

skindisease.ipynb - Colaboratory

conv2_block2_1_bn (BatchNorma

Fix TypeError: next() takes 1 posit

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[6] 1 import numpy as np
2 import os
3 import pandas as pd
4 import tensorflow as tf
5 import matplotlib.pyplot as plt

4s 1 from google.colab import drive
2 drive.mount('/content/gdrive')

Drive already mounted at /content/gdrive; to attempt to forcibly remount, call drive.mount("/content/gdrive", force_remount=True).

0s [8] 1 os.listdir("/content/gdrive/MyDrive/archive")

['skin']

0s [9] 1 os.listdir("/content/gdrive/MyDrive/archive/skin/train_set")

['benign', 'malignant']

0s [10] 1 os.listdir("/content/gdrive/MyDrive/archive/skin/test_set")

['benign', 'malignant']

0s [11] 1 import tensorflow as tf
2 import os
3 from keras.models import Sequential
4 from tensorflow.keras.layers import Dense

0s completed at 23:20

Windows

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Taskbar icons: Jellyfish, Calendar, Mail, Security, File Explorer, Chrome, Settings, Excel, Word, Edge, Task View, Start Menu

System tray: Network, Volume, ENG, 11:20 PM, 24-04-23, Notifications (2)

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[11]

7 from tensorflow.keras.layers import Dropout
8 from tensorflow.keras import Model
9 from tensorflow.keras.preprocessing.image import ImageDataGenerator
10 from tensorflow.keras.optimizers import Adam
11 from tensorflow.keras import layers

[12]

1 from tensorflow.keras.applications.resnet50 import ResNet50

[13]

1 train_dir="/content/gdrive/MyDrive/archive/skin/train_set"

[14]

1 test_dir="/content/gdrive/MyDrive/archive/skin/test_set"

[15]

1 label=["malignant","benign"]

[16]

1 print("class")
2 for i in range(len(label)):
3 print(i,end=" ")
4 print(label[i])

class
0 malignant
1 benign

[17]

1 print("number of classes:",len(label))

number of classes: 2

[18]

1 import numpy as np

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[17] 1 print("number of classes:",len(label))

0s

number of classes: 2

1 import numpy as np

2 import matplotlib.pyplot as plt

3 import seaborn as sns

4 from sklearn.metrics import confusion_matrix

5 from keras.preprocessing.image import ImageDataGenerator

6 from keras.models import Model

2s

[19] 1 # Define data directories

2 train_dir = "/content/gdrive/MyDrive/archive/skin/train_set"

3 test_dir = "/content/gdrive/MyDrive/archive/skin/test_set"

0s

1 # Define data generators for training and testing data

2 train_datagen = ImageDataGenerator(rescale=1./255,

3 shear_range=0.2,

4 zoom_range=0.2,

5 horizontal_flip=True,

6 validation_split=0.2,)

7 test_datagen = ImageDataGenerator(rescale=1./255)

8

9 train_generator = train_datagen.flow_from_directory(train_dir,

10 target_size=(224, 224),

11 batch_size=32,

12 class_mode='categorical',

13 subset='training')

14

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1 # Define data generators for training and testing data

2 train_datagen = ImageDataGenerator(rescale=1./255,

3 shear_range=0.2,

4 zoom_range=0.2,

5 horizontal_flip=True,

6 validation_split=0.2,)

7 test_datagen = ImageDataGenerator(rescale=1./255)

8

9 train_generator = train_datagen.flow_from_directory(train_dir,

10 target_size=(224, 224),

11 batch_size=32,

12 class_mode='categorical',

13 subset='training')

14

15 val_generator = train_datagen.flow_from_directory(train_dir,

16 target_size=(224, 224),

17 batch_size=32,

18 class_mode='categorical',

19 subset='validation')

20 test_generator = test_datagen.flow_from_directory(test_dir,

21 target_size=(224, 224),

22 batch_size=800,

23 class_mode='categorical')

Found 2110 images belonging to 2 classes.

Found 527 images belonging to 2 classes.

Found 662 images belonging to 2 classes.

