch 2/50</div><div>1/1 0s 485ms/step - accuracy: 0.2812 - loss: 1.12465 - val_accuracy: 0.4688 - val_loss: 1.8646</div><div>Epoch 3/50</div><div>1/1 1s 531ms/step - accuracy: 0.2812 - loss: 1.12235 - val_accuracy: 0.4688 - val_loss: 1.8558</div><div>Epoch 4/50</div><div>1/1 0s 478ms/step - accuracy: 0.2812 - loss: 1.12014 - val_accuracy: 0.4688 - val_loss: 1.8463</div><div>Epoch 5/50</div><div>1/1 0s 382ms/step - accuracy: 0.2812 - loss: 1.11882 - val_accuracy: 0.5000 - val_loss: 1.8385</div><div>Epoch 6/50</div><div>1/1 1s 767ms/step - accuracy: 0.2812 - loss: 1.1597 - val_accuracy: 0.5000 - val_loss: 1.8314</div><div>Epoch 7/50</div></div>
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