

```
! kaggle datasets download moltean/fruits
! unzip fruits.zip

from fastai.vision.all import *
from fastai.metrics import error_rate

train_folder = '/content/fruits-360_dataset/fruits-360/Training'
dls = ImageDataLoaders.from_path_func(train_folder,
                                     get_image_files(train_folder),
                                     lambda f: os.path.basename(os.path.dirname(f)),
                                     item_tfms = Resize(224))
```

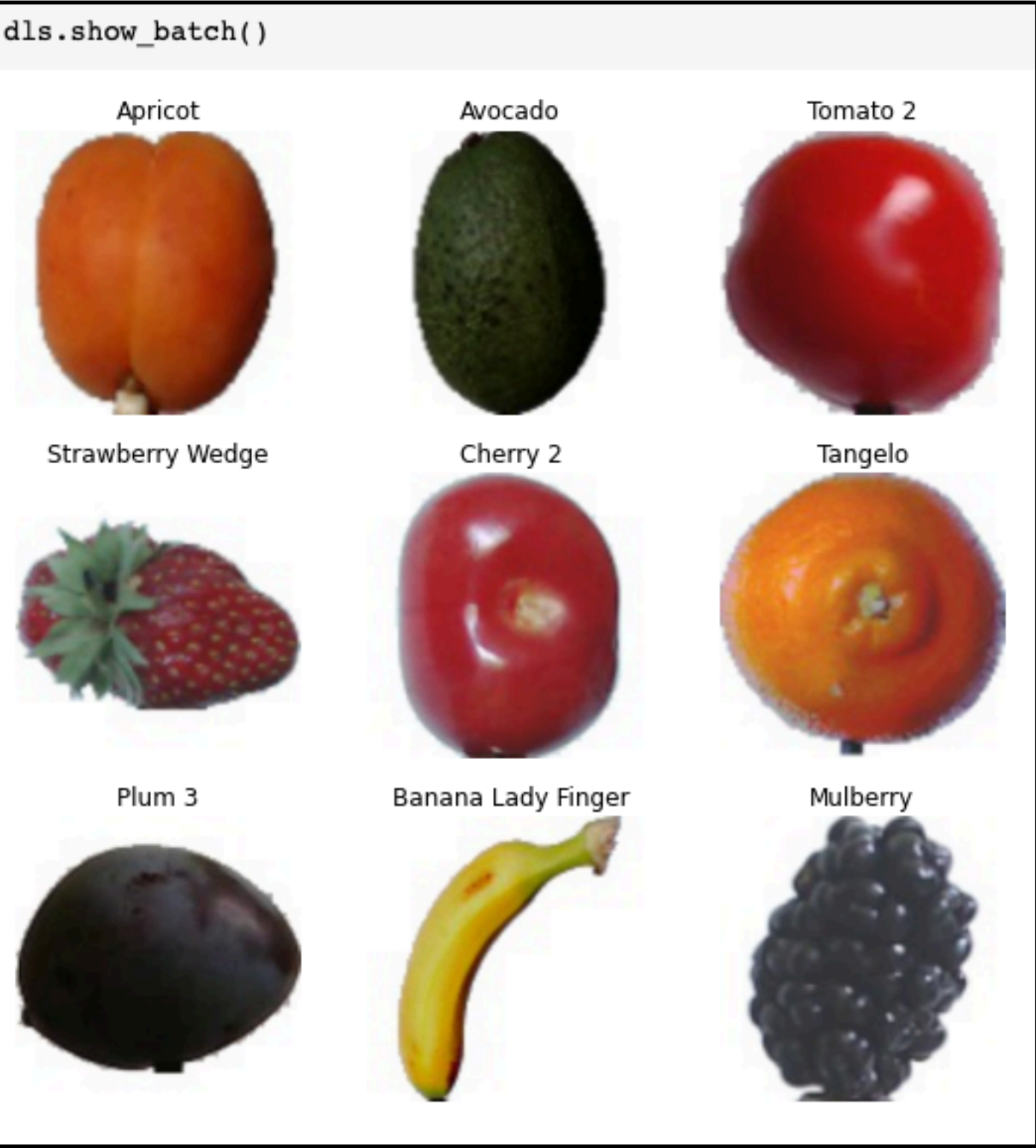
(a)

```
learn = cnn_learner(dls, models.vgg19_bn, metrics=error_rate)
learn.fine_tune(1)
```