[33] 1 # Load the ResNet50 model with pre-trained ImageNet weights

2 base_model = ResNet50(weights='imagenet', include_top=False, input_shape=(224, 224, 3))

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[33]

1 # Load the ResNet50 model with pre-trained ImageNet weights
2 base_model = ResNet50(weights='imagenet', include_top=False, input_shape=(224, 224, 3))

[34]

1 # Add custom layers on top of the pre-trained model
2 x = base_model.output
3 x = Flatten()(x)
4 x = Dense(512, activation='relu')(x)
5 x = Dropout(0.5)(x)
6 #output layer fully connected dance layer with two neuron
7 predictions = Dense(2, activation='softmax')(x)

[35]

1 # Combine the base ResNet50 model with the custom layers
2 model = Model(inputs=base_model.input, outputs=predictions)
3 #model.summary()

[36]

1 # Freeze all layers in the base ResNet50 model
2 for layer in base_model.layers[5:]:
3 layer.trainable = False
4 # Compile the model
5 model.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accuracy'])
6 model.summary()

Model: "model_1"

Layer (type)	Output Shape	Param #	Connected to
input_2 (InputLayer)	[(None, 224, 224, 3)]	0	[]
conv1_pad (ZeroPadding2D)	(None, 224, 224, 3)	0	input_2[0][0][1]

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✓ 2s [36] Total params: 74,969,474
Trainable params: 51,391,362
Non-trainable params: 23,578,112

✓ 1h 1 # Train the model on the training data
2 history = model.fit_generator(train_generator,
3 steps_per_epoch=train_generator.n // train_generator.batch_size,
4 epochs=70,
5 validation_data=val_generator,
6 validation_steps=val_generator.n // val_generator.batch_size)

Epoch 42/70
65/65 [=====] - 44s 677ms/step - loss: 0.1606 - accuracy: 0.9254 - val_loss: 0.5479 - val_accuracy: 0.8652
Epoch 43/70
65/65 [=====] - 45s 697ms/step - loss: 0.1553 - accuracy: 0.9278 - val_loss: 1.0050 - val_accuracy: 0.7461
Epoch 44/70
65/65 [=====] - 46s 714ms/step - loss: 0.1624 - accuracy: 0.9278 - val_loss: 1.0791 - val_accuracy: 0.7324
Epoch 45/70
65/65 [=====] - 45s 689ms/step - loss: 0.1313 - accuracy: 0.9374 - val_loss: 1.5758 - val_accuracy: 0.7090
Epoch 46/70
65/65 [=====] - 46s 709ms/step - loss: 0.1474 - accuracy: 0.9278 - val_loss: 0.8029 - val_accuracy: 0.8027
Epoch 47/70
65/65 [=====] - 46s 699ms/step - loss: 0.1393 - accuracy: 0.9269 - val_loss: 0.6788 - val_accuracy: 0.8203
Epoch 48/70
65/65 [=====] - 46s 705ms/step - loss: 0.1638 - accuracy: 0.9259 - val_loss: 0.4790 - val_accuracy: 0.8555
Epoch 49/70
65/65 [=====] - 45s 693ms/step - loss: 0.1271 - accuracy: 0.9379 - val_loss: 0.7701 - val_accuracy: 0.8105
Epoch 50/70
65/65 [=====] - 46s 709ms/step - loss: 0.1459 - accuracy: 0.9321 - val_loss: 0.5810 - val_accuracy: 0.8418
Epoch 51/70
65/65 [=====] - 44s 671ms/step - loss: 0.1186 - accuracy: 0.9350 - val_loss: 0.5508 - val_accuracy: 0.8457
Epoch 52/70

