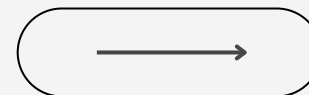


PROJECT 1

Face Recongition



PRESENTED BY

Christopher Kevin Herijanto
Thomas Dalton
Yohanes J Palis
Louis Maximilian

PENDAHULUAN

Face Recognition atau sistem pengenalan wajah adalah teknologi yang memungkinkan sistem komputer atau perangkat untuk mengidentifikasi atau memverifikasi seseorang berdasarkan citra wajahnya. Teknologi ini bekerja dengan menganalisis karakteristik wajah seseorang, seperti jarak antara mata, bentuk hidung, atau kontur wajah, dan membandingkannya dengan data wajah yang sudah ada.

Manfaat Face Recognition

- 1.Keamanan yang Lebih Baik
- 2.Kemudahan dan Kenyamanan
- 3.Pengurangan Kesalahan Manual
- 4.Penyediaan Bukti Visual
- 5.Peningkatan Efisiensi

Contoh Penggunaan di Dunia Nyata

- Bandara dan Perbatasan
- Perangkat Pribadi
- Sistem Absensi



CELEBA

CelebA_HQ_face_gender_dataset.zip

No duplicate data

Train dataset size: 23999 Test dataset size: 6001
Class names: ['female', 'male']

DATASET



HYPERPARAMETER TUNING

- **LEARNING RATE (LR=0.001)**
- **MOMENTUM
(MOMENTUM=0.9)**
- **OPTIMIZER (OPTIM.SGD)**
- **LOSS FUNCTION
(NN.CROSSENTROPYLOSS):**

PREPROCESSING

- **DELETE DUPLICATE**
- **BALANCING DATA**
- **AUGMENTASI**

VGG

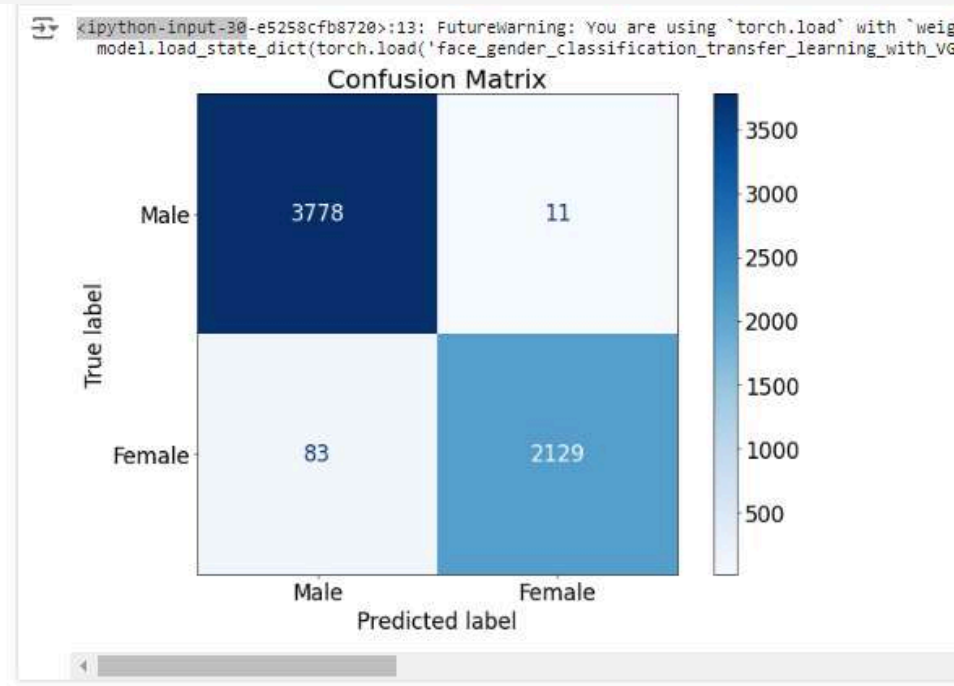
[LINK TO COLAB](#)

- Tahun Diperkenalkan: 2014

Fitur Utama:

- Menggunakan filter konvolusional kecil (3x3) dan arsitektur mendalam (hingga 19 lapisan).
- Arsitektur yang konsisten dengan kedalaman yang semakin meningkat.
- Mengutamakan keseragaman dalam ukuran filter dan lapisan penyatuan.

