



FAKE FACE DETECTION :

- 1.collecting the training dataset with common samples
- 2.samples r shared wth discriminator where it will evaluate [features will b extracted by discremented]
3. a noise is sent to generator and the generator will create a sample and share it to the discriminator.
4. now discriminator has old sample which is compared with the new sample generator generated .
5. the loss function generated by discriminator which is again sent to the generator to reduce loss and then shared to discriminator for comparison , this is the feedback loop process

6.Thus , image will b seen clearly and we can check whether its fake or real face

Change from CPU to GPU in RAM for effecient epochs and quick response

```
In [1]: import tensorflow as tf
import matplotlib.pyplot as plt
import tensorflow as tf
from tensorflow.keras.layers import (
Dense, Conv2D, Conv2DTranspose, Flatten, Reshape,
BatchNormalization, LeakyReLU, Input )
```

Hyperparameters

```
In [2]: BATCH_SIZE = 64
IMG_SIZE = 128
LATENT_DIM = 100
EPOCHS = 400
LR = 2e-4
```

GENERATOR

```
In [3]: def build_generator(latent_dim=100):
    return tf.keras.Sequential([
        Input((latent_dim,)),
        Dense(8*8*512, use_bias=False),
        Reshape((8, 8, 512)),
        Conv2DTranspose(256, 4, 2, "same", use_bias=False),
```

```
        BatchNormalization(),
        LeakyReLU(),
        Conv2DTranspose(128, 4, 2, "same", use_bias=False),
        BatchNormalization(),
        LeakyReLU(),
        Conv2DTranspose(64, 4, 2, "same", use_bias=False),
        BatchNormalization(),
        LeakyReLU(),
        Conv2DTranspose(3, 4, 2, "same", activation="tanh")
    ], name="Generator")
```

Discriminator

```
In [4]: def build_discriminator(img_size=128):
    return tf.keras.Sequential([
        Input((img_size, img_size, 3)),
        Conv2D(64, 4, 2, "same"), LeakyReLU(0.2),
        Conv2D(128, 4, 2, "same"), LeakyReLU(0.2),
        Conv2D(256, 4, 2, "same"), LeakyReLU(0.2),
        Conv2D(512, 4, 2, "same"), LeakyReLU(0.2),
        Flatten(),
        Dense(1)
    ], name="Discriminator")
```

```
In [5]: # tuple rebounding and use 2 variables , one for generator and another for dis
G,D = build_generator(), build_discriminator()
```

generator optimizer technique and discriminator optimizer technique

```
In [6]: from tensorflow.keras.losses import BinaryCrossentropy
from keras.optimizers import Adam
loss_fn = BinaryCrossentropy(from_logits=True)
g_opt = Adam(LR, 0.5)
d_opt = Adam(LR, 0.5)
```

Training step

```
In [7]: @tf.function
def train_step(real):
    noise = tf.random.normal([BATCH_SIZE, LATENT_DIM])
    with tf.GradientTape() as g_tape, tf.GradientTape() as d_tape:
        fake = G(noise, training=True)
        r_out, f_out = D(real, training=True), D(fake, training=True)
        g_loss = loss_fn(tf.ones_like(f_out), f_out)
        d_loss = loss_fn(tf.ones_like(r_out), r_out) + loss_fn(tf.zeros_like(f_out), f_out)

    g_opt.apply_gradients(zip(g_tape.gradient(g_loss),
                            G.trainable_variables),
                            G.trainable_variables))
    d_opt.apply_gradients(zip(d_tape.gradient(d_loss), D.trainable_variables),
                            D.trainable_variables))
```

```
    return g_loss, d_loss
```

Show generated images

```
In [8]: def show_images(epoch, seed):
    preds = G(seed, training=False)
    preds = (preds + 1) / 2.0 # [-1,1] -> [0,1]
    fig, axes = plt.subplots(4,4, figsize=(6,6))
    for i, ax in enumerate(axes.flat):
        ax.imshow(preds[i].numpy())
        ax.axis("off")
    plt.suptitle(f"Epoch {epoch}")
    plt.show()
```

Load dataset (resize to 128x128, normalize to [-1,1])

```
In [9]: train_ds = tf.keras.utils.image_dataset_from_directory(
    "/content/drive/MyDrive/FakeFace-main",
    label_mode=None,
    image_size=(IMG_SIZE, IMG_SIZE),
    batch_size=BATCH_SIZE
).map(lambda x: (tf.cast(x, tf.float32) / 127.5 - 1.0).prefetch(tf.data.AUTOT
```

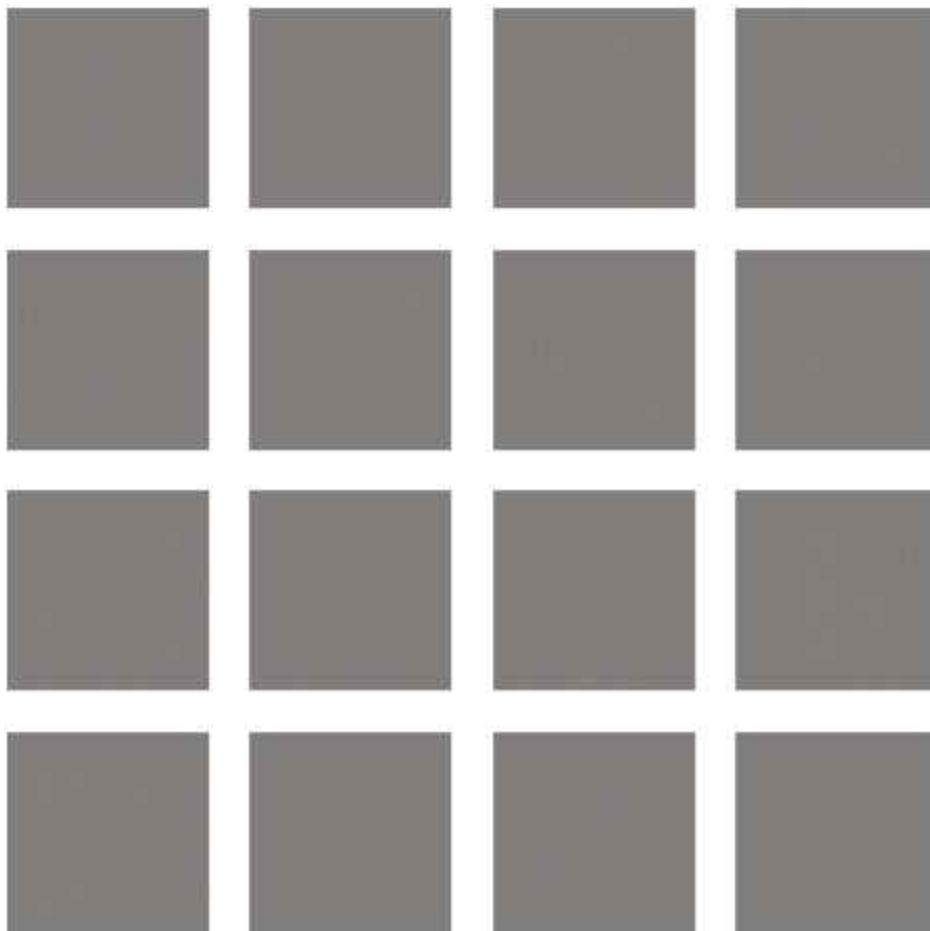
Found 297 files.