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✓ 1h

Epoch 34/70
65/65 [=====] - 44s 674ms/step - loss: 0.1737 - accuracy: 0.9201 - val_loss: 0.5165 - val_accuracy: 0.8340
Epoch 35/70
65/65 [=====] - 44s 674ms/step - loss: 0.1593 - accuracy: 0.9264 - val_loss: 0.4854 - val_accuracy: 0.8223
Epoch 36/70
65/65 [=====] - 47s 718ms/step - loss: 0.1445 - accuracy: 0.9326 - val_loss: 0.6579 - val_accuracy: 0.8145
Epoch 37/70
65/65 [=====] - 45s 692ms/step - loss: 0.1531 - accuracy: 0.9220 - val_loss: 0.6994 - val_accuracy: 0.8066
Epoch 38/70
65/65 [=====] - 46s 699ms/step - loss: 0.1431 - accuracy: 0.9293 - val_loss: 0.5204 - val_accuracy: 0.8320
Epoch 39/70
65/65 [=====] - 45s 687ms/step - loss: 0.1555 - accuracy: 0.9220 - val_loss: 0.5242 - val_accuracy: 0.8398
Epoch 40/70
65/65 [=====] - 45s 683ms/step - loss: 0.1401 - accuracy: 0.9360 - val_loss: 0.7566 - val_accuracy: 0.7969
Epoch 41/70
65/65 [=====] - 44s 679ms/step - loss: 0.1599 - accuracy: 0.9216 - val_loss: 0.5807 - val_accuracy: 0.8086
Epoch 42/70
65/65 [=====] - 44s 677ms/step - loss: 0.1606 - accuracy: 0.9254 - val_loss: 0.5479 - val_accuracy: 0.8652
Epoch 43/70
65/65 [=====] - 45s 697ms/step - loss: 0.1553 - accuracy: 0.9278 - val_loss: 1.0050 - val_accuracy: 0.7461
Epoch 44/70
65/65 [=====] - 46s 714ms/step - loss: 0.1624 - accuracy: 0.9278 - val_loss: 1.0791 - val_accuracy: 0.7324
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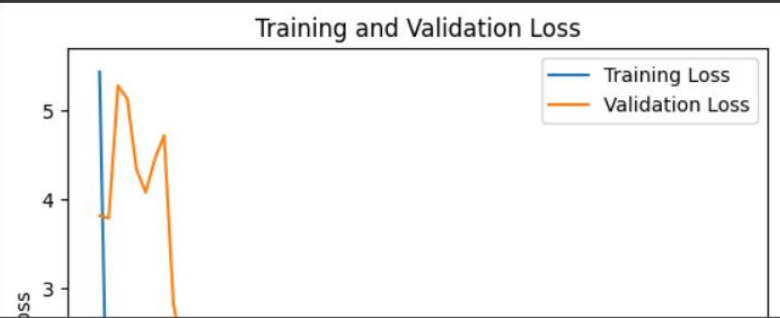
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```
1 # Plot the loss vs val_loss
2 plt.plot(history.history['loss'], label='Training Loss')
3 plt.plot(history.history['val_loss'], label='Validation Loss')
4 plt.title('Training and Validation Loss')
5 plt.xlabel('Epochs')
6 plt.ylabel('Loss')
7 plt.legend()
8 plt.show()
9
10 # Plot the accuracy vs val_accuracy
11 plt.plot(history.history['accuracy'], label='Training Accuracy')
12 plt.plot(history.history['val_accuracy'], label='Validation Accuracy')
13 plt.title('Training and Validation Accuracy')
14 plt.xlabel('Epochs')
15 plt.ylabel('Accuracy')
16 plt.legend()
17 plt.show()
```



Epochs	Training Loss	Validation Loss
1	5.2	3.8
2	3.8	5.5
3	5.5	4.2
4	4.2	5.5
5	4.2	3.2
6	4.2	4.5

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1s

Training and Validation Loss

Epochs	Training Loss	Validation Loss
0	5.5	3.8
10	0.3	0.8
20	0.2	0.5
30	0.2	0.6
40	0.2	0.7
50	0.2	0.6
60	0.2	0.5
70	0.2	2.0

Training and Validation Accuracy

Epochs	Training Accuracy	Validation Accuracy
0	0.85	0.85
10	0.90	0.88
20	0.92	0.90
30	0.93	0.91
40	0.94	0.92
50	0.95	0.93
60	0.96	0.94
70	0.98	0.95

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1s

Training and Validation Accuracy

Epochs	Training Accuracy	Validation Accuracy
0	0.78	0.55
10	0.90	0.75
20	0.92	0.85
30	0.91	0.82
40	0.93	0.80
50	0.94	0.83
60	0.93	0.82
70	0.95	0.85

26s

[39] 1 # Evaluate the model on the testing data
2 test_loss, test_acc = model.evaluate(test_generator, verbose=2)
3 print('Test Accuracy:', test_acc)
4 # Print the train and test loss
5 print('Train Loss:', history.history['loss'][-1])
6 print('Test Loss:', test_loss)

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26s

