Fazendo Download das Imagens

O código abaixo irá baixar imagens automaticamente:

```
- 100 imagens de pessoas com óculos
- 100 imagens de pessoas
```

Este código é equivalente a digitar "person" e "person with glasses" no buscador e então baixar as 100 primeiras imagens de cada busca

In [ ]:

```python
from bing_image_downloader.downloader import download


query_string = 'person'
#download(query_string, limit=100,  output_dir='downloads', adult_filter_off=Tru

query_string = 'person with glasses'
#download(query_string, limit=100,  output_dir='downloads', adult_filter_off=Tru
```

Excluindo Imagens Corrompidas

O código abaixo irá percorrer os diretórios dentro do diretório "downloads" e excluir qualquer imagem que esteja corrompida

In [ ]:

```python
import cv2
import os

def exclude_files(path_to_exclude):
    paths_to_exclude= os.listdir(path_to_exclude)
    for path in paths_to_exclude:
        if path != 'models':
            for file in os.listdir(os.path.join(path_to_exclude,path)):
                img = cv2.imread(os.path.join(path_to_exclude,path,file))
                if img is None:
                    print("\t Exclude file: {}".format(file))
                    os.system("del {}".format((os.path.join(path_to_exclude,path

exclude_files('downloads')
```

Tudo pronto com nosso dataset!

O código abaixo irá carregar as imagens que foram baixadas

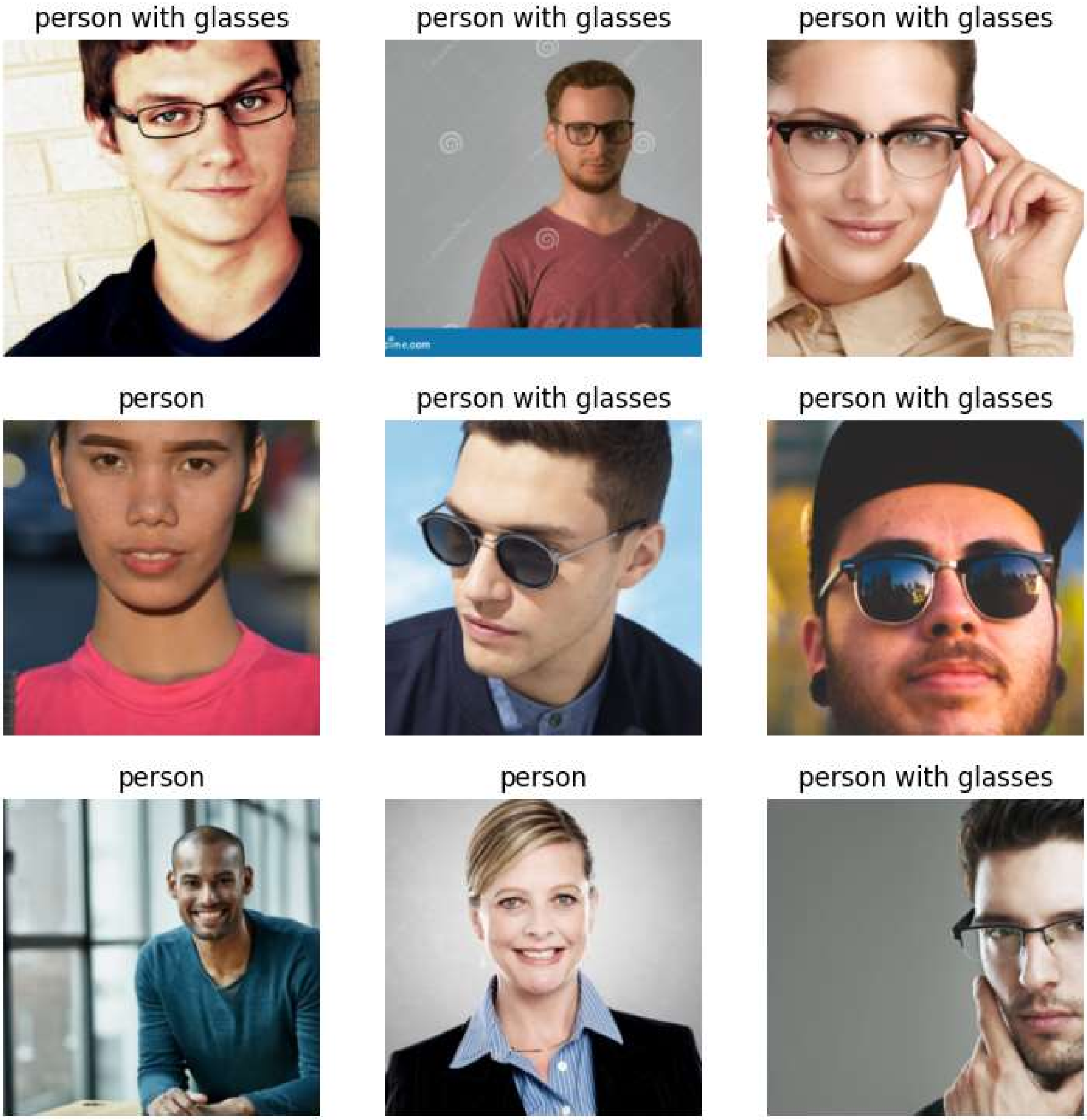
Iremos também avaliar com quantas imagens iremos treinar nosso modelo, e quantas iremos usar para validar nosso modelo.