Training loop

```
In [10]: seed = tf.random.normal([16, LATENT_DIM])
for e in range(1, EPOCHS+1):
    for real in train_ds:
        g_loss, d_loss = train_step(real)
    print(f"Epoch {e}/{EPOCHS} | G: {g_loss:.3f} D: {d_loss:.3f}")
    if e % 5 == 0: show_images(e, seed)
```

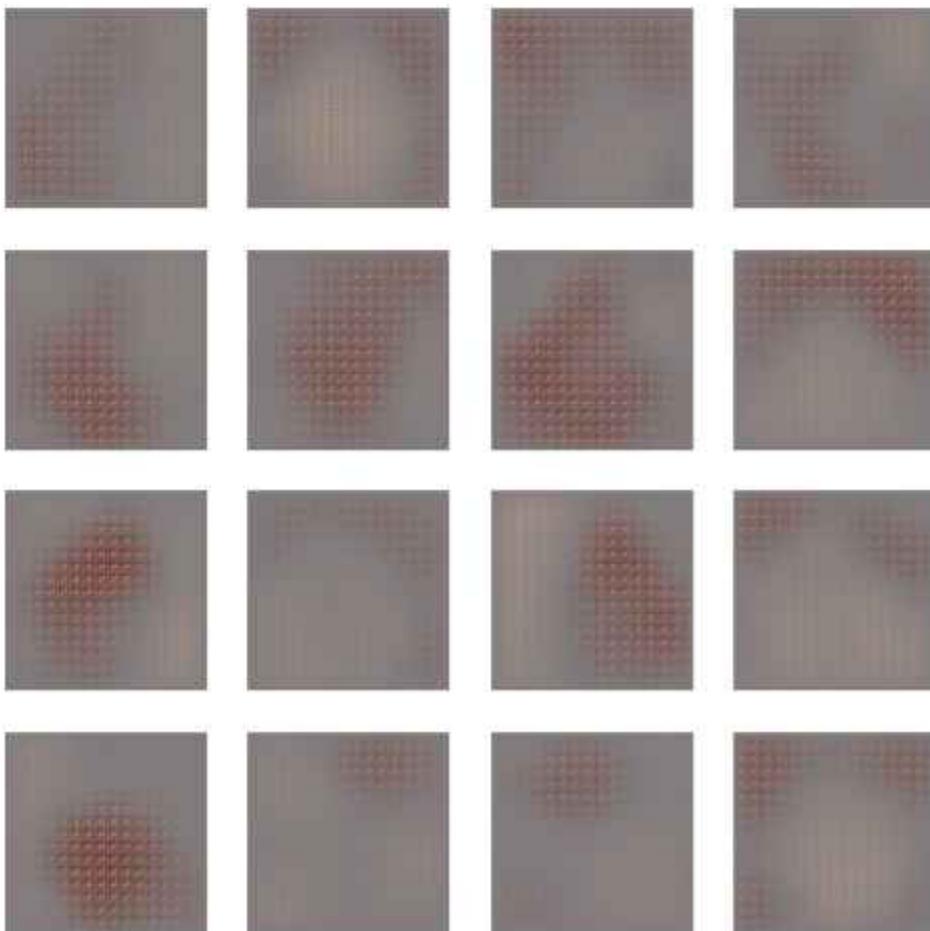
```
Epoch 1/400 | G: 1.317 D: 0.531
Epoch 2/400 | G: 4.659 D: 0.027
Epoch 3/400 | G: 2.512 D: 0.098
Epoch 4/400 | G: 3.350 D: 0.041
Epoch 5/400 | G: 5.666 D: 0.006
```

Epoch 5



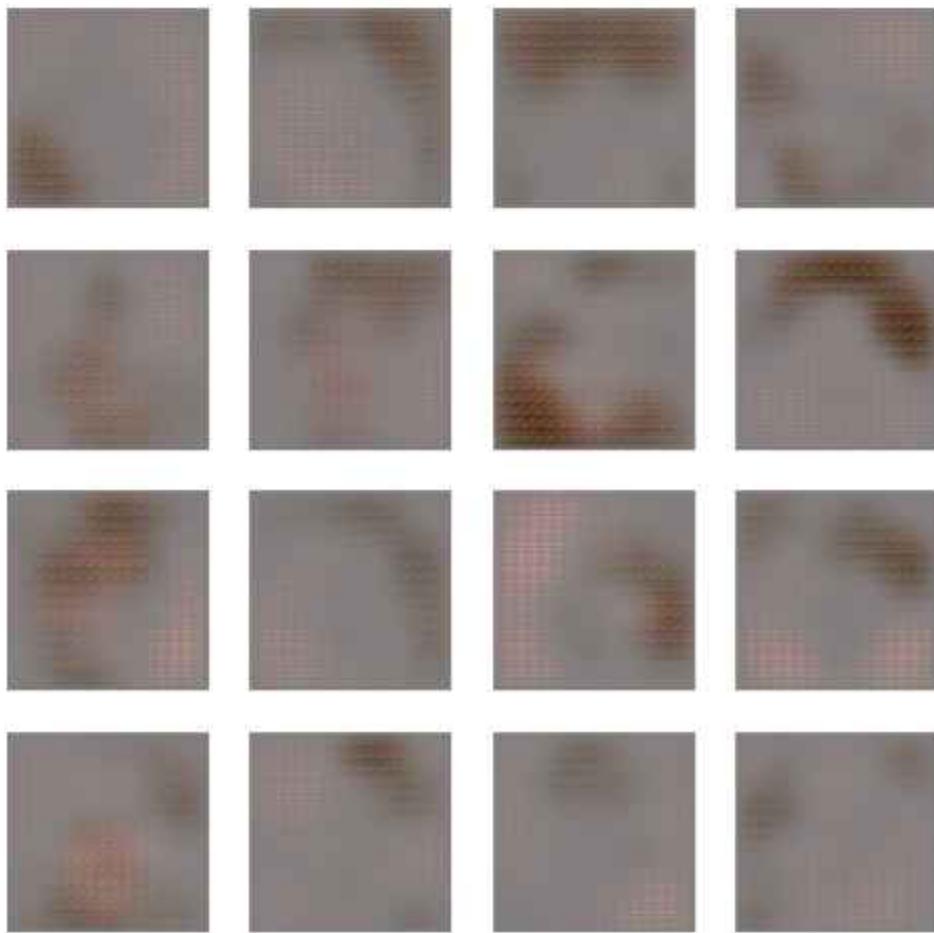
Epoch 6/400 | G: 13.948 D: 0.059
Epoch 7/400 | G: 6.365 D: 0.016
Epoch 8/400 | G: 12.241 D: 0.596
Epoch 9/400 | G: 9.029 D: 0.087
Epoch 10/400 | G: 4.797 D: 0.050