Dampak: Berpengaruh dalam menunjukkan pentingnya kedalaman dalam CNN.



```
# Hitung rata-rata loss dan akurasi untuk test set
epoch_loss = running_loss / len(test_dataset)
epoch_acc = running_corrects / len(test_dataset) * 100.
print('[Test #{}] Loss: {:.4f} Acc: {:.4f}% Time: {:.4f}s'.format
```

```
[Train #0] Loss: 0.0755 Acc: 97.1582% Time: 417.1413s
[Test #0] Loss: 0.0521 Acc: 98.2670% Time: 497.5950s
[Train #1] Loss: 0.0376 Acc: 98.6583% Time: 912.9390s
[Test #1] Loss: 0.0639 Acc: 97.6004% Time: 990.5064s
[Train #2] Loss: 0.0252 Acc: 99.0458% Time: 1403.5025s
[Test #2] Loss: 0.0485 Acc: 98.2503% Time: 1480.7817s
[Train #3] Loss: 0.0198 Acc: 99.2875% Time: 1891.2209s
[Test #3] Loss: 0.0783 Acc: 97.8670% Time: 1967.5380s
[Train #4] Loss: 0.0151 Acc: 99.5333% Time: 2385.3780s
[Test #4] Loss: 0.0572 Acc: 98.4336% Time: 2465.5706s
```

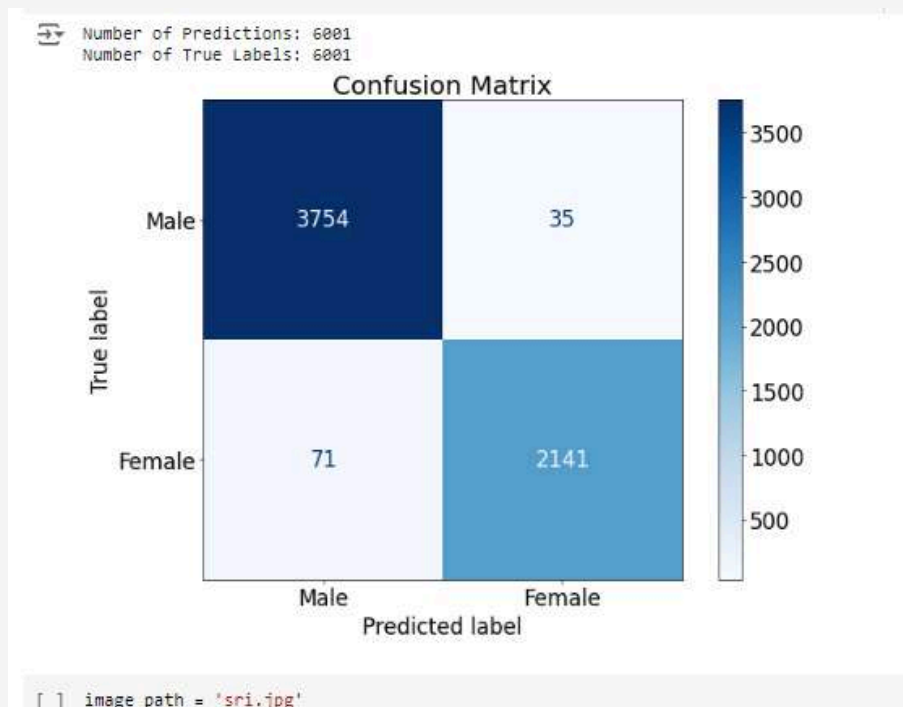
```
[ ] save_path = 'face_gender_classification_transfer_learning_with_VGG.pth'
    torch.save(model.state_dict(), save_path) # Simpan state_dict model (t
```

```
[ ] image_path = 'sri.jpg'
```

GOOGLNET

[LINK TO COLAB](#)