In [ ]:

```python
from fastai.vision.all import *
import numpy as np
import warnings
warnings.filterwarnings("ignore")



np.random.seed(53)
dls = ImageDataLoaders.from_folder('downloads', train='.', valid_pct=0.2, seed=4

dls.show_batch()
```

```
print(f"As imagens serão classficiadas entre {' e '.join(dls.vocab)}")
print(f"Quantidade de imagens para treinamento: {len(dls.train_ds)}")
print(f"Quantidade de imagens para validação: {len(dls.valid_ds)}")
```

```
As imagens serão classficiadas entre person e person with glasses
Quantidade de imagens para treinamento: 141
Quantidade de imagens para validação: 35
```



Instanciando e Treinando o Modelo

No código abaixo estamos passando nosso "dataset" e escolhendo o modelo "resnet34" para instanciar o que chamamos de "learner"

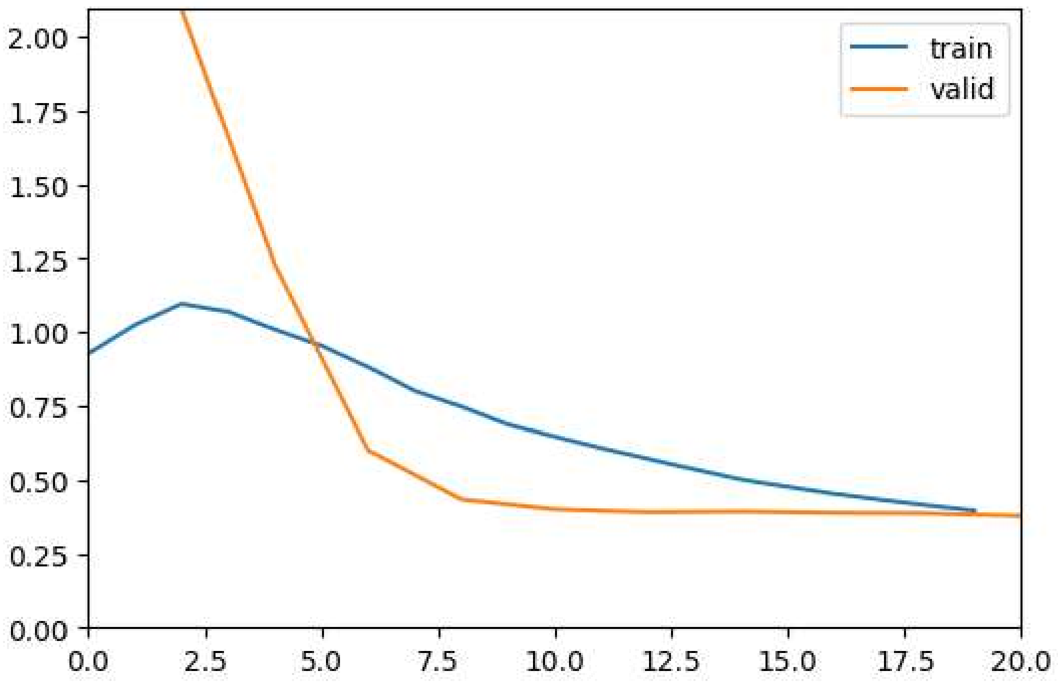
In [ ]:

```
from fastai.learner import Learner
learn: Learner = vision_learner(dls, models.resnet34, pretrained=True, metrics=[
```

