```python
# Importing the ZipFile module to handle ZIP file extraction
from zipfile import ZipFile

file_name = '/content/skincancer.zip'

# Opening and extracting the contents of the ZIP file
with ZipFile(file_name, 'r') as zip:
  # Extract all the files in the ZIP archive to the current working
directory
  zip.extractall()
  print('Done')
```

```
Done
```

```python
# 'fastai' is a deep learning library built on top of PyTorch
!pip install fastai
```

```
Requirement already satisfied: fastai in
/usr/local/lib/python3.11/dist-packages (2.7.18)
Requirement already satisfied: pip in /usr/local/lib/python3.11/dist-
packages (from fastai) (24.1.2)
Requirement already satisfied: packaging in
/usr/local/lib/python3.11/dist-packages (from fastai) (24.2)
Requirement already satisfied: fastdownload<2,>=0.0.5 in
/usr/local/lib/python3.11/dist-packages (from fastai) (0.0.7)
Requirement already satisfied: fastcore<1.8,>=1.5.29 in
/usr/local/lib/python3.11/dist-packages (from fastai) (1.7.29)
Requirement already satisfied: torchvision>=0.11 in
/usr/local/lib/python3.11/dist-packages (from fastai) (0.20.1+cu124)
Requirement already satisfied: matplotlib in
/usr/local/lib/python3.11/dist-packages (from fastai) (3.10.0)
Requirement already satisfied: pandas in
/usr/local/lib/python3.11/dist-packages (from fastai) (2.2.2)
Requirement already satisfied: requests in
/usr/local/lib/python3.11/dist-packages (from fastai) (2.32.3)
Requirement already satisfied: pyyaml in
/usr/local/lib/python3.11/dist-packages (from fastai) (6.0.2)
Requirement already satisfied: fastprogress>=0.2.4 in
/usr/local/lib/python3.11/dist-packages (from fastai) (1.0.3)
Requirement already satisfied: pillow>=9.0.0 in
/usr/local/lib/python3.11/dist-packages (from fastai) (11.1.0)
Requirement already satisfied: scikit-learn in
/usr/local/lib/python3.11/dist-packages (from fastai) (1.6.1)
Requirement already satisfied: scipy in
/usr/local/lib/python3.11/dist-packages (from fastai) (1.13.1)
Requirement already satisfied: spacy<4 in
/usr/local/lib/python3.11/dist-packages (from fastai) (3.7.5)
Requirement already satisfied: torch<2.6,>=1.10 in
/usr/local/lib/python3.11/dist-packages (from fastai) (2.5.1+cu124)
Requirement already satisfied: spacy-legacy<3.1.0,>=3.0.11 in
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/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai)
(3.0.12)
Requirement already satisfied: spacy-loggers<2.0.0,>=1.0.0 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai) (1.0.5)
Requirement already satisfied: murmurhash<1.1.0,>=0.28.0 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai)
(1.0.12)
Requirement already satisfied: cymem<2.1.0,>=2.0.2 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai)
(2.0.11)
Requirement already satisfied: preshed<3.1.0,>=3.0.2 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai) (3.0.9)
Requirement already satisfied: thinc<8.3.0,>=8.2.2 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai) (8.2.5)
Requirement already satisfied: wasabi<1.2.0,>=0.9.1 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai) (1.1.3)
Requirement already satisfied: srsly<3.0.0,>=2.4.3 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai) (2.5.1)
Requirement already satisfied: catalogue<2.1.0,>=2.0.6 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai)
(2.0.10)
Requirement already satisfied: weasel<0.5.0,>=0.1.0 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai) (0.4.1)
Requirement already satisfied: typer<1.0.0,>=0.3.0 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai)
(0.15.1)