Epoch 10



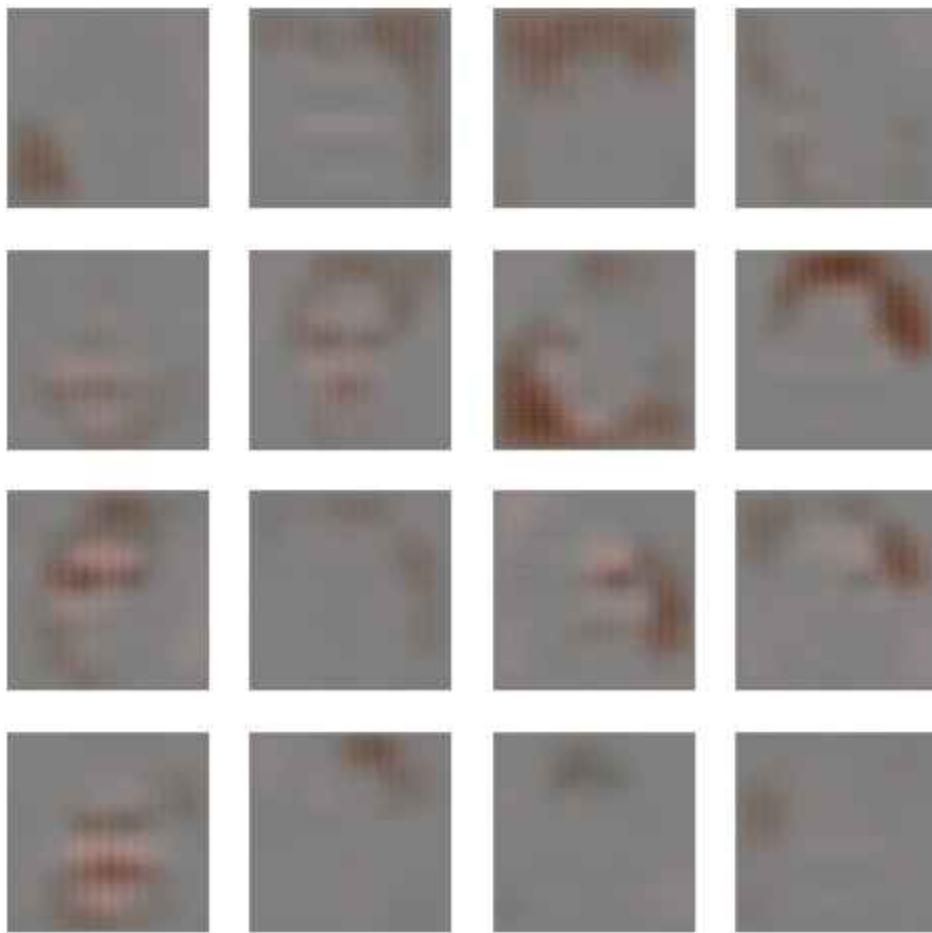
Epoch 11/400	G: 5.020	D: 0.140
Epoch 12/400	G: 6.554	D: 0.278
Epoch 13/400	G: 5.003	D: 0.055
Epoch 14/400	G: 4.122	D: 0.106
Epoch 15/400	G: 3.067	D: 0.236

Epoch 15



Epoch 16/400 | G: 3.310 D: 0.275
Epoch 17/400 | G: 2.969 D: 0.287
Epoch 18/400 | G: 0.683 D: 1.147
Epoch 19/400 | G: 1.079 D: 0.678
Epoch 20/400 | G: 0.712 D: 0.955

Epoch 20



Epoch 21/400 | G: 1.382 D: 0.688
Epoch 22/400 | G: 1.629 D: 0.833
Epoch 23/400 | G: 1.756 D: 0.550
Epoch 24/400 | G: 2.672 D: 1.003
Epoch 25/400 | G: 1.430 D: 0.589

Epoch 25



Epoch 26/400 | G: 1.204 D: 0.660
Epoch 27/400 | G: 1.135 D: 0.720
Epoch 28/400 | G: 1.356 D: 0.681
Epoch 29/400 | G: 3.029 D: 0.986
Epoch 30/400 | G: 1.412 D: 0.631

Epoch 30



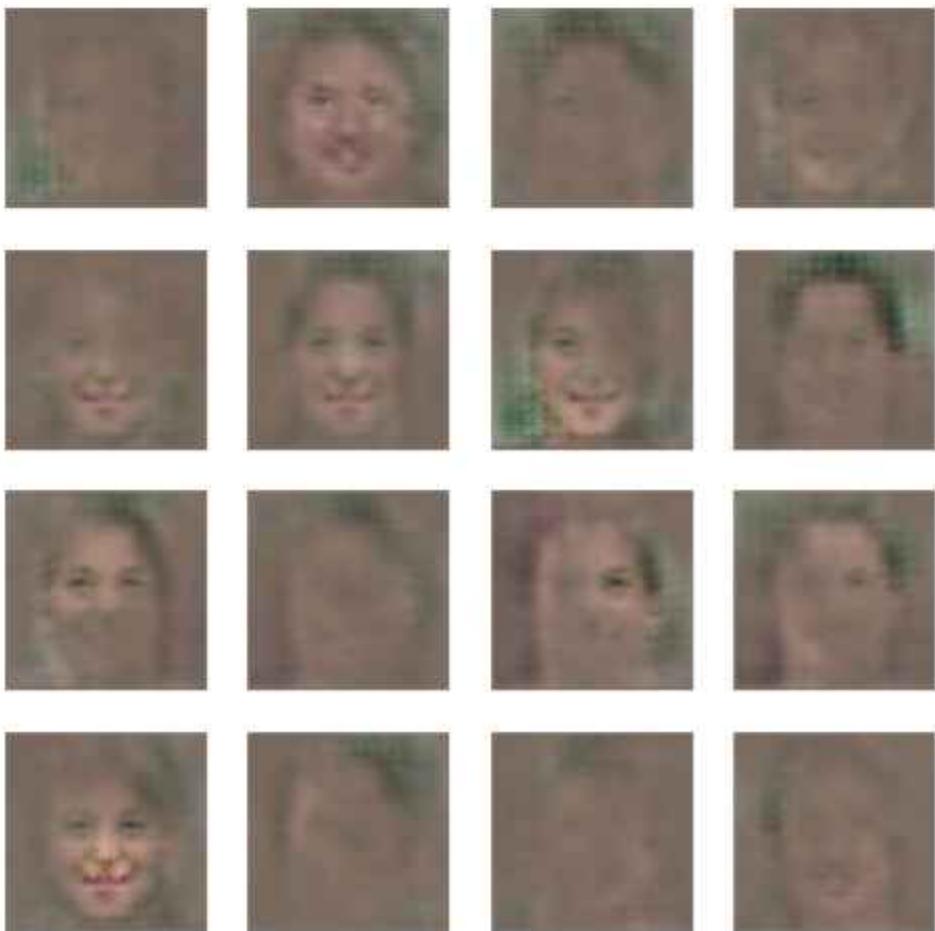
Epoch 31/400 | G: 0.921 D: 0.803
Epoch 32/400 | G: 1.762 D: 0.845
Epoch 33/400 | G: 1.256 D: 0.797
Epoch 34/400 | G: 1.270 D: 0.851
Epoch 35/400 | G: 1.474 D: 0.744