epoch	train_loss	valid_loss	error_rate	time
0	0.063546	0.005188	0.000739	07:30

epoch	train_loss	valid_loss	error_rate	time
0	0.002732	0.000917	0.000148	09:53

(c)



(b)

```
img = Image.open("test_image.jpg")
img.thumbnail((128,128))
img
```



(d)

```
learn.predict(Path("test_image.jpg"))

('Banana Lady Finger',
 TensorBase(17),
 TensorBase([4.8587e-08, 2.4250e-04, 1.0038e-04, 1.4874e-03, 6.8239e-06, 8.6110e-07,
 9.5964e-06, 7.6597e-07, 4.9971e-03, 1.2996e-04, 1.0477e-06, 1.2887e-06,
 2.3899e-05, 1.9750e-05, 1.8370e-05, 1.2725e-05, 2.8659e-04, 8.4605e-01,
 2.4386e-03, 3.3772e-04, 1.8727e-06, 1.6393e-06, 1.3305e-05, 1.4961e-06,
 2.3393e-05, 4.1712e-04, 8.5843e-06, 3.2918e-05, 2.1596e-06, 1.0995e-05,
 2.5409e-05, 1.1511e-04, 9.9926e-05, 2.7658e-05, 1.9428e-06, 4.2325e-06,
 1.0253e-06, 3.7775e-05, 2.0258e-04, 7.5247e-07, 1.7251e-06, 9.1321e-04,
 4.3665e-05, 8.8267e-06, 9.7258e-04, 1.5259e-05, 6.5819e-04, 1.3728e-03,
 2.5801e-04, 5.8307e-06, 1.0722e-04, 1.6029e-05, 5.5817e-08, 1.4620e-04,
 5.4944e-07, 2.1112e-05, 1.7604e-05, 1.5570e-05, 5.1265e-07, 2.1389e-08,
 2.5211e-06, 5.6068e-08, 1.9473e-05, 2.2825e-07, 7.4895e-08, 2.5268e-05,
 3.4190e-07, 1.5112e-06, 3.0372e-07, 1.4637e-05, 2.2508e-06, 3.5348e-06,
 5.5185e-06, 3.4633e-04, 5.4408e-05, 3.5524e-05, 1.9752e-06, 2.5770e-07,
 2.7427e-06, 1.4623e-06, 1.3184e-06, 7.0996e-05, 2.1286e-06, 4.3177e-05,
 2.5108e-02, 9.4072e-05, 9.8622e-04, 1.0720e-04, 1.1003e-03, 8.4104e-02,
 3.1746e-04, 1.2272e-05, 1.0985e-04, 2.9481e-06, 1.6855e-04, 1.5201e-03,
 3.3116e-04, 4.0948e-04, 1.3882e-06, 1.5402e-06, 5.3424e-06, 6.8701e-06,
 4.5094e-07, 1.9296e-06, 2.5209e-05, 1.5647e-07, 1.0739e-03, 2.4621e-04,
 5.3364e-07, 6.0017e-06, 1.0907e-04, 3.4635e-06, 4.6640e-05, 1.4445e-05,
 4.2439e-03, 1.5703e-05, 2.9677e-06, 1.4480e-07, 1.0329e-02, 9.5941e-06,
 4.1082e-03, 5.9450e-06, 4.4863e-07, 2.3725e-05, 2.5659e-03, 2.2302e-05,
 5.2024e-06, 2.1018e-04, 5.0770e-05, 8.0681e-05, 3.8735e-06]))
```

(e)