Requirement already satisfied: tqdm<5.0.0,>=4.38.0 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai)
(4.67.1)
Requirement already satisfied: pydantic!=1.8,!=1.8.1,<3.0.0,>=1.7.4 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai)
(2.10.6)
Requirement already satisfied: jinja2 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai) (3.1.5)
Requirement already satisfied: setuptools in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai)
(75.1.0)
Requirement already satisfied: langcodes<4.0.0,>=3.2.0 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai) (3.5.0)
Requirement already satisfied: numpy>=1.19.0 in
/usr/local/lib/python3.11/dist-packages (from spacy<4->fastai)
(1.26.4)
Requirement already satisfied: charset-normalizer<4,>=2 in
/usr/local/lib/python3.11/dist-packages (from requests->fastai)
(3.4.1)
Requirement already satisfied: idna<4,>=2.5 in
/usr/local/lib/python3.11/dist-packages (from requests->fastai) (3.10)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/usr/local/lib/python3.11/dist-packages (from requests->fastai)
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(2.3.0)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.11/dist-packages (from requests->fastai)
(2025.1.31)
Requirement already satisfied: filelock in
/usr/local/lib/python3.11/dist-packages (from torch<2.6,>=1.10-
>fastai) (3.17.0)
Requirement already satisfied: typing-extensions>=4.8.0 in
/usr/local/lib/python3.11/dist-packages (from torch<2.6,>=1.10-
>fastai) (4.12.2)
Requirement already satisfied: networkx in
/usr/local/lib/python3.11/dist-packages (from torch<2.6,>=1.10-
>fastai) (3.4.2)
Requirement already satisfied: fsspec in
/usr/local/lib/python3.11/dist-packages (from torch<2.6,>=1.10-
>fastai) (2024.10.0)
Collecting nvidia-cuda-nvrtc-cu12==12.4.127 (from torch<2.6,>=1.10-
>fastai)
  Downloading nvidia_cuda_nvrtc_cu12-12.4.127-py3-none-
manylinux2014_x86_64.whl.metadata (1.5 kB)
Collecting nvidia-cuda-runtime-cu12==12.4.127 (from torch<2.6,>=1.10-
>fastai)
  Downloading nvidia_cuda_runtime_cu12-12.4.127-py3-none-
manylinux2014_x86_64.whl.metadata (1.5 kB)
Collecting nvidia-cuda-cupti-cu12==12.4.127 (from torch<2.6,>=1.10-
>fastai)
  Downloading nvidia_cuda_cupti_cu12-12.4.127-py3-none-
manylinux2014_x86_64.whl.metadata (1.6 kB)
Collecting nvidia-cudnn-cu12==9.1.0.70 (from torch<2.6,>=1.10->fastai)
  Downloading nvidia_cudnn_cu12-9.1.0.70-py3-none-
manylinux2014_x86_64.whl.metadata (1.6 kB)
Collecting nvidia-cublas-cu12==12.4.5.8 (from torch<2.6,>=1.10-
>fastai)
  Downloading nvidia_cublas_cu12-12.4.5.8-py3-none-
manylinux2014_x86_64.whl.metadata (1.5 kB)
Collecting nvidia-cufft-cu12==11.2.1.3 (from torch<2.6,>=1.10->fastai)
  Downloading nvidia_cufft_cu12-11.2.1.3-py3-none-
manylinux2014_x86_64.whl.metadata (1.5 kB)
Collecting nvidia-curand-cu12==10.3.5.147 (from torch<2.6,>=1.10-
>fastai)
  Downloading nvidia_curand_cu12-10.3.5.147-py3-none-
manylinux2014_x86_64.whl.metadata (1.5 kB)
Collecting nvidia-cusolver-cu12==11.6.1.9 (from torch<2.6,>=1.10-
>fastai)
  Downloading nvidia_cusolver_cu12-11.6.1.9-py3-none-
manylinux2014_x86_64.whl.metadata (1.6 kB)
Collecting nvidia-cusparse-cu12==12.3.1.170 (from torch<2.6,>=1.10-
>fastai)
  Downloading nvidia_cusparse_cu12-12.3.1.170-py3-none-
```

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manylinux2014_x86_64.whl.metadata (1.6 kB)
Requirement already satisfied: nvidia-nccl-cu12==2.21.5 in
/usr/local/lib/python3.11/dist-packages (from torch<2.6,>=1.10-
>fastai) (2.21.5)
Requirement already satisfied: nvidia-nvtx-cu12==12.4.127 in
/usr/local/lib/python3.11/dist-packages (from torch<2.6,>=1.10-
>fastai) (12.4.127)