- Tahun Diperkenalkan: 2014
- Fitur Utama:
- Memperkenalkan modul Inception, memungkinkan beberapa ukuran filter untuk menangkap fitur berbeda.
 - Menggunakan konvolusi 1x1 untuk pengurangan dimensi, mengurangi biaya komputasi.
 - Kedalaman 22 lapisan, dengan 9 modul awal.
- Dampak: Efisiensi dalam kinerja, menekankan pemrosesan multi-skala.



```
epoch_loss = running_loss / len(test_dataset)
epoch_acc = running_corrects / len(test_dataset) * 100
print('[Test #{}] Loss: {:.4f} Acc: {:.4f}% Time: {:.4f}'

[Train #0] Loss: 0.1255 Acc: 95.0873% Time: 304.5695s
[Test #0] Loss: 0.0594 Acc: 97.8504% Time: 376.2776s
[Train #1] Loss: 0.0546 Acc: 98.1999% Time: 685.0056s
[Test #1] Loss: 0.0530 Acc: 98.1503% Time: 757.2913s
[Train #2] Loss: 0.0389 Acc: 98.7041% Time: 1067.6936s
[Test #2] Loss: 0.0556 Acc: 98.1836% Time: 1137.0313s
[Train #3] Loss: 0.0247 Acc: 99.2583% Time: 1450.2351s
[Test #3] Loss: 0.0680 Acc: 98.1503% Time: 1523.2198s
[Train #4] Loss: 0.0200 Acc: 99.3333% Time: 1824.1704s
[Test #4] Loss: 0.0598 Acc: 98.2336% Time: 1893.8565s

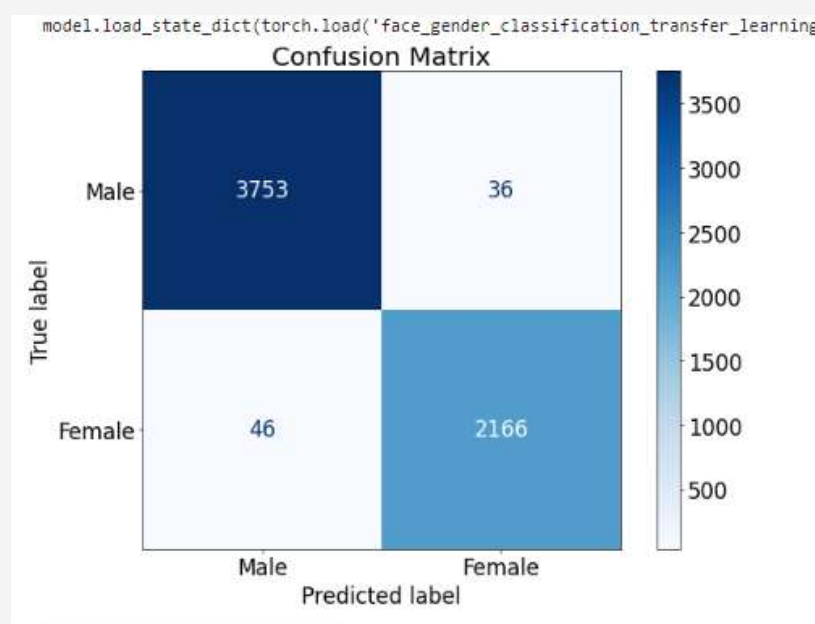
[ ] save_path = 'face_gender_classification_transfer_learning_with
torch.save(model.state_dict(), save_path) # Simpan state_dict
```


RESNET

[LINK TO COLAB](#)

- Tahun Diperkenalkan: 2015
- Fitur Utama:
- Memperkenalkan lewati koneksi atau koneksi sisa untuk memungkinkan gradien mengalir melalui jaringan tanpa menghilang.
- Dapat memiliki jaringan yang sangat dalam (misalnya 152 lapisan).
- Berfokus pada peningkatan waktu dan akurasi pelatihan untuk jaringan yang lebih dalam.