```
1 # Evaluate the model on the testing data
2 test_loss, test_acc = model.evaluate(test_generator, verbose=2)
3 print('Test Accuracy:', test_acc)
4 # Print the train and test loss
5 print('Train Loss:', history.history['loss'][-1])
6 print('Test Loss:', test_loss)
7 print('Test Accuracy:', test_acc)
8 # Plot the train and validation loss over epochs
9 plt.plot(history.history['loss'])
10 plt.plot(history.history['val_loss'])
11 plt.title('Model Loss')
12 plt.xlabel('Epochs')
13 plt.ylabel('Loss')
14 plt.legend(['Train', 'Validation'])
15 plt.show()
```

1/1 - 22s - loss: 1.0056 - accuracy: 0.8263 - 22s/epoch - 22s/step

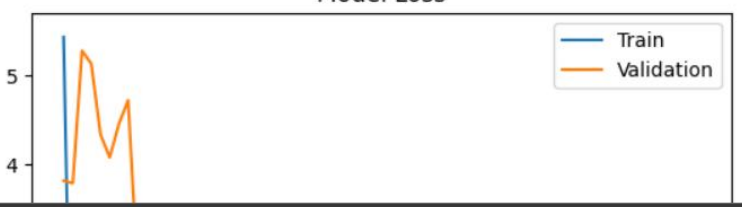
Test Accuracy: 0.8262839913368225

Train Loss: 0.1245984137058258

Test Loss: 1.0056229829788208

Test Accuracy: 0.8262839913368225

Model Loss



Epoch	Train Loss	Validation Loss
1	5.2	3.8
2	5.1	5.3
3	4.8	4.5
4	4.6	4.2
5	4.5	4.1

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✓ [39] 26s

Test Loss: 1.0056229829788208
Test Accuracy: 0.8262839913368225

Model Loss

Epoch	Train Loss	Validation Loss
0	5.5	3.8
5	0.3	5.5
10	0.2	0.8
20	0.2	0.6
30	0.2	1.8
40	0.2	0.6
50	0.2	0.6
60	0.2	0.5
70	0.2	2.0

✓ [40] 9s

```
1 # Evaluate the model on the testing data
2 test_loss, test_acc = model.evaluate(test_generator, verbose=2)
3 print('Test Accuracy:', test_acc)
4
```

0s completed at 23:20

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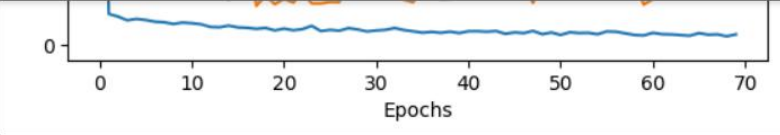
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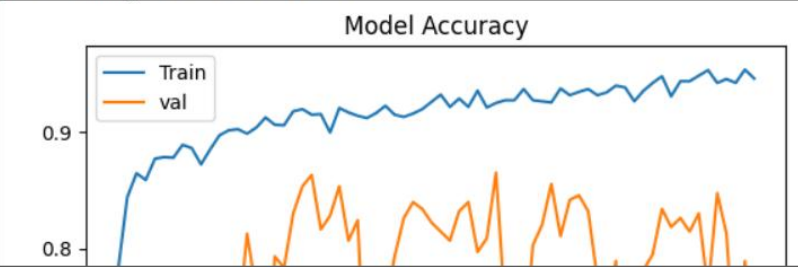
✓ [39] 26s



✓ [40] 9s