In [ ]:

```
learn.fit_one_cycle(10, cbs=[ShowGraphCallback()])
learn.save('stage1')
```

epoch	train_loss	valid_loss	accuracy	recall_score	precision_score	f1_score	time
0	1.024394	2.094386	0.428571	0.000000	0.000000	0.000000	00:15
1	1.069266	1.228289	0.457143	0.105263	0.500000	0.173913	00:15
2	0.954118	0.599570	0.714286	0.631579	0.800000	0.705882	00:16
3	0.800544	0.433649	0.771429	0.789474	0.789474	0.789474	00:16
4	0.687285	0.400029	0.800000	0.842105	0.800000	0.820513	00:16
5	0.606675	0.390461	0.828571	0.842105	0.842105	0.842105	00:15
6	0.535516	0.392728	0.857143	0.842105	0.888889	0.864865	00:15
7	0.476199	0.388202	0.857143	0.842105	0.888889	0.864865	00:15
8	0.432269	0.386510	0.857143	0.842105	0.888889	0.864865	00:15
9	0.396060	0.377853	0.857143	0.842105	0.888889	0.864865	00:16



```
Out[ ]: Path('downloads/models/stage1.pth')
```

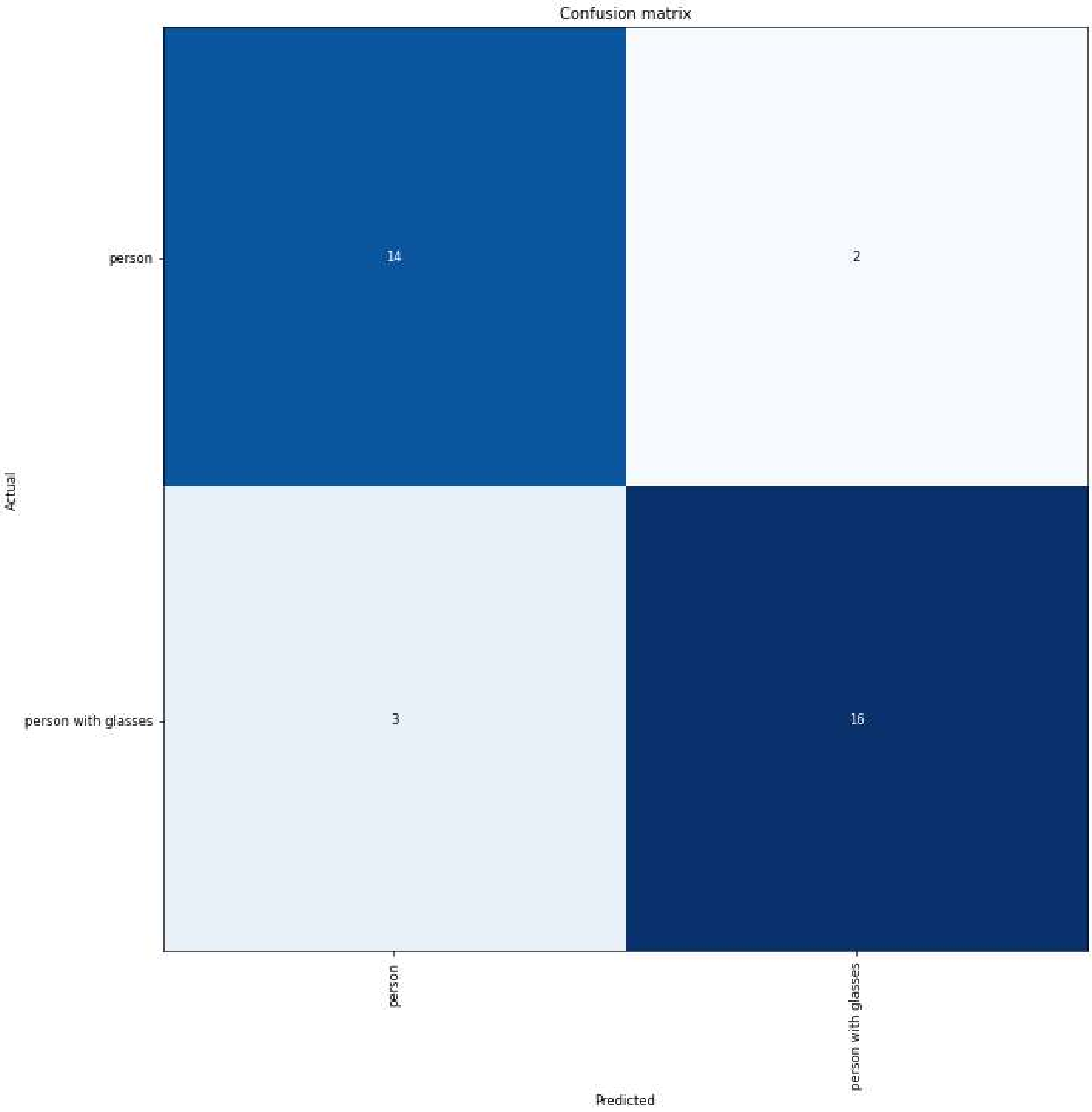
Carregando o modelo salvo

```
In [ ]: learn.load('stage1')
```