Epoch 35



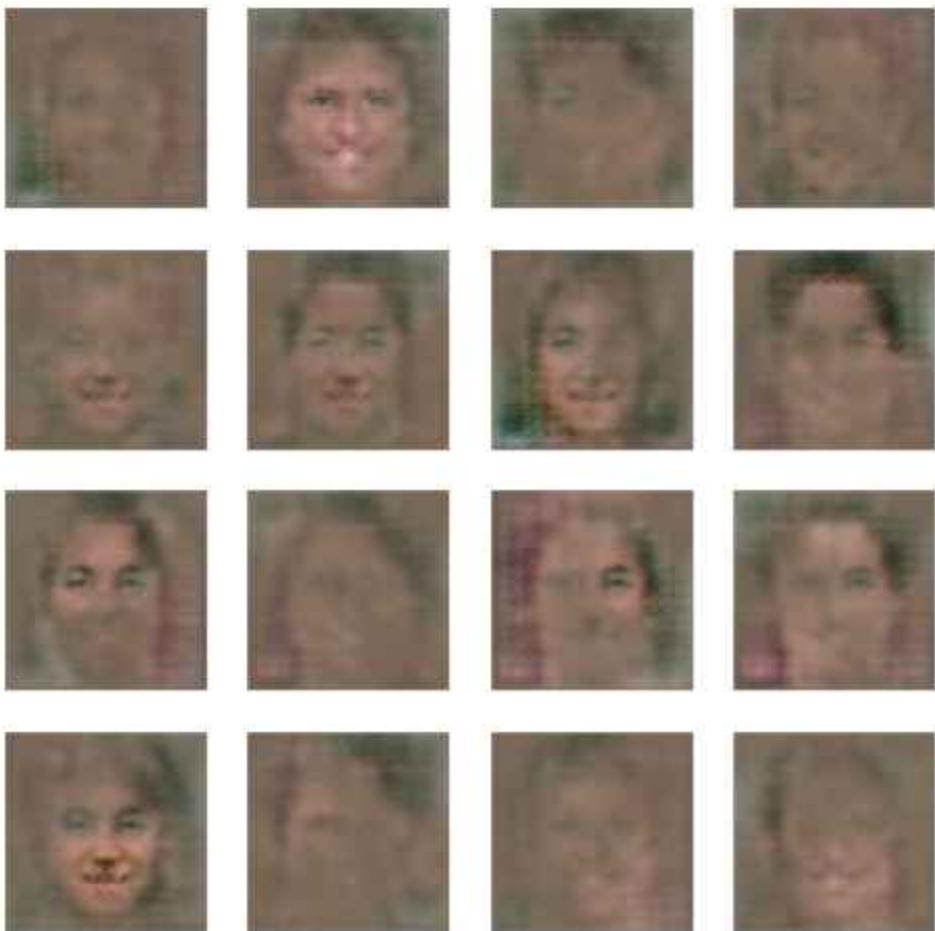
Epoch 36/400 | G: 0.198 D: 2.168
Epoch 37/400 | G: 1.334 D: 1.017
Epoch 38/400 | G: 0.948 D: 1.027
Epoch 39/400 | G: 1.008 D: 1.059
Epoch 40/400 | G: 0.948 D: 1.092

Epoch 40



Epoch 41/400 | G: 0.975 D: 1.092
Epoch 42/400 | G: 0.383 D: 1.498
Epoch 43/400 | G: 1.568 D: 1.291
Epoch 44/400 | G: 1.116 D: 1.010
Epoch 45/400 | G: 1.002 D: 0.959

Epoch 45



Epoch 46/400 | G: 1.564 D: 1.053
Epoch 47/400 | G: 0.602 D: 1.219
Epoch 48/400 | G: 1.097 D: 1.074
Epoch 49/400 | G: 1.330 D: 0.965
Epoch 50/400 | G: 0.230 D: 1.858

Epoch 50



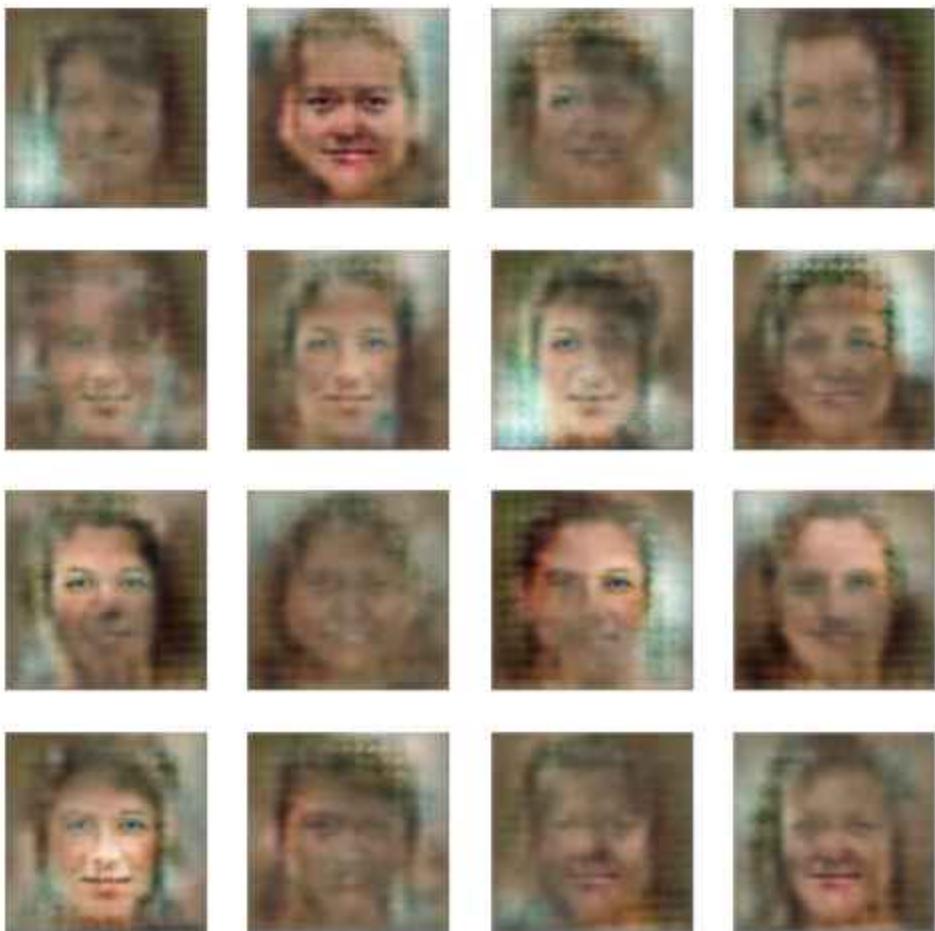
Epoch 51/400 | G: 0.843 D: 1.114
Epoch 52/400 | G: 0.946 D: 0.973
Epoch 53/400 | G: 0.973 D: 1.116
Epoch 54/400 | G: 0.955 D: 1.182
Epoch 55/400 | G: 0.989 D: 0.899

Epoch 55



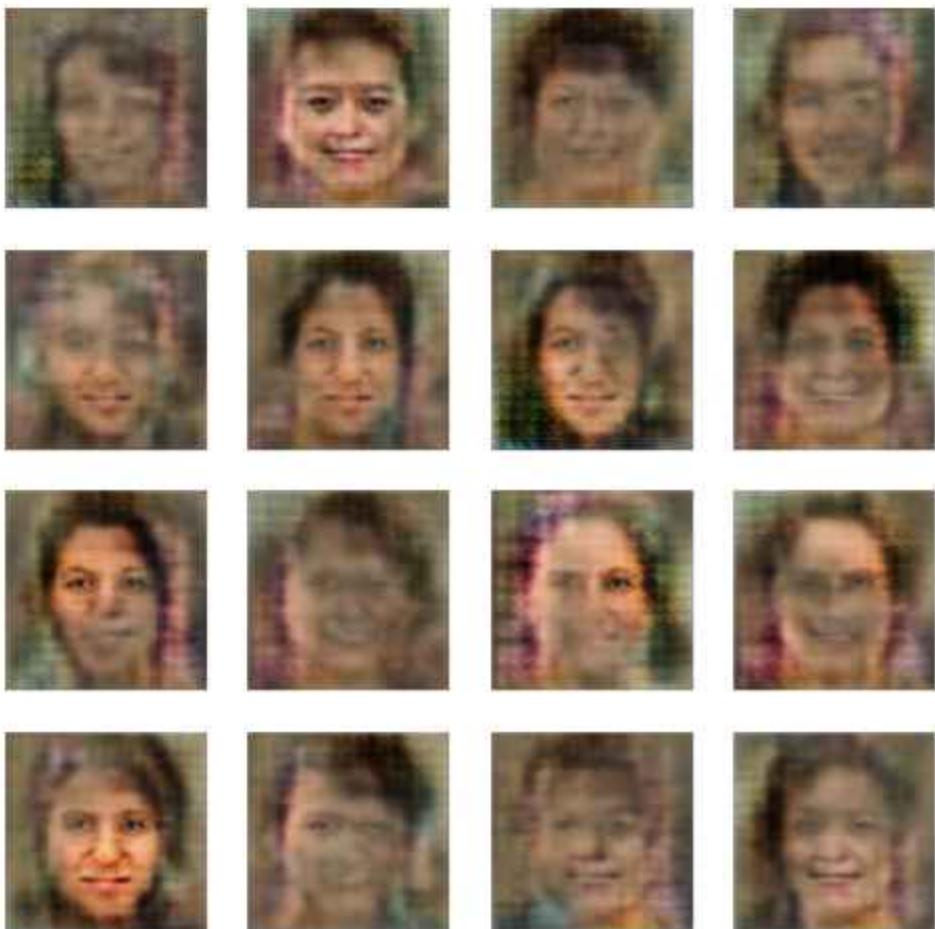
Epoch 56/400 | G: 0.873 D: 1.168
Epoch 57/400 | G: 1.473 D: 1.261
Epoch 58/400 | G: 0.949 D: 1.018
Epoch 59/400 | G: 1.400 D: 1.226
Epoch 60/400 | G: 0.991 D: 1.109