```
1 # Evaluate the model on the testing data
2 test_loss, test_acc = model.evaluate(test_generator, verbose=2)
3 print('Test Accuracy:', test_acc)
4
5 # Plot the training and testing accuracy
6 plt.plot(history.history['accuracy'])
7 plt.plot(history.history['val_accuracy'])
8 plt.title('Model Accuracy')
9 plt.xlabel('Epoch')
10 plt.ylabel('Accuracy')
11 plt.legend(['Train', 'val'], loc='upper left')
12 plt.show()
```

1/1 - 5s - loss: 1.0056 - accuracy: 0.8263 - 5s/epoch - 5s/step
Test Accuracy: 0.8262839913368225



✓ 0s completed at 23:20

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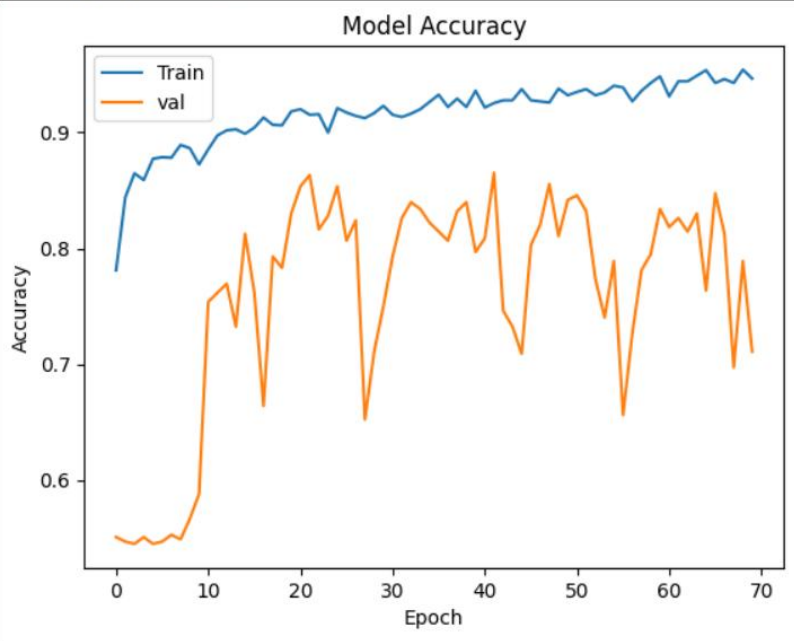
[40] 11 plt.legend(['Train', 'val'], loc='upper left')

12 plt.show()

1/1 - 5s - loss: 1.0056 - accuracy: 0.8263 - 5s/epoch - 5s/step

Test Accuracy: 0.8262839913368225

Model Accuracy



Epoch	Train Accuracy	val Accuracy
0	0.78	0.55
10	0.90	0.85
20	0.92	0.82
30	0.93	0.80
40	0.94	0.82
50	0.93	0.80
60	0.94	0.82
70	0.95	0.72

[41] 1 import matplotlib.pyplot as plt

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conv2_block2_1_bn (BatchNorma

Fix TypeError: next() takes 1 posi

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✓ 13s

```
1 import matplotlib.pyplot as plt
2
3 # Get the next batch of images from the test generator
4 x_test, y_test = next(test_generator)
5
6 # Predict the classes of the testing data
7 y_pred = model.predict(x_test)
8 y_pred_classes = np.argmax(y_pred, axis=1)
9 y_true_classes = np.argmax(y_test, axis=1)
10 label_dict = {0: 'benign', 1: 'malignant'}
11
12 # Plot the images along with their predicted and actual labels
13 fig, axes = plt.subplots(nrows=4, ncols=4, figsize=(12,12))
14 for i, ax in enumerate(axes.flat):
15     ax.imshow(x_test[i])
16     pred_label = label_dict[y_pred_classes[i]]
17     true_label = label_dict[y_true_classes[i]]
18     ax.set_title("Pred: {}\nTrue: {}".format(pred_label, true_label))
19     ax.axis('off')
20 plt.tight_layout()
21 plt.show()
22
23
```

21/21 [=====] - 4s 138ms/step

Pred: benign
True: malignant

Pred: benign
True: benign

Pred: benign
True: benign

Pred: benign
True: malignant

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21/21 [=====] - 4s 138ms/step

✓ 13s

Pred: benign
True: malignant

Pred: benign
True: benign

Pred: benign
True: benign

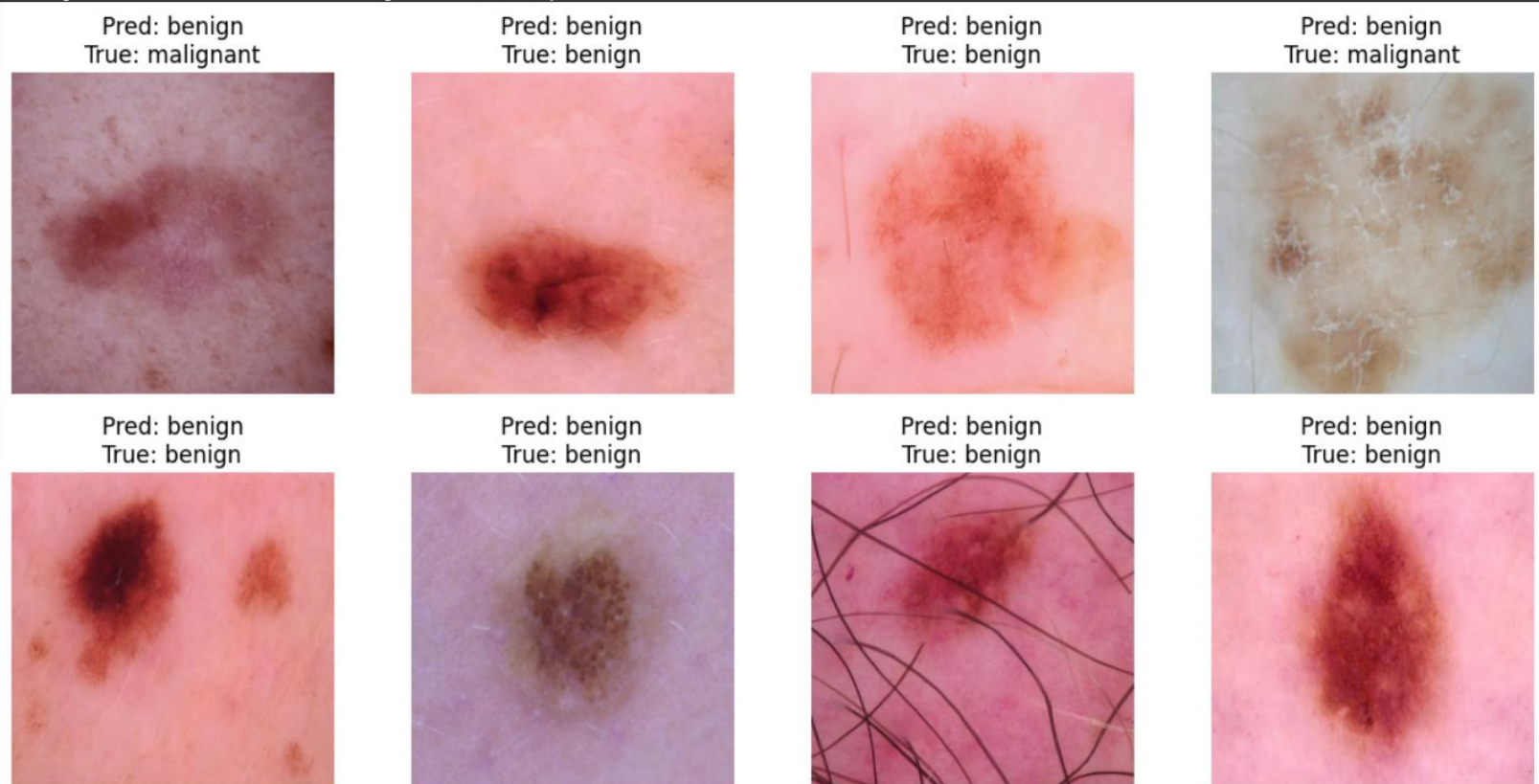
Pred: benign
True: malignant

Pred: benign
True: benign

Pred: benign
True: benign

Pred: benign
True: benign

Pred: benign
True: benign



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Fix TypeError: next() takes 1 posi

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```
1 # Create confusion matrix
2 cm = confusion_matrix(y_true_classes, y_pred_classes)
3
4 # Plot confusion matrix
5 sns.heatmap(cm, annot=True, fmt='d', cmap='Blues')
6 plt.title('Confusion Matrix')
7 plt.xlabel('Predicted Label')
8 plt.ylabel('True Label')
9 plt.show()
```

Confusion Matrix

	0	1
0	342	18
1	97	205

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Fix TypeError: next() takes 1 positi

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[44]

8 plt.ylabel('True Label')
9 plt.show()

Confusion Matrix

	Predicted Label 0	Predicted Label 1
True Label 0	342	18
True Label 1	97	205

[] 1

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