Dampak: Mencetak rekor baru dalam kompetisi ImageNet dan memengaruhi arsitektur selanjutnya.



```
epoch_loss = running_loss / len(test_dataset)
epoch_acc = running_corrects / len(test_dataset) *
print('[Test #{}] Loss: {:.4f} Acc: {:.4f}% Time:

[Train #0] Loss: 0.0898 Acc: 96.7207% Time: 300.5880s
[Test #0] Loss: 0.0567 Acc: 97.6837% Time: 370.3020s
[Train #1] Loss: 0.0437 Acc: 98.4374% Time: 656.4217s
[Test #1] Loss: 0.0525 Acc: 98.4669% Time: 726.0654s
[Train #2] Loss: 0.0286 Acc: 99.0375% Time: 1017.7287s
[Test #2] Loss: 0.0442 Acc: 98.4836% Time: 1087.3307s
[Train #3] Loss: 0.0175 Acc: 99.4500% Time: 1376.7104s
[Test #3] Loss: 0.0581 Acc: 98.4669% Time: 1443.2731s
[Train #4] Loss: 0.0116 Acc: 99.6542% Time: 1736.8377s
[Test #4] Loss: 0.0535 Acc: 98.6336% Time: 1806.4469s

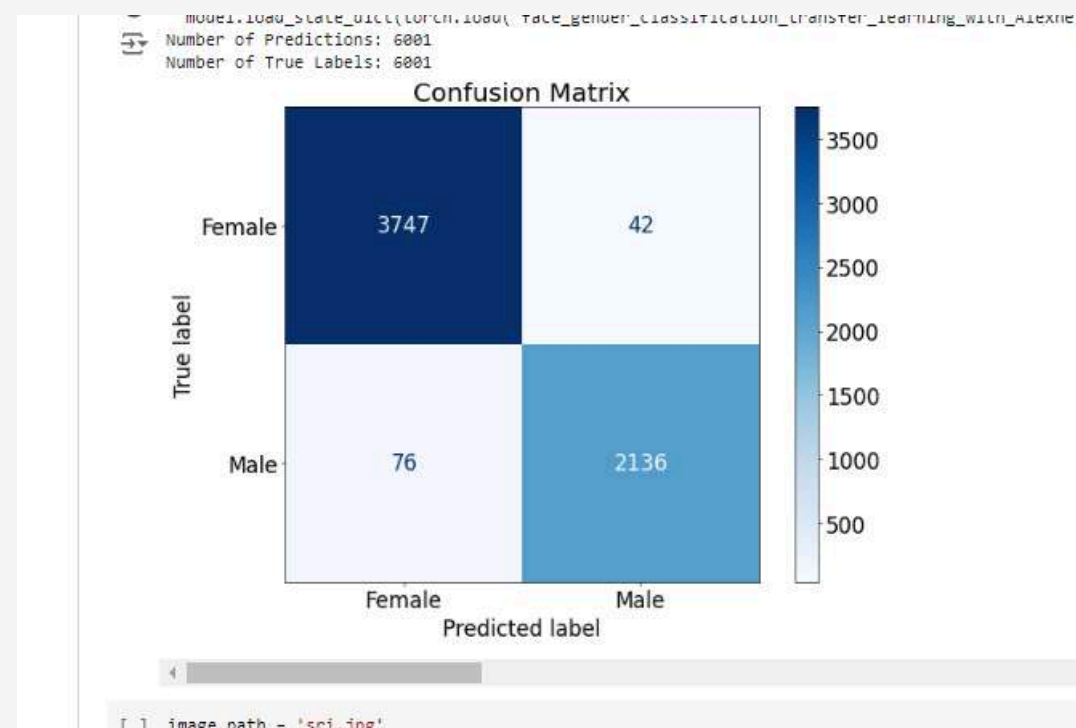
[37] save_path = 'face_gender_classification_transfer_learning_
torch.save(model.state_dict(), save_path)
```

ALEXNET

[LINK TO COLAB](#)

- Tahun Diperkenalkan: 2012
- Fitur Utama:
- Model pembelajaran mendalam pertama yang memenangkan kompetisi ImageNet.
- Berisi 5 lapisan konvolusional diikuti oleh 3 lapisan yang terhubung sepenuhnya.
- Memperkenalkan fungsi aktivasi ReLU dan dropout untuk regularisasi.