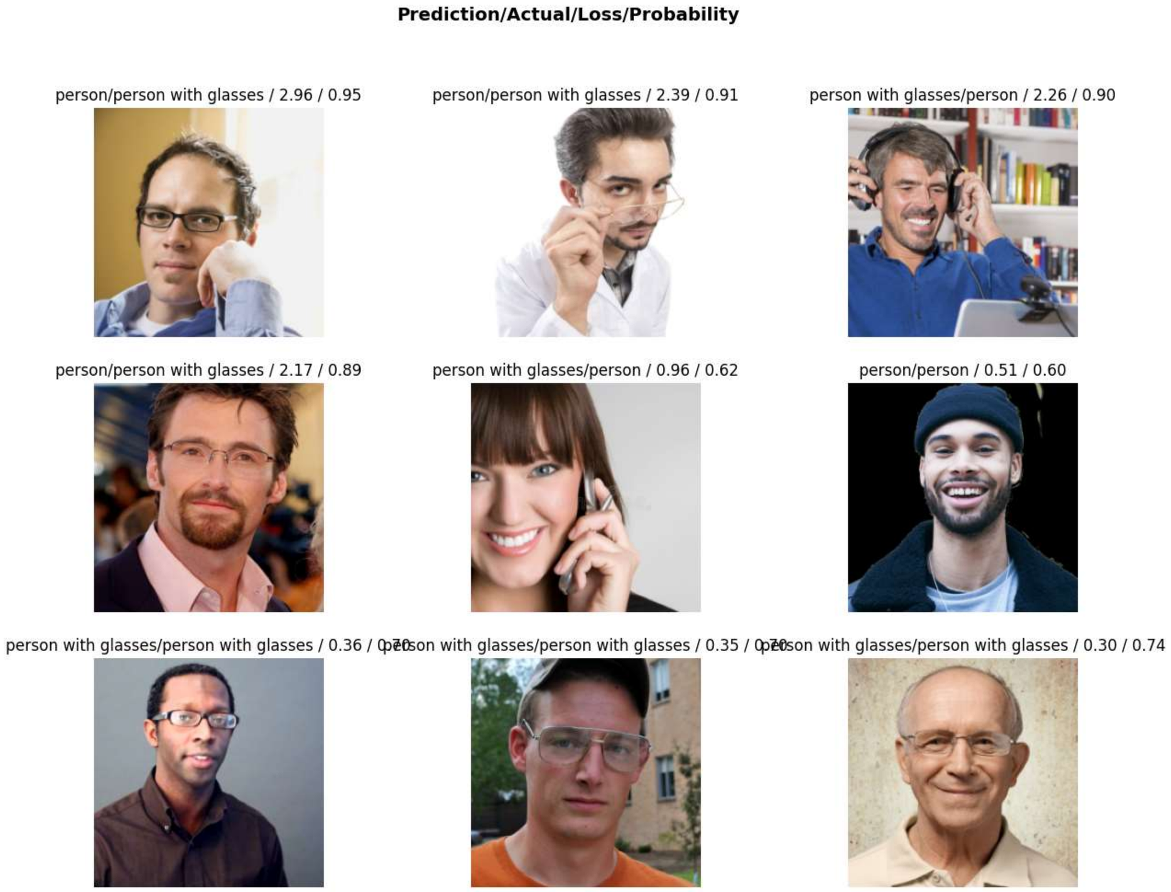
```
Out[ ]: <fastai.learner.Learner at 0x2e7abc16200>
```

Métricas de Validação

```
In [ ]: interp = ClassificationInterpretation.from_learner(learn)
        interp.plot_confusion_matrix(figsize=(12,12), dpi=60)
```



```
In [ ]: interp.plot_top_losses(9, figsize=(15,11)) #,heatmat=True
```