Collecting nvidia-nvjitlink-cu12==12.4.127 (from torch<2.6,>=1.10-
>fastai)
  Downloading nvidia_nvjitlink_cu12-12.4.127-py3-none-
manylinux2014_x86_64.whl.metadata (1.5 kB)
Requirement already satisfied: triton==3.1.0 in
/usr/local/lib/python3.11/dist-packages (from torch<2.6,>=1.10-
>fastai) (3.1.0)
Requirement already satisfied: sympy==1.13.1 in
/usr/local/lib/python3.11/dist-packages (from torch<2.6,>=1.10-
>fastai) (1.13.1)
Requirement already satisfied: mpmath<1.4,>=1.1.0 in
/usr/local/lib/python3.11/dist-packages (from sympy==1.13.1-
>torch<2.6,>=1.10->fastai) (1.3.0)
Requirement already satisfied: contourpy>=1.0.1 in
/usr/local/lib/python3.11/dist-packages (from matplotlib->fastai)
(1.3.1)
Requirement already satisfied: cycler>=0.10 in
/usr/local/lib/python3.11/dist-packages (from matplotlib->fastai)
(0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in
/usr/local/lib/python3.11/dist-packages (from matplotlib->fastai)
(4.56.0)
Requirement already satisfied: kiwisolver>=1.3.1 in
/usr/local/lib/python3.11/dist-packages (from matplotlib->fastai)
(1.4.8)
Requirement already satisfied: pyparsing>=2.3.1 in
/usr/local/lib/python3.11/dist-packages (from matplotlib->fastai)
(3.2.1)
Requirement already satisfied: python-dateutil>=2.7 in
/usr/local/lib/python3.11/dist-packages (from matplotlib->fastai)
(2.8.2)
Requirement already satisfied: pytz>=2020.1 in
/usr/local/lib/python3.11/dist-packages (from pandas->fastai) (2025.1)
Requirement already satisfied: tzdata>=2022.7 in
/usr/local/lib/python3.11/dist-packages (from pandas->fastai) (2025.1)
Requirement already satisfied: joblib>=1.2.0 in
/usr/local/lib/python3.11/dist-packages (from scikit-learn->fastai)
(1.4.2)
Requirement already satisfied: threadpoolctl>=3.1.0 in
/usr/local/lib/python3.11/dist-packages (from scikit-learn->fastai)
(3.5.0)
Requirement already satisfied: language-data>=1.2 in
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/usr/local/lib/python3.11/dist-packages (from langcodes<4.0.0,>=3.2.0-
>spacy<4->fastai) (1.3.0)
Requirement already satisfied: annotated-types>=0.6.0 in
/usr/local/lib/python3.11/dist-packages (from pydantic!=1.8,!
=1.8.1,<3.0.0,>=1.7.4->spacy<4->fastai) (0.7.0)
Requirement already satisfied: pydantic-core==2.27.2 in
/usr/local/lib/python3.11/dist-packages (from pydantic!=1.8,!
=1.8.1,<3.0.0,>=1.7.4->spacy<4->fastai) (2.27.2)
Requirement already satisfied: six>=1.5 in
/usr/local/lib/python3.11/dist-packages (from python-dateutil>=2.7-
>matplotlib->fastai) (1.17.0)
Requirement already satisfied: blis<0.8.0,>=0.7.8 in
/usr/local/lib/python3.11/dist-packages (from thinc<8.3.0,>=8.2.2-
>spacy<4->fastai) (0.7.11)
Requirement already satisfied: confection<1.0.0,>=0.0.1 in
/usr/local/lib/python3.11/dist-packages (from thinc<8.3.0,>=8.2.2-
>spacy<4->fastai) (0.1.5)
Requirement already satisfied: click>=8.0.0 in
/usr/local/lib/python3.11/dist-packages (from typer<1.0.0,>=0.3.0-
>spacy<4->fastai) (8.1.8)
Requirement already satisfied: shellingham>=1.3.0 in
/usr/local/lib/python3.11/dist-packages (from typer<1.0.0,>=0.3.0-
>spacy<4->fastai) (1.5.4)
Requirement already satisfied: rich>=10.11.0 in
/usr/local/lib/python3.11/dist-packages (from typer<1.0.0,>=0.3.0-
>spacy<4->fastai) (13.9.4)
Requirement already satisfied: cloudpathlib<1.0.0,>=0.7.0 in
/usr/local/lib/python3.11/dist-packages (from weasel<0.5.0,>=0.1.0-
>spacy<4->fastai) (0.20.0)
Requirement already satisfied: smart-open<8.0.0,>=5.2.1 in
/usr/local/lib/python3.11/dist-packages (from weasel<0.5.0,>=0.1.0-
>spacy<4->fastai) (7.1.0)
Requirement already satisfied: MarkupSafe>=2.0 in