Dampak: Mendemonstrasikan efektivitas pembelajaran mendalam dalam visi komputer.



```
# Hitung rata-rata loss dan akurasi untuk test set  
epoch_loss = running_loss / len(test_dataset)  
epoch_acc = running_corrects / len(test_dataset) * 100.  
print('[Test #{}] Loss: {:.4f} Acc: {:.4f}% Time: {:.4f}'.format(i, epoch_loss, epoch_acc, time.time() - start_time))
```

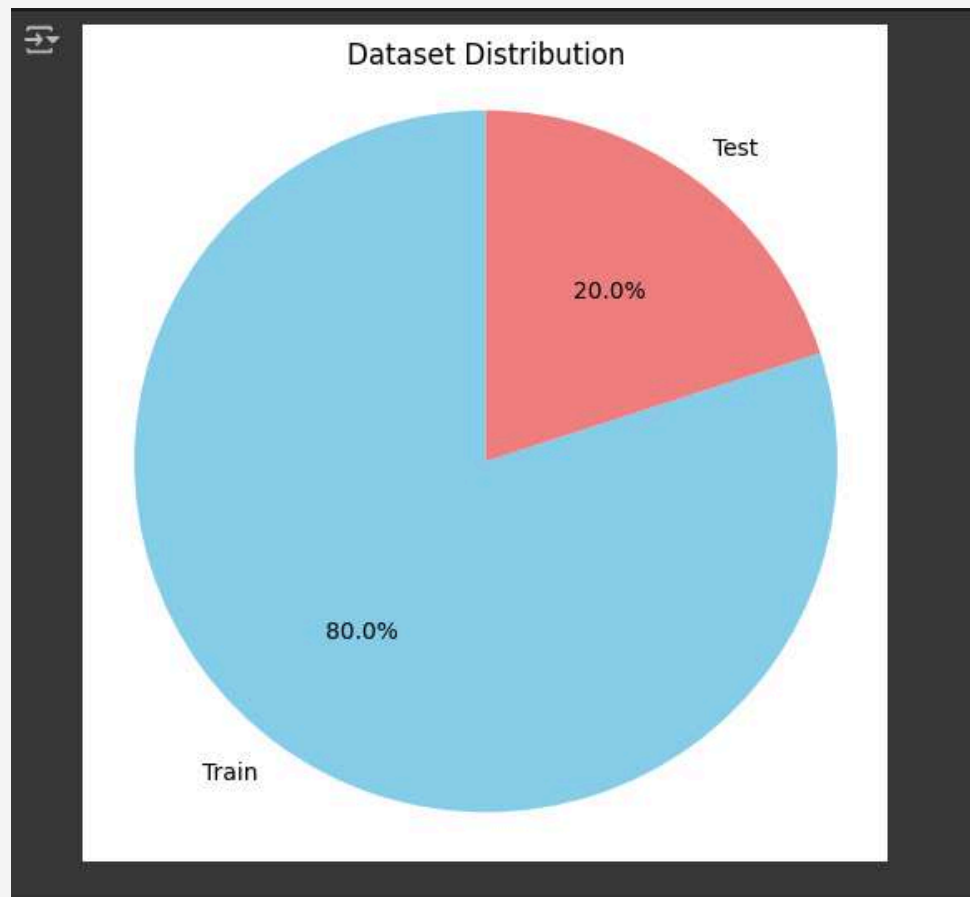
```
[Train #0] Loss: 0.1269 Acc: 95.1873% Time: 270.2573s  
[Test #0] Loss: 0.1223 Acc: 95.1508% Time: 336.7920s  
[Train #1] Loss: 0.0649 Acc: 97.6666% Time: 607.2941s  
[Test #1] Loss: 0.0741 Acc: 97.2171% Time: 672.9987s  
[Train #2] Loss: 0.0497 Acc: 98.1666% Time: 942.0401s  
[Test #2] Loss: 0.0616 Acc: 97.7004% Time: 1008.5161s  
[Train #3] Loss: 0.0404 Acc: 98.4958% Time: 1279.8077s  
[Test #3] Loss: 0.0611 Acc: 97.9170% Time: 1344.0593s  
[Train #4] Loss: 0.0347 Acc: 98.7208% Time: 1610.9498s  
[Test #4] Loss: 0.0565 Acc: 98.0337% Time: 1677.7971s
```

```
[ ] save_path = 'face_gender_classification_transfer_learning_with_alexnet.pth'  
torch.save(model.state_dict(), save_path) # Simpan state_dict
```


