

```

from fastai.vision.all import *

path = untar_data(URLs.IMAGENETTE_320)

img = array(Image.open((path/'train').ls()[0].ls()[0]))

show_image(img),img.shape

(<AxesSubplot:>, (320, 463, 3))

```



Schedule: Question, This notebook, How to read a research paper, Presentation/Less formal

```

np.random.choice(np.arange(14),8,replace=False)

array([2, 5, 1, 0, 9, 8, 6, 7])

```

```

img.shape

(320, 463, 3)

```

```
img.shape[0]//2,img.shape[1]//2
```

(160, 231)

```
ex=img[:img.shape[0]//2,:img.shape[1]//2]  
show_image(ex)
```

<AxesSubplot:>



```
img.shape[0]//4,-img.shape[0]//4
```

(80, -80)

```
ex=img[img.shape[0]//4:-img.shape[0]//4,  
       img.shape[1]//4:-img.shape[1]//4]  
show_image(ex)
```

<AxesSubplot:>



```
ex.shape,img.shape
```

```
((160, 232, 3), (320, 463, 3))
```

```
show_image(img)
```

```
<AxesSubplot:>
```



```
list(range(10,0,-1))
```

```
[10, 9, 8, 7, 6, 5, 4, 3, 2, 1]
```

```
show_image(img),img.shape
```

```
(<AxesSubplot:>, (320, 463, 3))
```



```
show_image(img[: -1:2, : -1:2]),img[: -1:2, : -1:2].shape
```

```
(<AxesSubplot:>, (160, 231, 3))
```



```
show_image(img[1::2,1::2]),img[1::2,1::2].shape
```

```
(<AxesSubplot:>, (160, 231, 3))
```



```
img[:-1:2,:-1:2]//2+img[1::2,1::2]//2
```

```
img[:, :, 2] // 2 + img[1::2, 1::2] // 2
```

ValueError: operands could not be broadcast together with shapes (160,232,3) (160,231,3)

```
img[1::2, 1::2].shape
```

(160, 231, 3)

```
ex = img[:, :, 2] // 2 + img[1::2, 1::2] // 2  
show_image(ex), ex.shape
```

(<AxesSubplot:~>, (160, 231, 3))



```
array([1/3, 1/3, 1/3])
```

array([0.33333333, 0.33333333, 0.33333333])

```
(array([1/3, 1/3, 1/3]) @ img[:, :, :]).shape
```

(320, 463, 1)

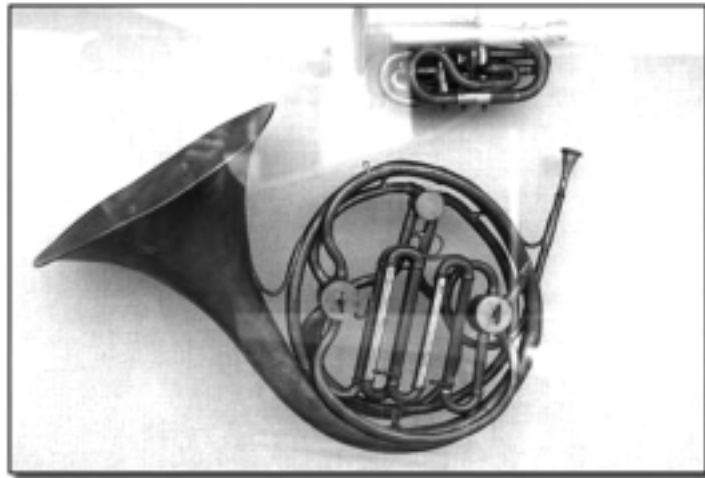
```
ex1.max(),ex2.max()
```

```
(765, 255.0)
```

```
np.
```

```
ex1= (array([1/2,1/2,1/2])@img[...,None]).clip(0,255)  
ex2= (array([1/3,1/3,1/3])@img[...,None]).clip(0,255)  
show_image(ex1,cmap='gray'),show_image(ex2,cmap='gray')
```

```
(<AxesSubplot:>, <AxesSubplot:>)
```





```

norm_tfm=Normalize.from_stats(*imagenet_stats,cuda=False)
def show_norm(img): show_images((norm_tfm.decode(img).clamp(0,1)),nrows=3)

norm_img = norm_tfm(TensorImage(img.transpose(2,0,1)).float()[None]/255)

noise= torch.randn_like(norm_img)

As = torch.linspace(0,1,12)[...,None,None,None]; As.squeeze()

tensor([0.0000, 0.0909, 0.1818, 0.2727, 0.3636, 0.4545, 0.5455, 0.6364, 0.7273,
        0.8182, 0.9091, 1.0000])

(As)**.5*norm_img

(1-As**.5).squeeze()

tensor([1.0000, 0.6985, 0.5736, 0.4778, 0.3970, 0.3258, 0.2615, 0.2023, 0.1472,
        0.0955, 0.0465, 0.0000])

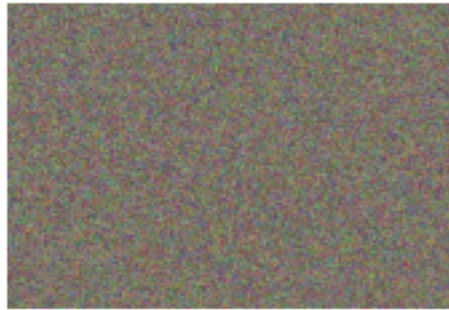
((1-As)**.5).squeeze()

```



```
tensor([1.0000, 0.9535, 0.9045, 0.8528, 0.7977, 0.7385, 0.6742, 0.6030, 0.5222,  
        0.4264, 0.3015, 0.0000])
```

```
show_norm((As)**.5*norm_img+(1-As)**.5*noise)
```



```
show_norm((As)**.5*norm_img+(1-As**.5)*noise)
```



```
As.squeeze(),As.shape
```

```
(tensor([0.0000, 0.0909, 0.1818, 0.2727, 0.3636, 0.4545, 0.5455, 0.6364, 0.7273,  
        0.8182, 0.9091, 1.0000]),  
 torch.Size([12, 1, 1, 1]))
```

```
norm_img.shape
```

```
torch.Size([1, 3, 320, 463])
```

```
show_norm((As)**.5*norm_img)
```



$1 - (As)^{0.5}$

`tensor([[[[1.0000]]],`

`[[[0.6985]]],`

`[[[0.5736]]],`

`[[[0.4778]]],`

`[[[0.3970]]],`

`[[[0.3258]]],`

```
[[[0.2615]]],
```

```
[[[0.2023]]],
```

```
[[[0.1472]]],
```

```
[[[0.0955]]],
```

```
[[[0.0465]]],
```

```
[[[0.0000]]])
```

```
show_norm((1-As)**.5*noise)
```