Epoch 60



Epoch 61/400 | G: 1.260 D: 1.150
Epoch 62/400 | G: 0.744 D: 1.191
Epoch 63/400 | G: 1.043 D: 0.992
Epoch 64/400 | G: 1.178 D: 0.990
Epoch 65/400 | G: 0.876 D: 1.119

Epoch 65



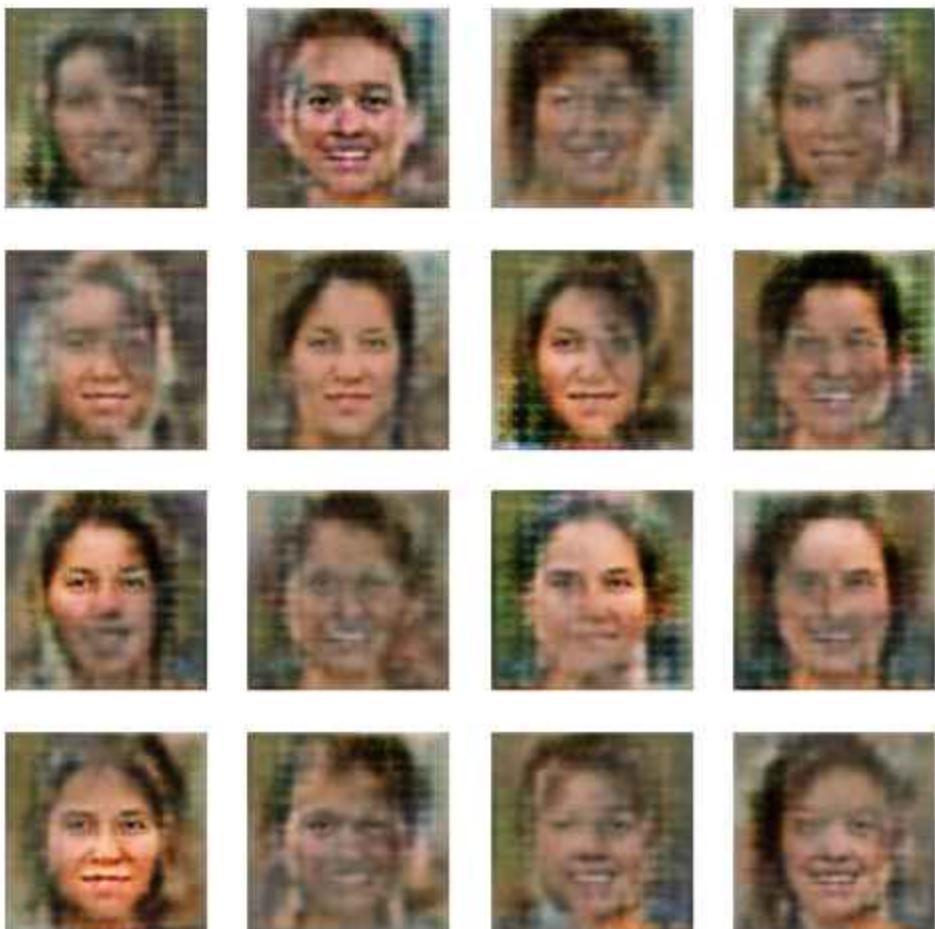
Epoch 66/400 | G: 0.855 D: 1.101
Epoch 67/400 | G: 1.081 D: 0.949
Epoch 68/400 | G: 0.406 D: 1.446
Epoch 69/400 | G: 0.963 D: 1.055
Epoch 70/400 | G: 0.871 D: 1.068

Epoch 70



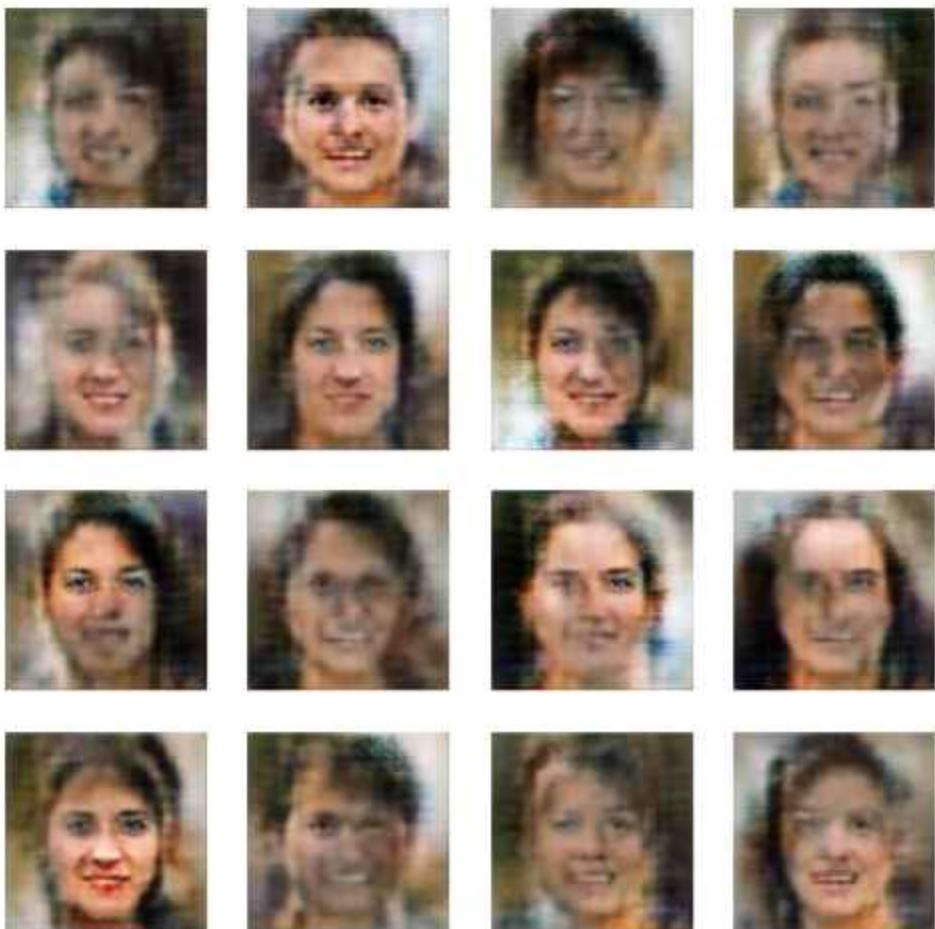
Epoch 71/400 | G: 1.068 D: 1.065
Epoch 72/400 | G: 1.049 D: 1.131
Epoch 73/400 | G: 0.775 D: 1.055
Epoch 74/400 | G: 0.811 D: 1.247
Epoch 75/400 | G: 0.840 D: 1.054