VISUALISASI DATASET

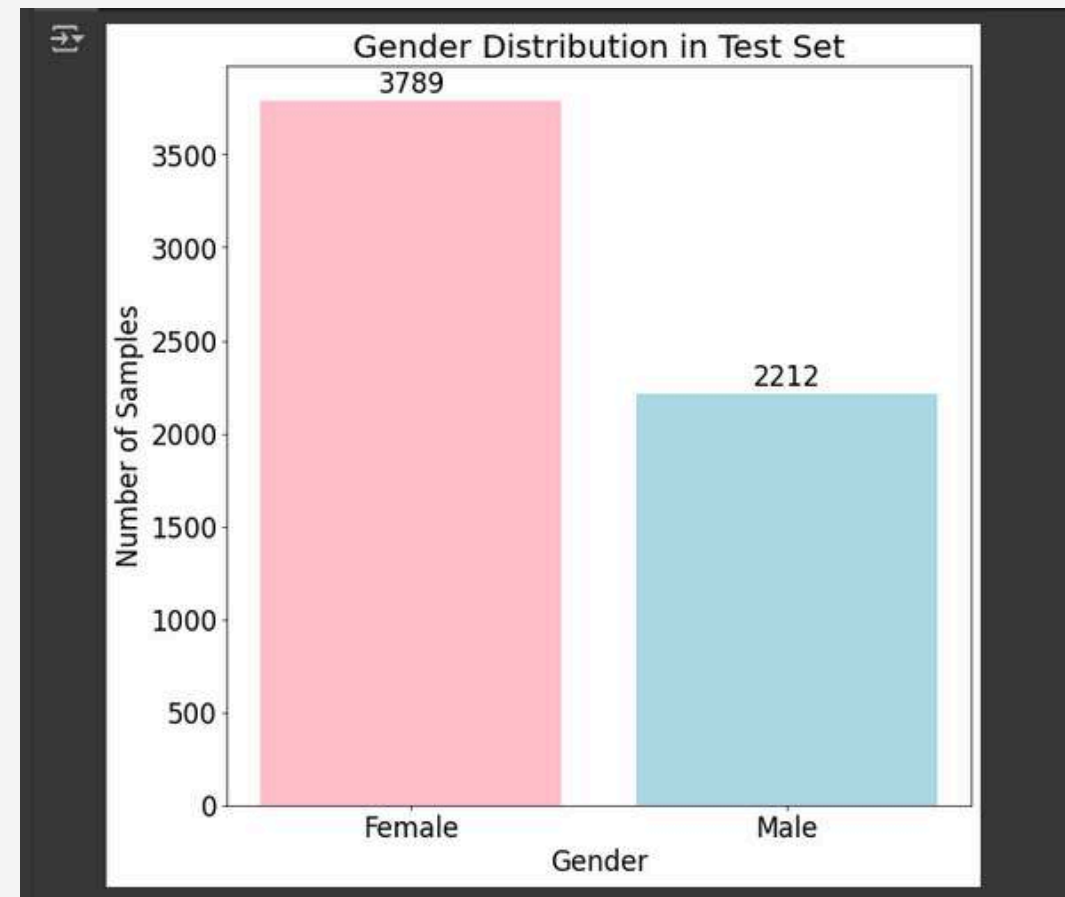
[LINK TO COLAB](#)

PEMBAGIAN DATA TRAIN DAN TEST



TOTAL DATASET 30000 DENGAN PEMBAGIAN
TRAIN DATASET SIZE: 23999 (80%)
TEST DATASET SIZE: 6001(20%)
CLASS NAMES: ['FEMALE', 'MALE']

CLASS DISTRIBUSI DATA TEST



TOTAL DATASET UNTUK DATA TEST ADALAH 6001 DENGAN PEMBAGIAN
FEMALE: 3789
MALE: 2212

CLASS DATA TRAIN

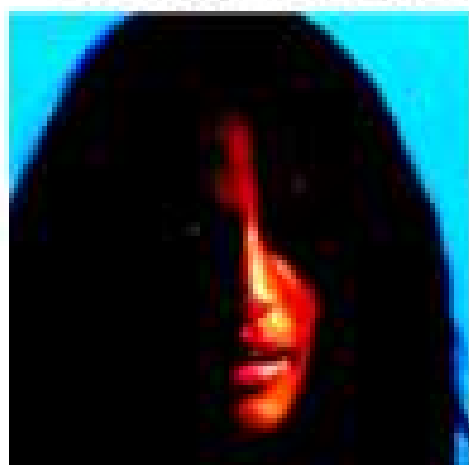


TOTAL DATASET UNTUK DATA TRAIN ADALAH 23999 DENGAN PEMBAGIAN
FEMALE: 15154
MALE: 8845

CONTOH HASIL PREDIKSI SALAH

WARNING:matplotlib.image:Clipping input data to the valid range for imshow with RGB data ([0..1])

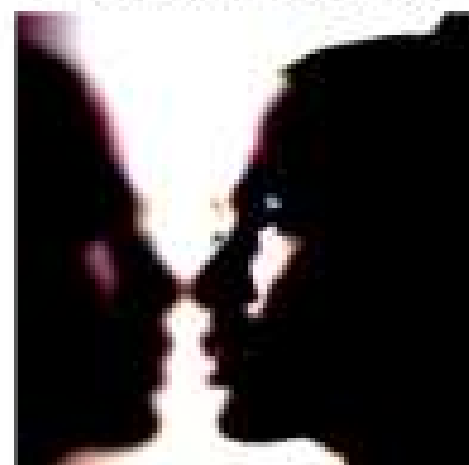
True: Female
Pred: Male



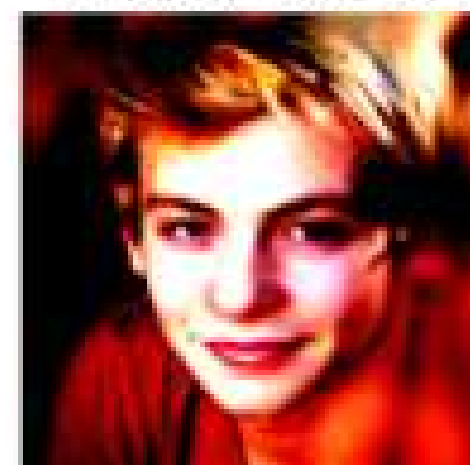
True: Female
Pred: Male



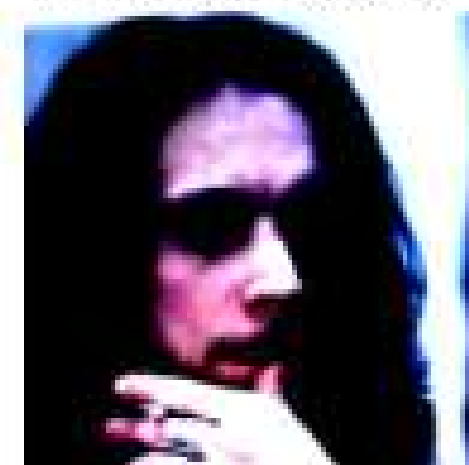
True: Female
Pred: Male



True: Female
Pred: Male

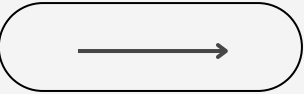


True: Female
Pred: Male



Feature	AlexNet	VGG	GoogLeNet	ResNet
Year Introduced	2012	2014	2014	2015
Depth	8 layers	16-19 layers	22 layers	34, 50, 101, 152 layers
Convolution Filters	11x11, 5x5	3x3	Mixed sizes	3x3
Unique Features	ReLU, dropout	Depth, uniformity	Inception modules, 1x1 convolutions	Residual connections
Computational Efficiency	Moderate	High	High	Very High
Performance on ImageNet	60% top-5 accuracy	71.3%	68.7%	76.5%