Prediction/Actual/Loss/Probability

person/person with glasses / 2.96 / 0.95

person/person with glasses / 2.39 / 0.91

person with glasses/person / 2.26 / 0.90

person/person with glasses / 2.17 / 0.89

person with glasses/person / 0.96 / 0.62

person/person / 0.51 / 0.60

person with glasses/person with glasses / 0.36 / 0.70

person with glasses/person with glasses / 0.35 / 0.70

person with glasses/person with glasses / 0.30 / 0.74

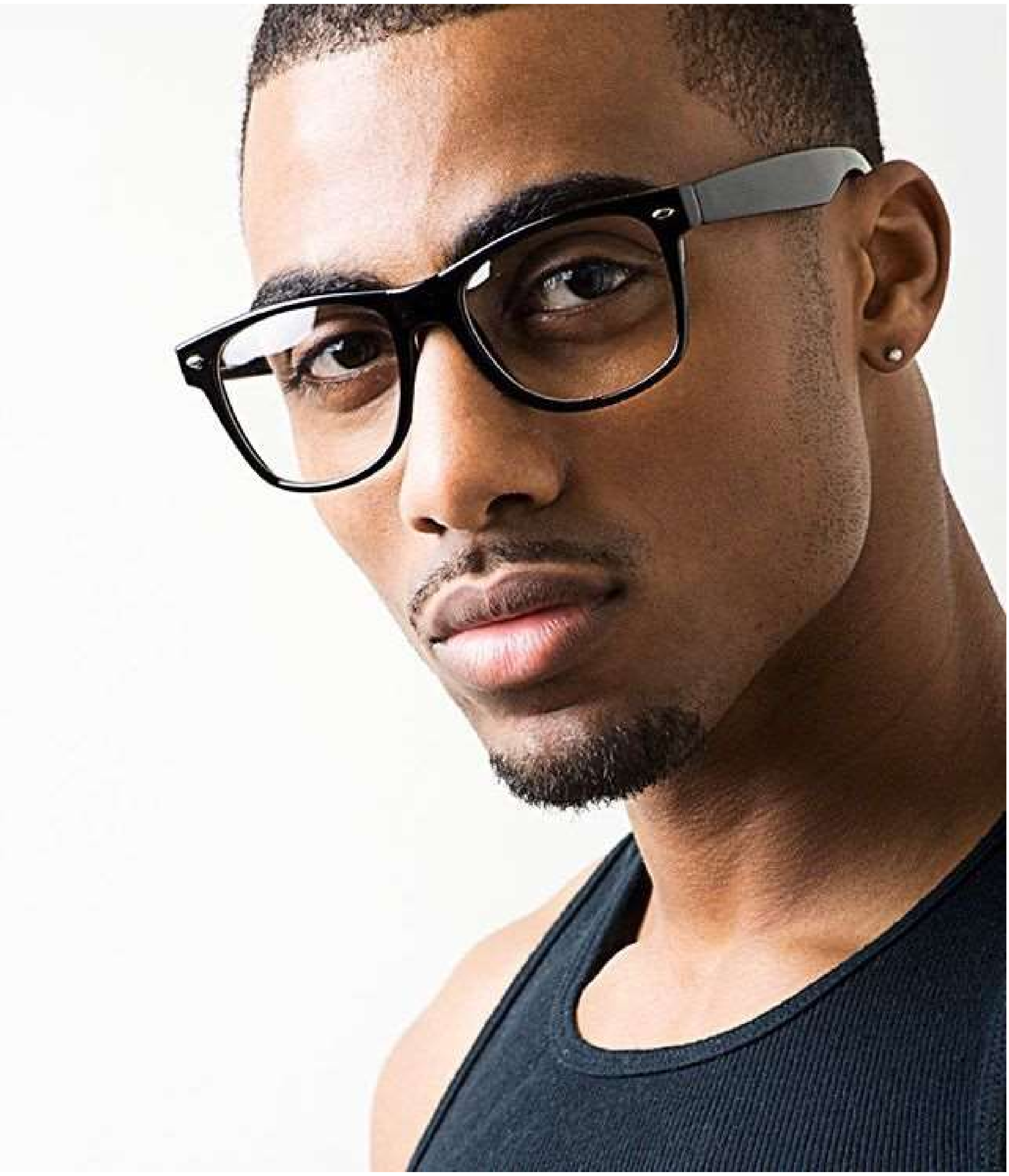
Realizando predições com o modelo treinado

```
In [ ]: from torchvision import transforms
        from PIL import Image
```

```
In [ ]: ## Open Image
        test_class = random.choice(dls.vocab)
        print(f"CLASSE DE TESTE: {test_class}")
        test_image = random.choice(os.listdir(os.path.join('downloads',test_class)))
        print(f"IMAGE DE TESTE : {test_image}")

        image_path = os.path.join('downloads',test_class,test_image)
        image = Image.open(image_path).convert('RGB')
        image
```

```
CLASSE DE TESTE: person with glasses
IMAGE DE TESTE : Image_61.jpg
```