/usr/local/lib/python3.11/dist-packages (from jinja2->spacy<4->fastai)
(3.0.2)
Requirement already satisfied: marisa-trie>=1.1.0 in
/usr/local/lib/python3.11/dist-packages (from language-data>=1.2-
>langcodes<4.0.0,>=3.2.0->spacy<4->fastai) (1.2.1)
Requirement already satisfied: markdown-it-py>=2.2.0 in
/usr/local/lib/python3.11/dist-packages (from rich>=10.11.0-
>typer<1.0.0,>=0.3.0->spacy<4->fastai) (3.0.0)
Requirement already satisfied: pygments<3.0.0,>=2.13.0 in
/usr/local/lib/python3.11/dist-packages (from rich>=10.11.0-
>typer<1.0.0,>=0.3.0->spacy<4->fastai) (2.18.0)
Requirement already satisfied: wrapt in
/usr/local/lib/python3.11/dist-packages (from smart-
open<8.0.0,>=5.2.1->weasel<0.5.0,>=0.1.0->spacy<4->fastai) (1.17.2)
Requirement already satisfied: mdurl~=0.1 in
/usr/local/lib/python3.11/dist-packages (from markdown-it-py>=2.2.0-
```

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>rich>=10.11.0->typer<1.0.0,>=0.3.0->spacy<4->fastai) (0.1.2)
Downloading nvidia_cublas_cu12-12.4.5.8-py3-none-
manylinux2014_x86_64.whl (363.4 MB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 363.4/363.4 MB 4.0 MB/s eta
0:00:00
anylinux2014_x86_64.whl (13.8 MB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 13.8/13.8 MB 110.6 MB/s eta
0:00:00
anylinux2014_x86_64.whl (24.6 MB)
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0:00:00
e_cu12-12.4.127-py3-none-manylinux2014_x86_64.whl (883 kB)
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0:00:00
anylinux2014_x86_64.whl (664.8 MB)
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0:00:00
anylinux2014_x86_64.whl (211.5 MB)
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0:00:00
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0:00:00
anylinux2014_x86_64.whl (127.9 MB)
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0:00:00
anylinux2014_x86_64.whl (207.5 MB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 207.5/207.5 MB 6.0 MB/s eta
0:00:00
anylinux2014_x86_64.whl (21.1 MB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 21.1/21.1 MB 86.4 MB/s eta
0:00:00
e-cu12, nvidia-cuda-nvrtc-cu12, nvidia-cuda-cupti-cu12, nvidia-cublas-
cu12, nvidia-cusparse-cu12, nvidia-cudnn-cu12, nvidia-cusolver-cu12
  Attempting uninstall: nvidia-nvjitlink-cu12
    Found existing installation: nvidia-nvjitlink-cu12 12.5.82
    Uninstalling nvidia-nvjitlink-cu12-12.5.82:
      Successfully uninstalled nvidia-nvjitlink-cu12-12.5.82
  Attempting uninstall: nvidia-curand-cu12
    Found existing installation: nvidia-curand-cu12 10.3.6.82
    Uninstalling nvidia-curand-cu12-10.3.6.82:
      Successfully uninstalled nvidia-curand-cu12-10.3.6.82
  Attempting uninstall: nvidia-cufft-cu12
    Found existing installation: nvidia-cufft-cu12 11.2.3.61
    Uninstalling nvidia-cufft-cu12-11.2.3.61:
      Successfully uninstalled nvidia-cufft-cu12-11.2.3.61
  Attempting uninstall: nvidia-cuda-runtime-cu12
    Found existing installation: nvidia-cuda-runtime-cu12 12.5.82
    Uninstalling nvidia-cuda-runtime-cu12-12.5.82:
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```
      Successfully uninstalled nvidia-cuda-runtime-cu12-12.5.82
  Attempting uninstall: nvidia-cuda-nvrtc-cu12
    Found existing installation: nvidia-cuda-nvrtc-cu12 12.5.82
    Uninstalling nvidia-cuda-nvrtc-cu12-12.5.82:
      Successfully uninstalled nvidia-cuda-nvrtc-cu12-12.5.82
  Attempting uninstall: nvidia-cuda-cupti-cu12
    Found existing installation: nvidia-cuda-cupti-cu12 12.5.82
    Uninstalling nvidia-cuda-cupti-cu12-12.5.82:
      Successfully uninstalled nvidia-cuda-cupti-cu12-12.5.82
  Attempting uninstall: nvidia-cublas-cu12
    Found existing installation: nvidia-cublas-cu12 12.5.3.2
    Uninstalling nvidia-cublas-cu12-12.5.3.2:
      Successfully uninstalled nvidia-cublas-cu12-12.5.3.2
  Attempting uninstall: nvidia-cusparse-cu12
    Found existing installation: nvidia-cusparse-cu12 12.5.1.3
    Uninstalling nvidia-cusparse-cu12-12.5.1.3:
      Successfully uninstalled nvidia-cusparse-cu12-12.5.1.3
  Attempting uninstall: nvidia-cudnn-cu12
    Found existing installation: nvidia-cudnn-cu12 9.3.0.75
    Uninstalling nvidia-cudnn-cu12-9.3.0.75:
      Successfully uninstalled nvidia-cudnn-cu12-9.3.0.75
  Attempting uninstall: nvidia-cusolver-cu12
    Found existing installation: nvidia-cusolver-cu12 11.6.3.83
    Uninstalling nvidia-cusolver-cu12-11.6.3.83:
      Successfully uninstalled nvidia-cusolver-cu12-11.6.3.83
Successfully installed nvidia-cublas-cu12-12.4.5.8 nvidia-cuda-cupti-
cu12-12.4.127 nvidia-cuda-nvrtc-cu12-12.4.127 nvidia-cuda-runtime-
cu12-12.4.127 nvidia-cudnn-cu12-9.1.0.70 nvidia-cufft-cu12-11.2.1.3
nvidia-curand-cu12-10.3.5.147 nvidia-cusolver-cu12-11.6.1.9 nvidia-
cusparse-cu12-12.3.1.170 nvidia-nvjitlink-cu12-12.4.127
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# 'timm' library provides a collection of pre-trained models and model
architectures
!pip install timm
```

```
Requirement already satisfied: timm in /usr/local/lib/python3.11/dist-
packages (1.0.15)
Requirement already satisfied: torch in
/usr/local/lib/python3.11/dist-packages (from timm) (2.5.1+cu124)
Requirement already satisfied: torchvision in
/usr/local/lib/python3.11/dist-packages (from timm) (0.20.1+cu124)
Requirement already satisfied: pyyaml in
/usr/local/lib/python3.11/dist-packages (from timm) (6.0.2)
Requirement already satisfied: huggingface_hub in
/usr/local/lib/python3.11/dist-packages (from timm) (0.28.1)
Requirement already satisfied: safetensors in
/usr/local/lib/python3.11/dist-packages (from timm) (0.5.3)
Requirement already satisfied: filelock in
/usr/local/lib/python3.11/dist-packages (from huggingface_hub->timm)
(3.17.0)
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Requirement already satisfied: fsspec>=2023.5.0 in
/usr/local/lib/python3.11/dist-packages (from huggingface_hub->timm)
(2024.10.0)
Requirement already satisfied: packaging>=20.9 in
/usr/local/lib/python3.11/dist-packages (from huggingface_hub->timm)
(24.2)
Requirement already satisfied: requests in
/usr/local/lib/python3.11/dist-packages (from huggingface_hub->timm)
(2.32.3)
Requirement already satisfied: tqdm>=4.42.1 in
/usr/local/lib/python3.11/dist-packages (from huggingface_hub->timm)
(4.67.1)
Requirement already satisfied: typing-extensions>=3.7.4.3 in
/usr/local/lib/python3.11/dist-packages (from huggingface_hub->timm)
(4.12.2)
Requirement already satisfied: networkx in
/usr/local/lib/python3.11/dist-packages (from torch->timm) (3.4.2)
Requirement already satisfied: jinja2 in
/usr/local/lib/python3.11/dist-packages (from torch->timm) (3.1.5)
Requirement already satisfied: nvidia-cuda-nvrtc-cu12==12.4.127 in
/usr/local/lib/python3.11/dist-packages (from torch->timm) (12.4.127)
Requirement already satisfied: nvidia-cuda-runtime-cu12==12.4.127
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/usr/local/lib/python3.11/dist-packages (from torch->timm) (12.4.127)
Requirement already satisfied: nvidia-cudnn-cu12==9.1.0.70 in
/usr/local/lib/python3.11/dist-packages (from torch->timm) (9.1.0.70)
Requirement already satisfied: nvidia-cublas-cu12==12.4.5.8 in
/usr/local/lib/python3.11/dist-packages (from torch->timm) (12.4.5.8)
Requirement already satisfied: nvidia-cufft-cu12==11.2.1.3 in