Epoch 75



Epoch 76/400 | G: 0.868 D: 1.175
Epoch 77/400 | G: 0.558 D: 1.370
Epoch 78/400 | G: 0.712 D: 1.117
Epoch 79/400 | G: 0.838 D: 1.123
Epoch 80/400 | G: 1.692 D: 1.177

Epoch 80



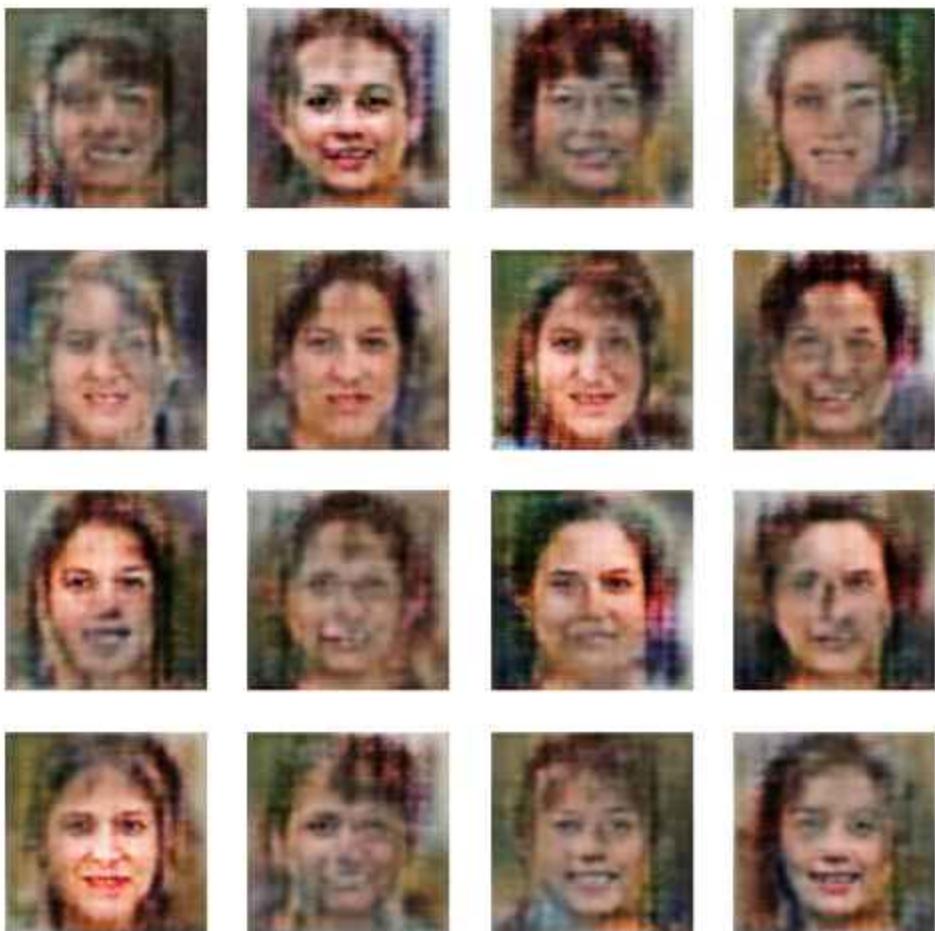
Epoch 81/400 | G: 0.884 D: 1.125
Epoch 82/400 | G: 0.816 D: 1.034
Epoch 83/400 | G: 0.645 D: 1.117
Epoch 84/400 | G: 1.334 D: 1.066
Epoch 85/400 | G: 0.996 D: 1.165

Epoch 85



Epoch 86/400 | G: 0.361 D: 1.478
Epoch 87/400 | G: 0.990 D: 0.892
Epoch 88/400 | G: 0.465 D: 1.355
Epoch 89/400 | G: 0.998 D: 1.089
Epoch 90/400 | G: 0.953 D: 0.980

Epoch 90



Epoch 91/400 | G: 0.962 D: 1.051
Epoch 92/400 | G: 0.966 D: 1.058
Epoch 93/400 | G: 1.254 D: 0.917
Epoch 94/400 | G: 0.454 D: 1.292
Epoch 95/400 | G: 0.847 D: 1.012