Out[ ]:



In [ ]:

```
# predict image with learn
pred,pred_idx,probs = learn.predict(image)
print("Probabilities: ")
for i in range(len(dls.vocab)):
    print(f"\t{dls.vocab[i]}: {probs[i].item()*100:.02f} %")

print(f"\nPrediction: {pred.upper()}")
image
```

```
Probabilities: 
        person: 0.00 %
        person with glasses: 100.00 %

Prediction: PERSON WITH GLASSES
```

Out[ ]:

GRAD-CAM

In [ ]:

```
class Hook():
    def __init__(self, m):
        self.hook = m.register_forward_hook(self.hook_func)
    def hook_func(self, m, i, o): self.stored = o.detach().clone()
    def __enter__(self, *args): return self
    def __exit__(self, *args): self.hook.remove()
class HookBwd():
    def __init__(self, m):
        self.hook = m.register_backward_hook(self.hook_func)
    def hook_func(self, m, gi, go): self.stored = go[0].detach().clone()
    def __enter__(self, *args): return self
    def __exit__(self, *args): self.hook.remove()
```

In [ ]:

```
x = first(dls.test_dl([image]))[0]
cls = list(dls.vocab).index(test_class)
```

```
with HookBwd(learn.model[0]) as hookg:
    with Hook(learn.model[0]) as hook:
        output = learn.model.eval()(x)
        act = hook.stored
    output[0,cls].backward()
    grad = hookg.stored
```

In [ ]:

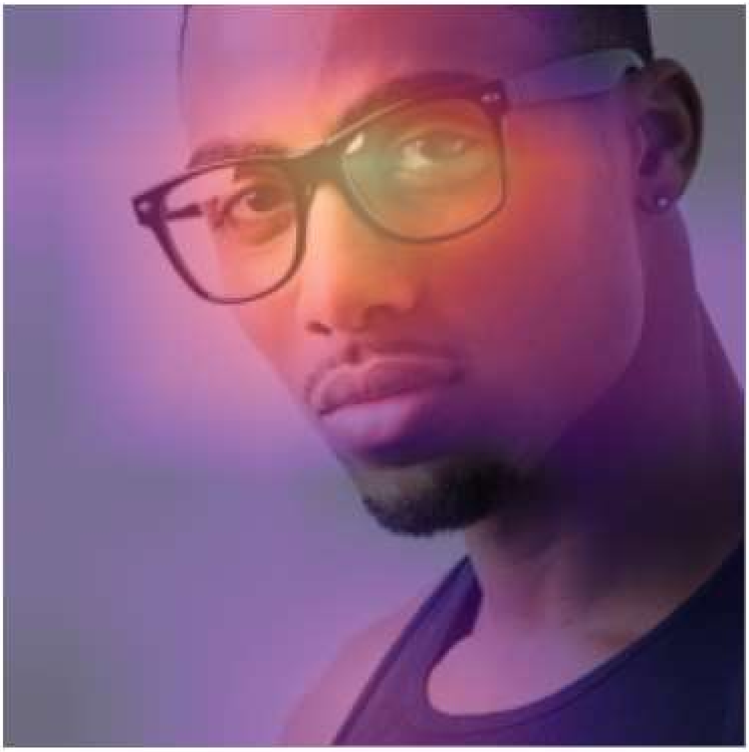
```
w = grad[0].mean(dim=[1,2], keepdim=True)
cam_map = (w * act[0]).sum(0)
cam_map.shape
```

Out[ ]:

```
torch.Size([7, 7])
```

In [ ]:

```
x_dec = TensorImage(dls.train.decode((x,))[0][0])
_,ax = plt.subplots()
x_dec.show(ctx=ax)
ax.imshow(cam_map.detach().cpu(), alpha=0.6, extent=(0,224,224,0),
              interpolation='bilinear', cmap='magma');
```



In [ ]:

In [ ]: