```
# ================================
# STEP 1: Install required libraries
# ================================
!pip install torch torchvision pillow

# ================================
# STEP 2: Imports
# ================================
import torch
import torchvision.transforms as transforms
from torchvision import models
from PIL import Image
import os

# ================================
# STEP 3: Load PRETRAINED DenseNet121
# ================================
model = models.densenet121(pretrained=True)

# Modify final layer for 5 classes (your dataset)
num_classes = 5
model.classifier = torch.nn.Linear(model.classifier.in_features, num_classes)

model.eval()     # inference mode
model = model.to("cpu")

# ================================
# STEP 4: Class labels (MUST MATCH FOLDERS)
# ================================
class_names = [
    "lung_cancer",
    "fracture",
    "pneumonia",
    "tuberculosis",
    "normal"
]

# ================================
# STEP 5: Image preprocessing (X-ray standard)
# ================================
transform = transforms.Compose([
    transforms.Resize((224, 224)),
    transforms.Grayscale(num_output_channels=3),
    transforms.ToTensor(),
    transforms.Normalize(
        mean=[0.485, 0.456, 0.406],
        std=[0.229, 0.224, 0.225]
    )
])

# ================================
# STEP 6: Load images and predict
# ================================
dataset_dir = "xray_dataset"

print("\n🔍 X-RAY DISEASE PREDICTIONS\n")

with torch.no_grad():
    for label in os.listdir(dataset_dir):
        label_path = os.path.join(dataset_dir, label)

        if not os.path.isdir(label_path):
            continue

        for img_name in os.listdir(label_path):
            img_path = os.path.join(label_path, img_name)

            image = Image.open(img_path).convert("RGB")
            image = transform(image).unsqueeze(0)

            outputs = model(image)
            _, predicted = torch.max(outputs, 1)

            print(f"Image: {img_name}")
            print(f"Actual Label: {label}")
            print(f"Predicted Label: {class_names[predicted.item()]}")
            print("-" * 40)
```

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  warnings.warn(
/usr/local/lib/python3.12/dist-packages/torchvision/models/_utils.py:223: UserWarning: Arguments othe
  warnings.warn(msg)
Downloading: "https://download.pytorch.org/models/densenet121-a639ec97.pth" to /root/.cache/torch/hub
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🔍 X-RAY DISEASE PREDICTIONS

Image: pneumonia_1.png
Actual Label: pneumonia
Predicted Label: tuberculosis
----------------------------------------
Image: pneumonia_3.png
Actual Label: pneumonia
Predicted Label: lung_cancer
----------------------------------------
Image: pneumonia_2.png
Actual Label: pneumonia
Predicted Label: tuberculosis
----------------------------------------
Image: normal_2.png
Actual Label: normal
Predicted Label: lung_cancer
----------------------------------------
Image: normal_1.png
Actual Label: normal
Predicted Label: lung_cancer
```

```
import shutil

shutil.make_archive("xray_dataset", "zip", "xray_dataset")
```

```
'/content/xray_dataset.zip'
```