/usr/local/lib/python3.11/dist-packages (from torch->timm) (11.2.1.3)
Requirement already satisfied: nvidia-curand-cu12==10.3.5.147 in
/usr/local/lib/python3.11/dist-packages (from torch->timm)
(10.3.5.147)
Requirement already satisfied: nvidia-cusolver-cu12==11.6.1.9 in
/usr/local/lib/python3.11/dist-packages (from torch->timm) (11.6.1.9)
Requirement already satisfied: nvidia-cusparse-cu12==12.3.1.170 in
/usr/local/lib/python3.11/dist-packages (from torch->timm)
(12.3.1.170)
Requirement already satisfied: nvidia-nccl-cu12==2.21.5 in
/usr/local/lib/python3.11/dist-packages (from torch->timm) (2.21.5)
Requirement already satisfied: nvidia-nvtx-cu12==12.4.127 in
/usr/local/lib/python3.11/dist-packages (from torch->timm) (12.4.127)
Requirement already satisfied: nvidia-nvjitlink-cu12==12.4.127 in
/usr/local/lib/python3.11/dist-packages (from torch->timm) (12.4.127)
Requirement already satisfied: triton==3.1.0 in
/usr/local/lib/python3.11/dist-packages (from torch->timm) (3.1.0)
Requirement already satisfied: sympy==1.13.1 in
```

```
/usr/local/lib/python3.11/dist-packages (from torch->timm) (1.13.1)
Requirement already satisfied: mpmath<1.4,>=1.1.0 in
/usr/local/lib/python3.11/dist-packages (from sympy==1.13.1->torch-
>timm) (1.3.0)
Requirement already satisfied: numpy in
/usr/local/lib/python3.11/dist-packages (from torchvision->timm)
(1.26.4)
Requirement already satisfied: pillow!=8.3.*,>=5.3.0 in
/usr/local/lib/python3.11/dist-packages (from torchvision->timm)
(11.1.0)
Requirement already satisfied: MarkupSafe>=2.0 in
/usr/local/lib/python3.11/dist-packages (from jinja2->torch->timm)
(3.0.2)
Requirement already satisfied: charset-normalizer<4,>=2 in
/usr/local/lib/python3.11/dist-packages (from requests-
>huggingface_hub->timm) (3.4.1)
Requirement already satisfied: idna<4,>=2.5 in
/usr/local/lib/python3.11/dist-packages (from requests-
>huggingface_hub->timm) (3.10)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/usr/local/lib/python3.11/dist-packages (from requests-
>huggingface_hub->timm) (2.3.0)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.11/dist-packages (from requests-
>huggingface_hub->timm) (2025.1.31)
```

```
# Import essential components from the 'fastai' library for computer
vision tasks
from fastai.vision.all import *

# Import the 'torch.nn' module to access neural network layers and
functions from PyTorch
import torch.nn as nn
import timm

# 'nvidia-smi' command to display the status of the GPU, if available
!nvidia-smi
```

```
Wed Mar  5 16:08:45 2025
+-----------------------------------------------------------------------
--------------------+
| NVIDIA-SMI 550.54.15              Driver Version: 550.54.15
CUDA Version: 12.4     |
|-----------------------------------------+------------------------
+----------------------+
| GPU  Name                 Persistence-M | Bus-Id          Disp.A |
Volatile Uncorr. ECC |
| Fan  Temp   Perf          Pwr:Usage/Cap |           Memory-Usage |
GPU-Util  Compute M. |
|                                         |                        |
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====================|
|   0  Tesla T4                       Off |   00000000:00:04.0 Off |
0 |
| N/A   42C    P8             10W /   70W |       0MiB /  15360MiB |
0%      Default |
|                                         |                        |
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+-----------------------------------------+------------------------
+----------------------+


+-----------------------------------------------------------------------------
--------------------+