Epoch 95



Epoch 96/400 | G: 0.970 D: 1.091

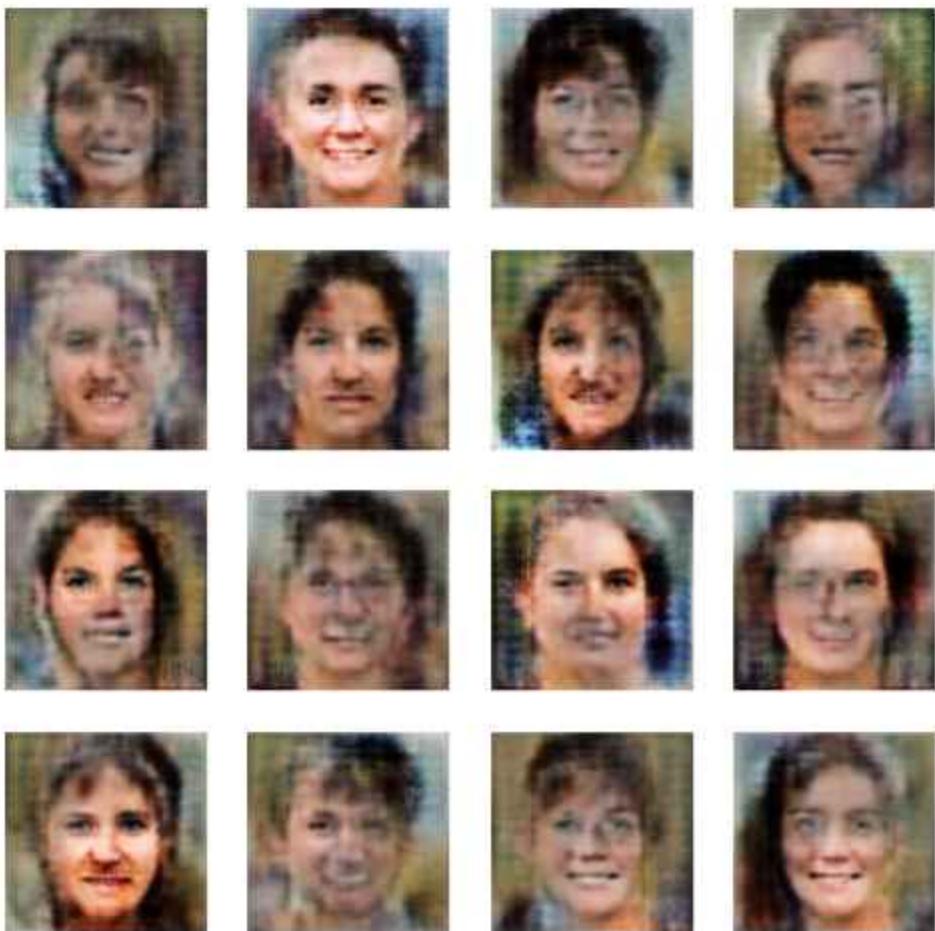
Epoch 97/400 | G: 0.182 D: 1.964

Epoch 98/400 | G: 1.091 D: 1.000

Epoch 99/400 | G: 0.896 D: 0.990

Epoch 100/400 | G: 1.109 D: 0.985

Epoch 100



Epoch 101/400 | G: 0.908 D: 0.912

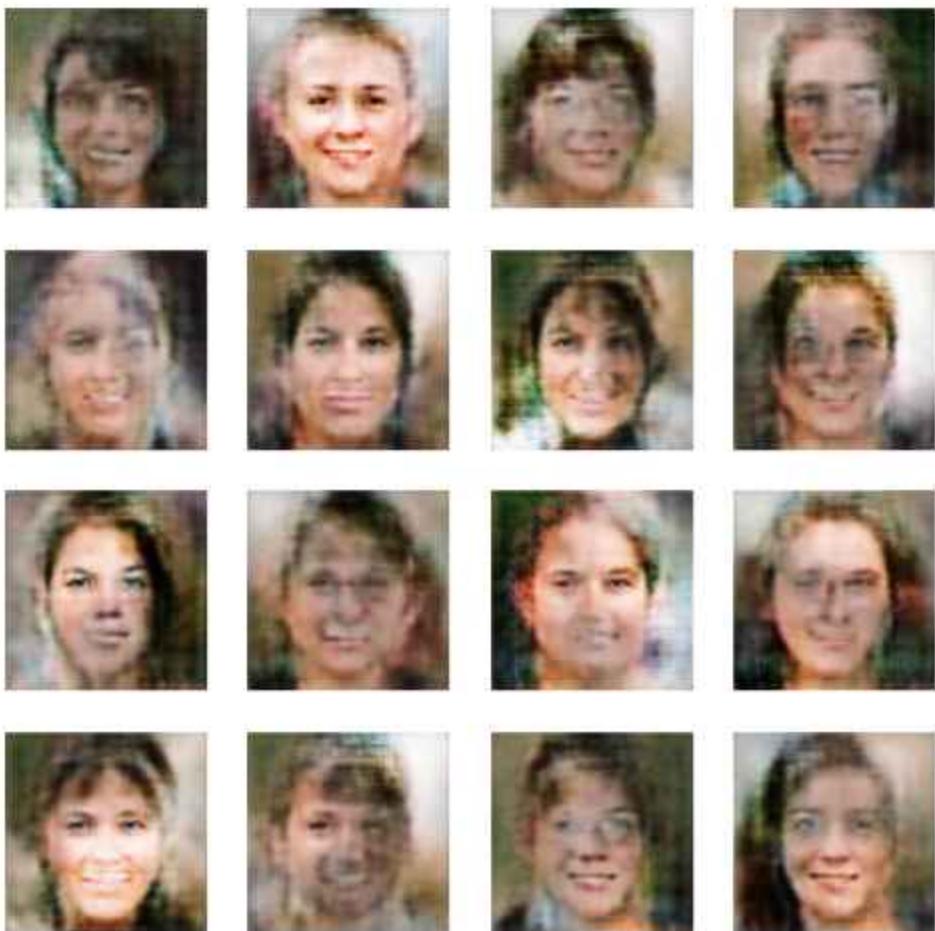
Epoch 102/400 | G: 2.124 D: 1.425

Epoch 103/400 | G: 0.861 D: 1.051

Epoch 104/400 | G: 0.961 D: 0.936

Epoch 105/400 | G: 0.487 D: 1.261

Epoch 105



Epoch 106/400 | G: 0.996 D: 0.961

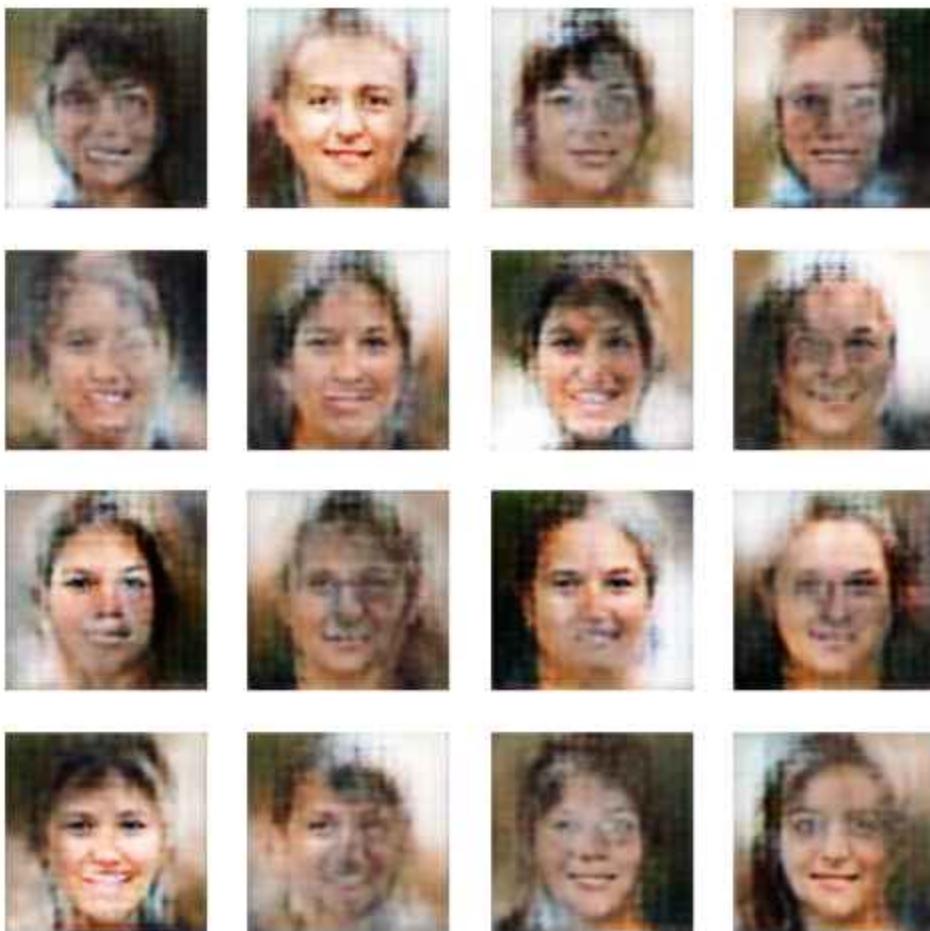
Epoch 107/400 | G: 1.076 D: 0.966

Epoch 108/400 | G: 1.068 D: 0.963

Epoch 109/400 | G: 1.085 D: 0.926

Epoch 110/400 | G: 0.630 D: 1.152

Epoch 110



Epoch 111/400 | G: 1.057 D: 0.890

Epoch 112/400 | G: 1.141 D: 0.830

Epoch 113/400 | G: 1.166 D: 0.779

Epoch 114/400 | G: 0.273 D: 1.699

Epoch 115/400 | G: 1.075 D: 0.848

Epoch 115



Epoch 116/400 | G: 1.068 D: 0.867

Epoch 117/400 | G: 2.062 D: 1.111

Epoch 118/400 | G: 1.169 D: 0.878

Epoch 119/400 | G: 1.096 D: 0.893

Epoch 120/400 | G: 0.906 D: 0.740

Epoch 120



Epoch 121/400 | G: 1.967 D: 1.247

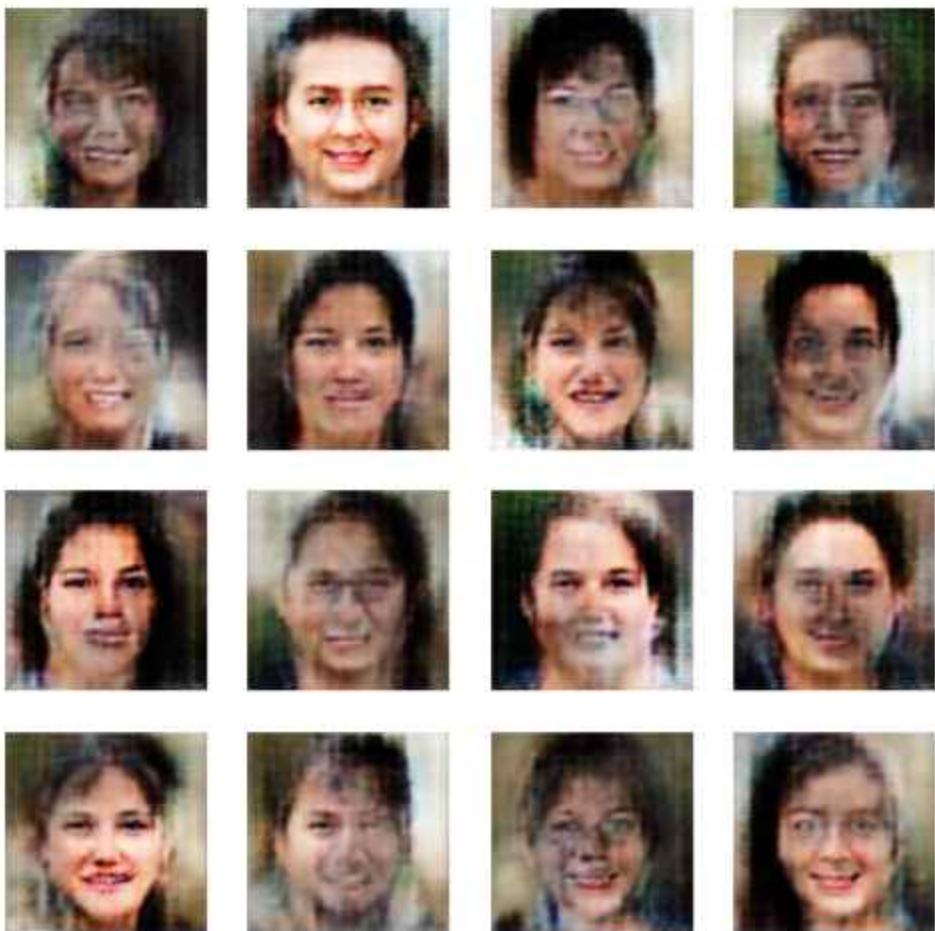