COMPARISON



VGG

Accuracy: **98,443%**

Training Time Total: **2465,6 s**

GOOGLENET

Accuracy: **98,2336%**

Training Time Total: **1893,9 s**

RESNET

Accuracy: **98,6336%**

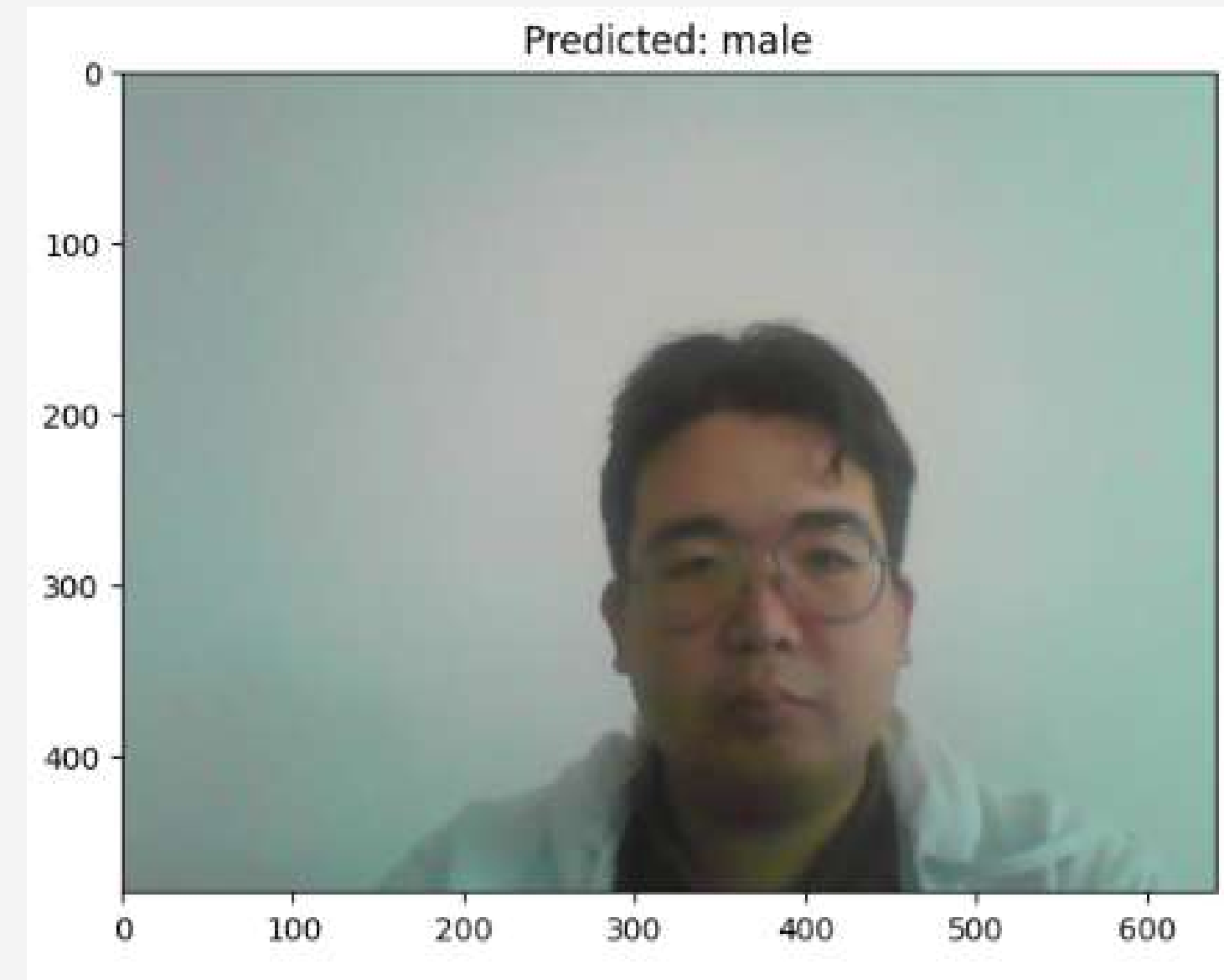
Training Time Total: **1806,4 s**

ALEXNET

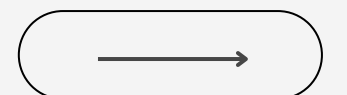
Accuracy: **98,0337%**

Training Time Total: **1677, 8 s**

[LINK TO COLAB](#)



COMPARISON & IMPLEMENTATION



GITHUB

Link Address

[Link To Github/kevin](#)

[Link To Github/thomas](#)

[Link To Github/Yohanes](#)