| Processes:
|
|  GPU   GI   CI        PID   Type   Process name
GPU Memory |
|        ID   ID
Usage      |
|
=============================================================================
====================|
|  No running processes found
|
+-----------------------------------------------------------------------------
--------------------+

path="/content/skincancer1/Skin cancer ISIC The International Skin
Imaging Collaboration/Train"

# Define a series of image augmentation transformations to apply to
the dataset
tfms = aug_transforms()

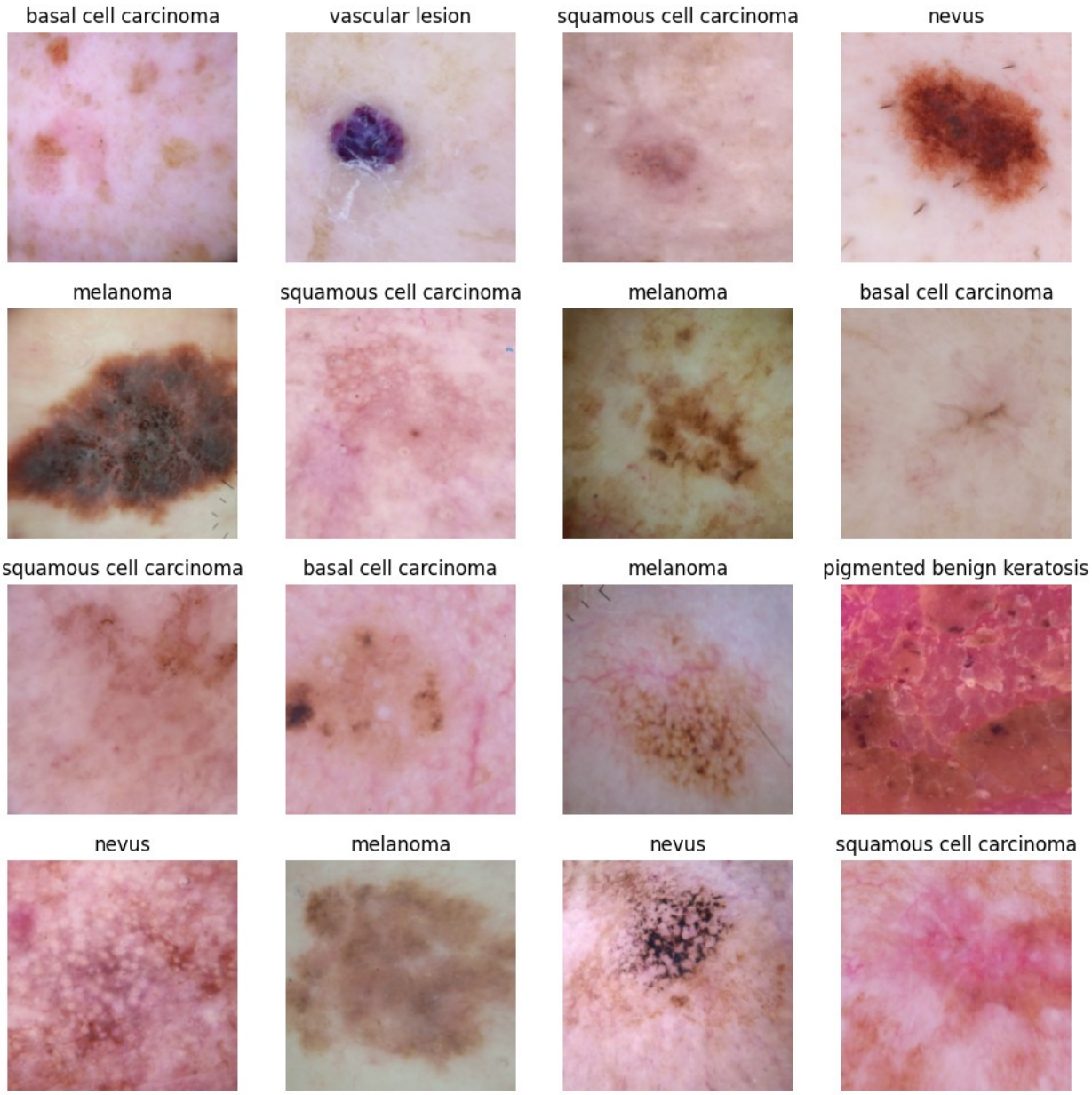
# Define a DataBlock for organizing and processing the dataset
dls = DataBlock(
    blocks=(ImageBlock, CategoryBlock),  # Define input as images and
output as categories (labels)
    get_items=get_image_files,           # Function to retrieve image
files from the dataset
    get_y=parent_label,                 # Function to retrieve labels
from folder structure (parent folder name)
    splitter=RandomSplitter(0.2, seed=50),  # Split the dataset into
training (80%) and validation (20%) sets
    item_tfms=Resize(226),              # Resize all images to 226x226
pixels as a preprocessing step
    batch_tfms=[*tfms, Normalize.from_stats(*imagenet_stats)]  # Apply
```

```
augmentation transforms and normalize images using ImageNet statistics
).dataloaders(path, bs=32)  # Create DataLoader objects with a batch
size of 32

# Print the class labels (vocabulary) used for the classification task
print(dls.vocab)
```

```
['basal cell carcinoma', 'dermatofibroma', 'melanoma', 'nevus',
'pigmented benign keratosis', 'squamous cell carcinoma', 'vascular
lesion']
```

```
# Display a batch of 16 images from the training set to visualize the
data
dls.show_batch(max_n=16)
```




```
# Create a vision learner using the ResNet18 architecture and the training/validation data (dls)
learn = vision_learner(dls, resnet18, metrics=accuracy)

# Fine-tune the model for 25 epochs (adjusting the pre-trained weights to the dataset)
learn.fine_tune(25)
```

```
Downloading: "https://download.pytorch.org/models/resnet18-f37072fd.pth" to /root/.cache/torch/hub/checkpoints/resnet18-f37072fd.pth
100%|██████████| 44.7M/44.7M [00:00<00:00, 70.7MB/s]
```

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```

```
# Unfreeze all layers of the model to allow further fine-tuning
learn.unfreeze()

# Train the model using the One Cycle learning rate policy for 10 epochs
# The learning rate range is set to vary from 1e-18 to 1e-7
learn.fit_one_cycle(10, lr_max=slice(1e-18, 1e-7))
```

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```
# Perform Test Time Augmentation (TTA) to evaluate the model on augmented test data
preds, targs = learn.tta()

# Calculate accuracy by comparing the predicted labels to the true labels
accuracy = (preds.argmax(dim=1) == targs).float().mean()

# Print the accuracy of the model using TTA
print(f'TTA Accuracy: {accuracy*100:.4f}%')
```

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TTA Accuracy: 80.6846%
```

```
# Create an interpretation object to analyze the model's predictions and errors
interp = ClassificationInterpretation.from_learner(learn)

# Plot the confusion matrix to visualize the performance of the model on the dataset
interp.plot_confusion_matrix()
```

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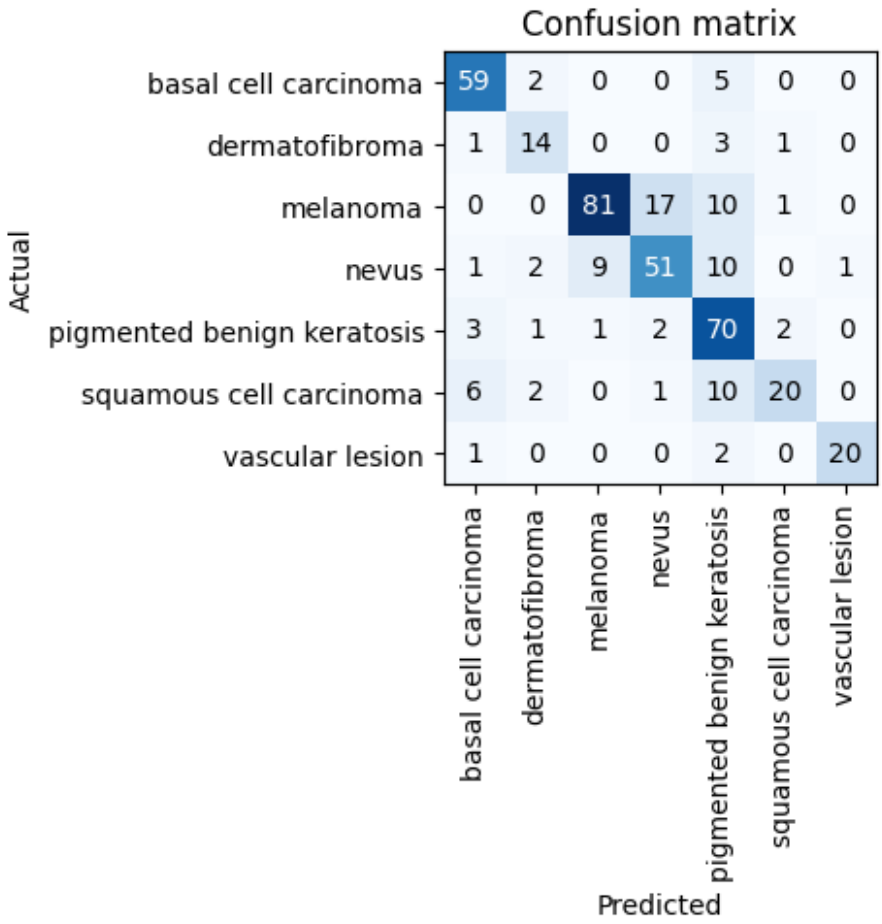


```
# Perform a learning rate finder to identify the optimal learning rate for training
learn.lr_find()

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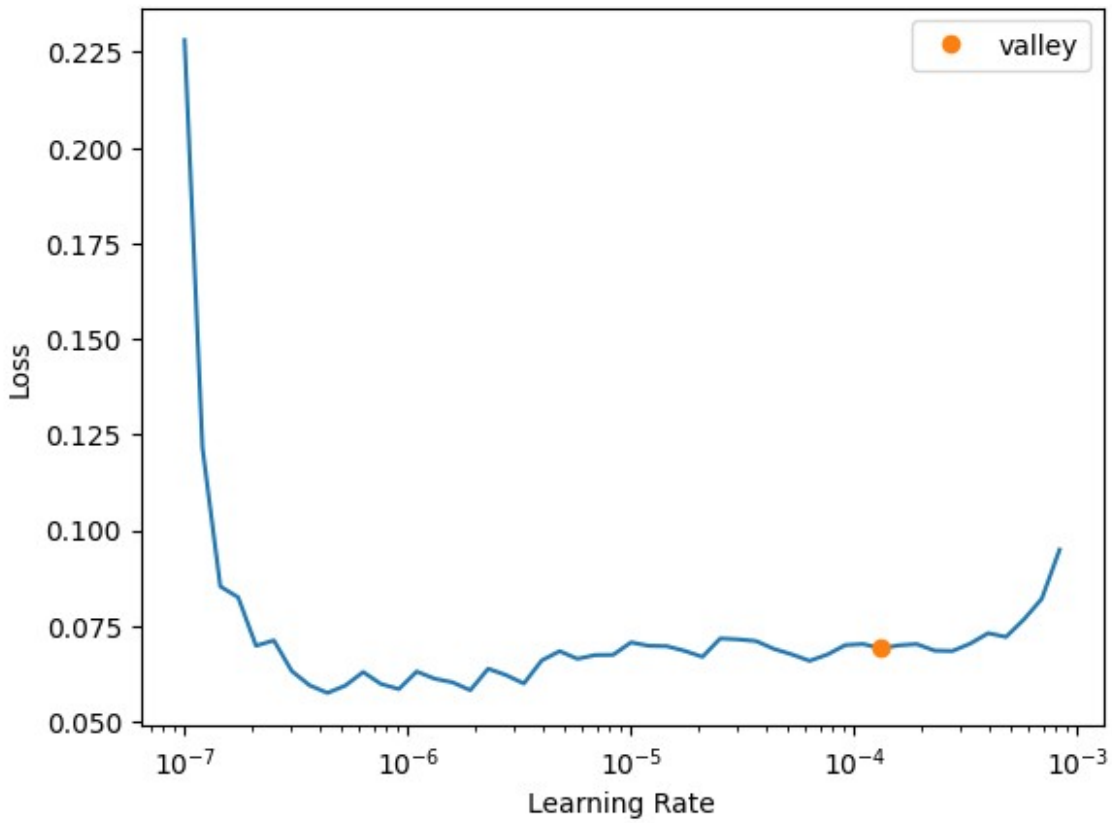
SuggestedLRs(valley=0.00013182566908653826)
```




```
# Display the model's predictions alongside the ground truth for a
sample of the data
learn.show_results()
```

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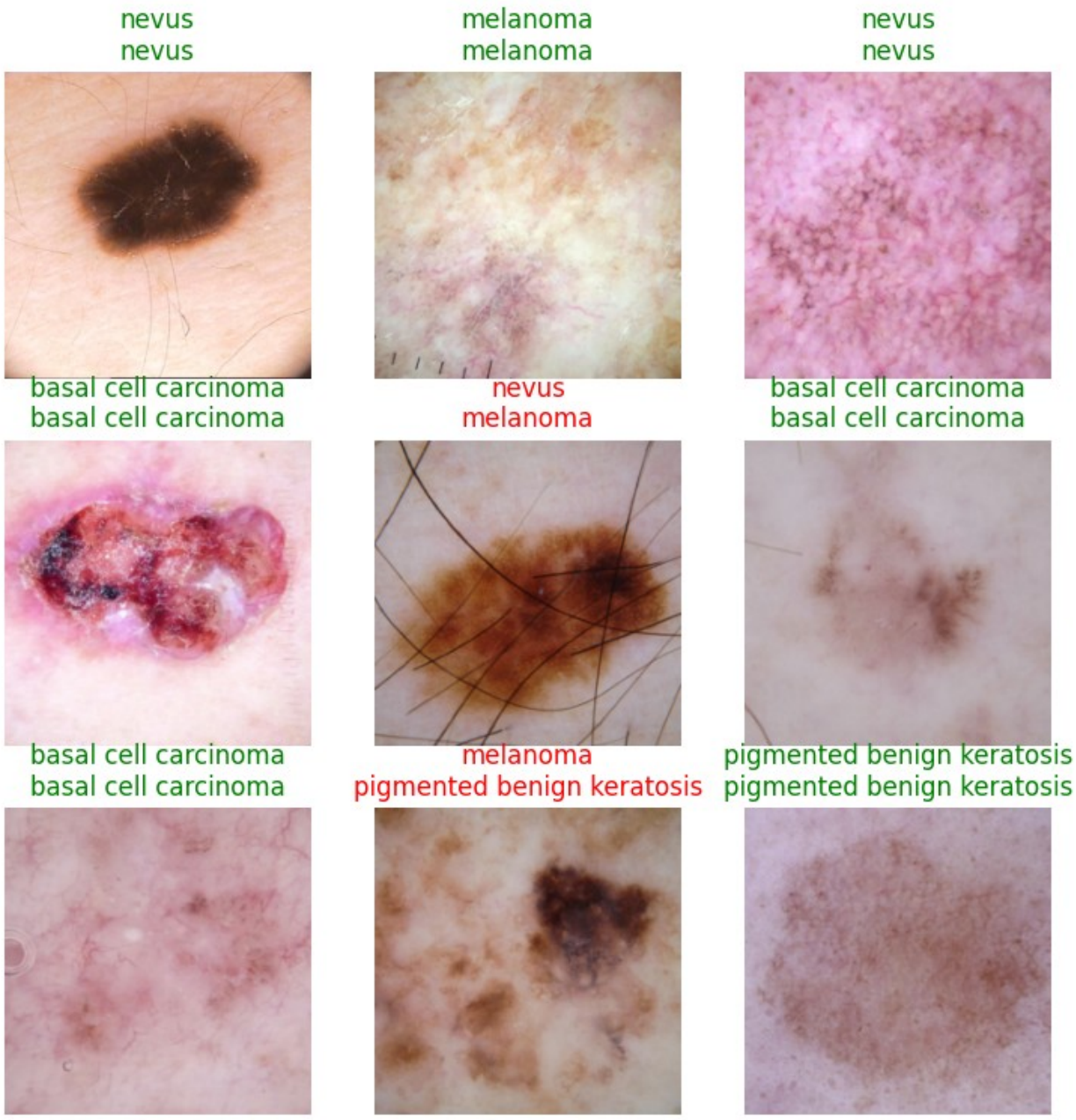


```
# Import necessary libraries for plotting precision-recall curves
from sklearn.metrics import precision_recall_curve,
average_precision_score
import matplotlib.pyplot as plt
import numpy as np

# Get predictions and targets from the learner
preds, targs = learn.get_preds()

# Convert predictions and targets to numpy arrays for further analysis
preds = preds.numpy()
```

```
targs = targs.numpy()

# Number of classes in the classification task
n_classes = preds.shape[1]

# Initialize dictionaries to store precision, recall, and average
precision for each class
precision = dict()
recall = dict()
average_precision = dict()

# Calculate precision, recall, and average precision for each class
for i in range(n_classes):
    precision[i], recall[i], _ = precision_recall_curve(targs == i,
preds[:, i])
    average_precision[i] = average_precision_score(targs == i,
preds[:, i])

# Plot Precision-Recall Curves for each class
plt.figure(figsize=(10, 8))
for i in range(n_classes):
    plt.plot(recall[i], precision[i], lw=2, label=f'Class {i} (AP =
{average_precision[i]:.2f})')

plt.xlabel('Recall')
plt.ylabel('Precision')
plt.title('Precision-Recall Curve')
plt.legend(loc='best')
plt.show()
```

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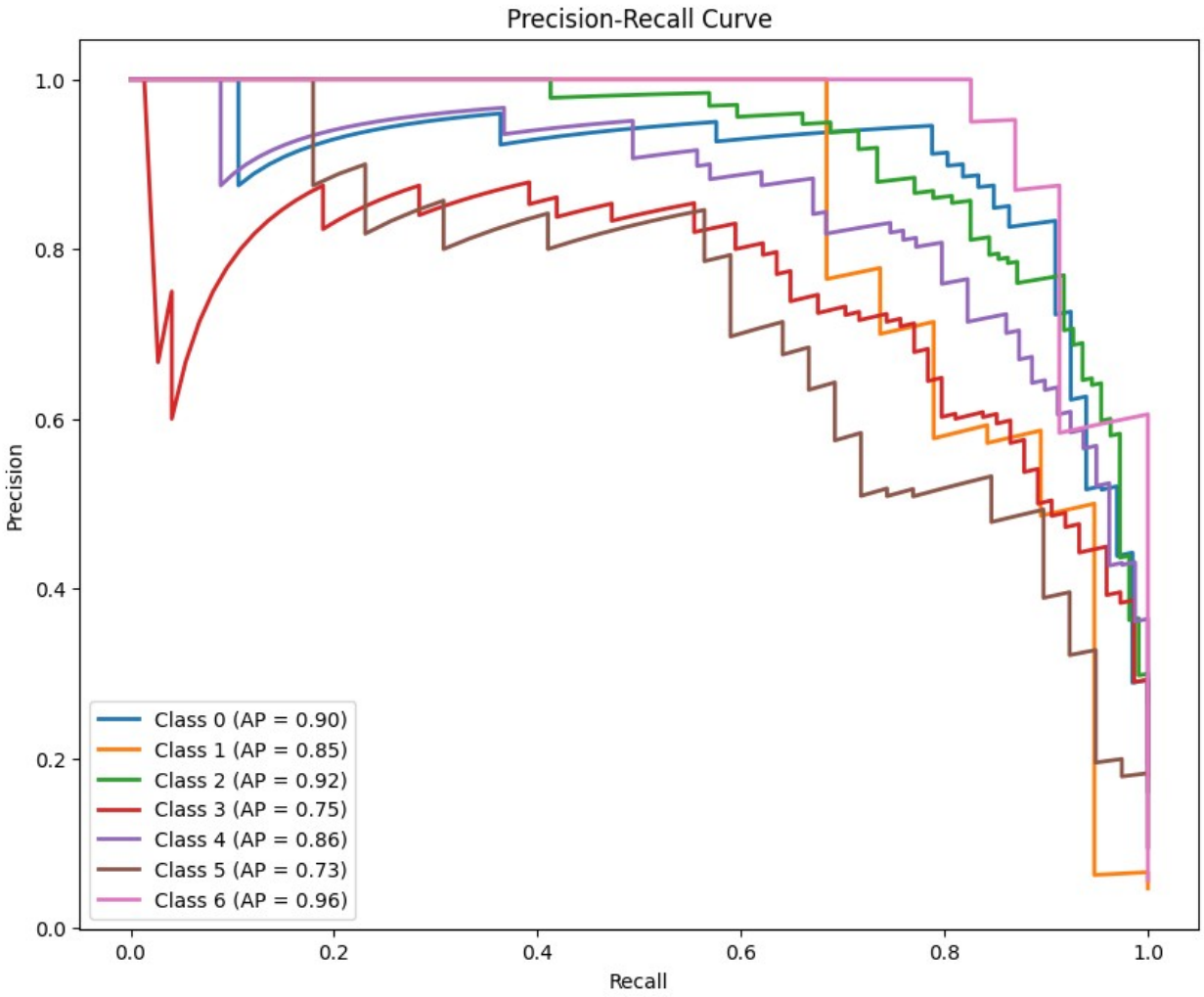


```
# Import necessary libraries for plotting ROC curves
from sklearn.metrics import roc_curve, auc
import matplotlib.pyplot as plt
import numpy as np

# Get predictions and targets from the learner
preds, targs = learn.get_preds()

# Convert predictions and targets to numpy arrays for further analysis
preds = preds.numpy()
targs = targs.numpy()

# Number of classes in the classification task
n_classes = preds.shape[1]

# Initialize dictionaries to store false positive rate (fpr), true
positive rate (tpr), and AUC for each class
fpr = dict()
tpr = dict()
```

```
roc_auc = dict()

# Calculate ROC curve and AUC for each class
for i in range(n_classes):
    fpr[i], tpr[i], _ = roc_curve(targs == i, preds[:, i])
    roc_auc[i] = auc(fpr[i], tpr[i])

# Plot ROC Curves for each class
plt.figure(figsize=(10, 8))
for i in range(n_classes):
    plt.plot(fpr[i], tpr[i], lw=2, label=f'Class {i} (AUC =
{roc_auc[i]:.2f})')

# Plot diagonal line (random classifier) for comparison
plt.plot([0, 1], [0, 1], 'k--', lw=2)

# Label the axes and add title and legend
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title('ROC Curve')
plt.legend(loc='best')
plt.show()
```

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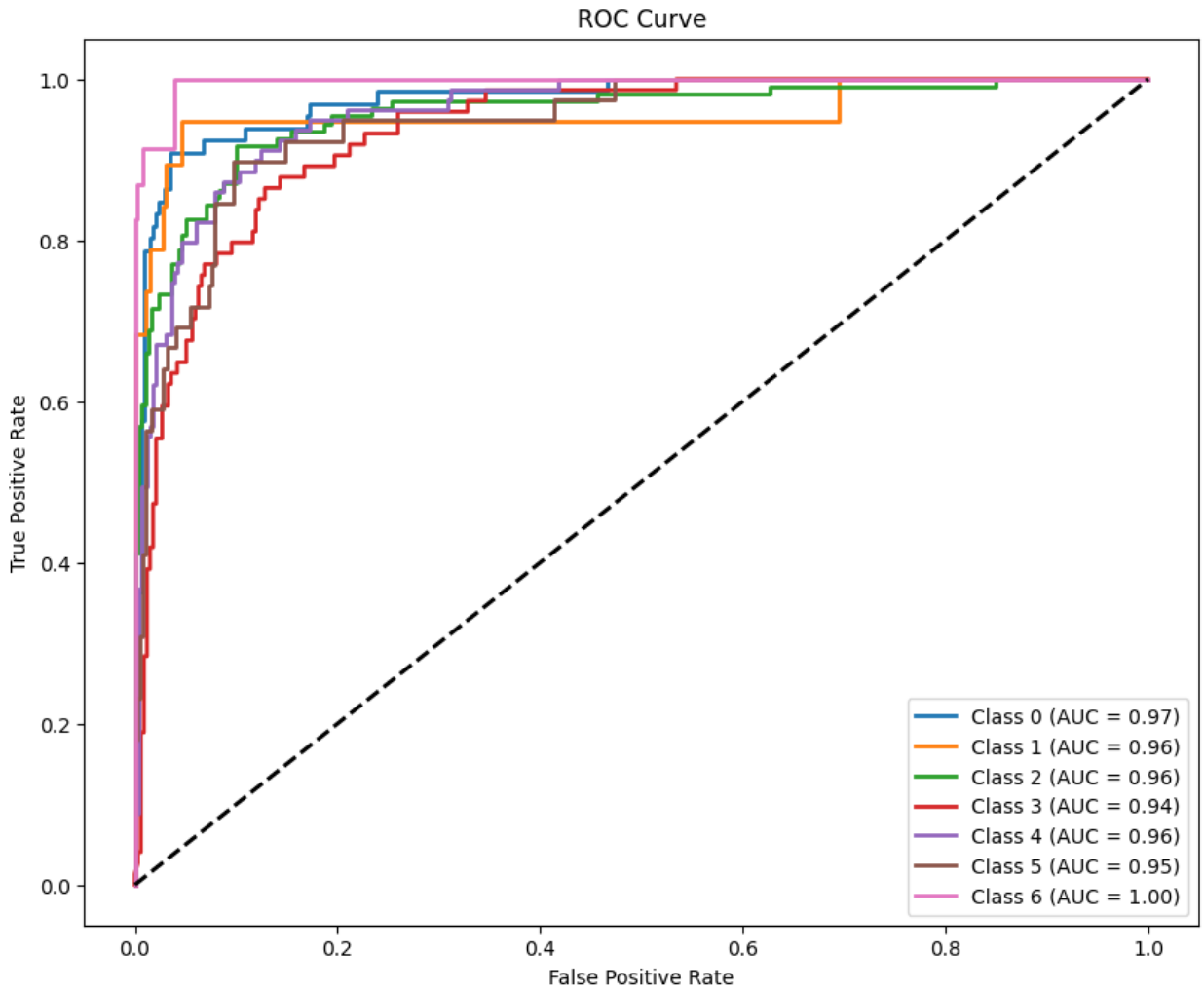


```
# Import necessary components from fastai for image processing
from fastai.vision.all import *

# Load a single image from the test set
img = PILImage.create("/content/skincancer1/Skin cancer ISIC The
International Skin Imaging Collaboration/Test/vascular
lesion/ISIC_0024370.jpg")

# Use the trained model to make a prediction on the image
pred_class, pred_idx, pred_probs = learn.predict(img)

# Print the predicted class and the probabilities for each class
print(f"Predicted Class: {pred_class}")
print(f"Predicted Probabilities: {pred_probs}")
```

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```

```
Predicted Class: vascular lesion
Predicted Probabilities: tensor([6.6437e-07, 2.1787e-06, 2.1805e-08,
1.7065e-07, 2.1289e-06, 2.8998e-09,
        9.9999e-01])
```