Epoch 122/400 | G: 1.547 D: 0.798

Epoch 123/400 | G: 1.237 D: 0.743

Epoch 124/400 | G: 1.573 D: 0.881

Epoch 125/400 | G: 1.011 D: 0.884

Epoch 125



Epoch 126/400 | G: 0.974 D: 0.882

Epoch 127/400 | G: 1.057 D: 0.915

Epoch 128/400 | G: 1.174 D: 0.817

Epoch 129/400 | G: 0.668 D: 1.129

Epoch 130/400 | G: 1.214 D: 0.803

Epoch 130



Epoch 131/400 | G: 0.925 D: 0.979

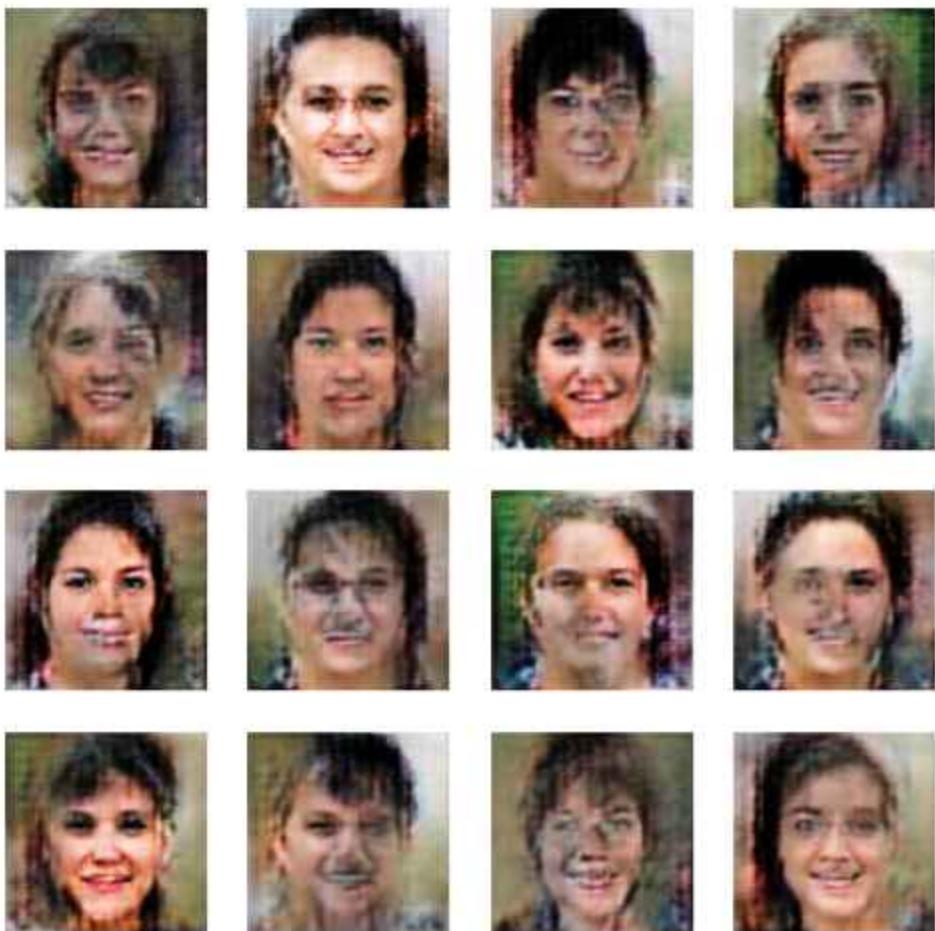
Epoch 132/400 | G: 1.413 D: 0.735

Epoch 133/400 | G: 1.186 D: 0.739

Epoch 134/400 | G: 1.059 D: 0.807

Epoch 135/400 | G: 1.237 D: 0.787

Epoch 135



Epoch 136/400 | G: 0.279 D: 1.672

Epoch 137/400 | G: 0.929 D: 0.798

Epoch 138/400 | G: 0.707 D: 1.093

Epoch 139/400 | G: 1.474 D: 0.797

Epoch 140/400 | G: 1.572 D: 0.724

Epoch 140



Epoch 141/400 | G: 1.969 D: 1.351

Epoch 142/400 | G: 0.960 D: 1.111

Epoch 143/400 | G: 1.068 D: 0.938

Epoch 144/400 | G: 1.035 D: 1.096

Epoch 145/400 | G: 1.017 D: 0.959

Epoch 145



Epoch 146/400 | G: 0.952 D: 0.865

Epoch 147/400 | G: 1.559 D: 0.817

Epoch 148/400 | G: 1.148 D: 0.859

Epoch 149/400 | G: 0.248 D: 1.769

Epoch 150/400 | G: 1.322 D: 0.838

Epoch 150



Epoch 151/400 | G: 1.346 D: 0.847

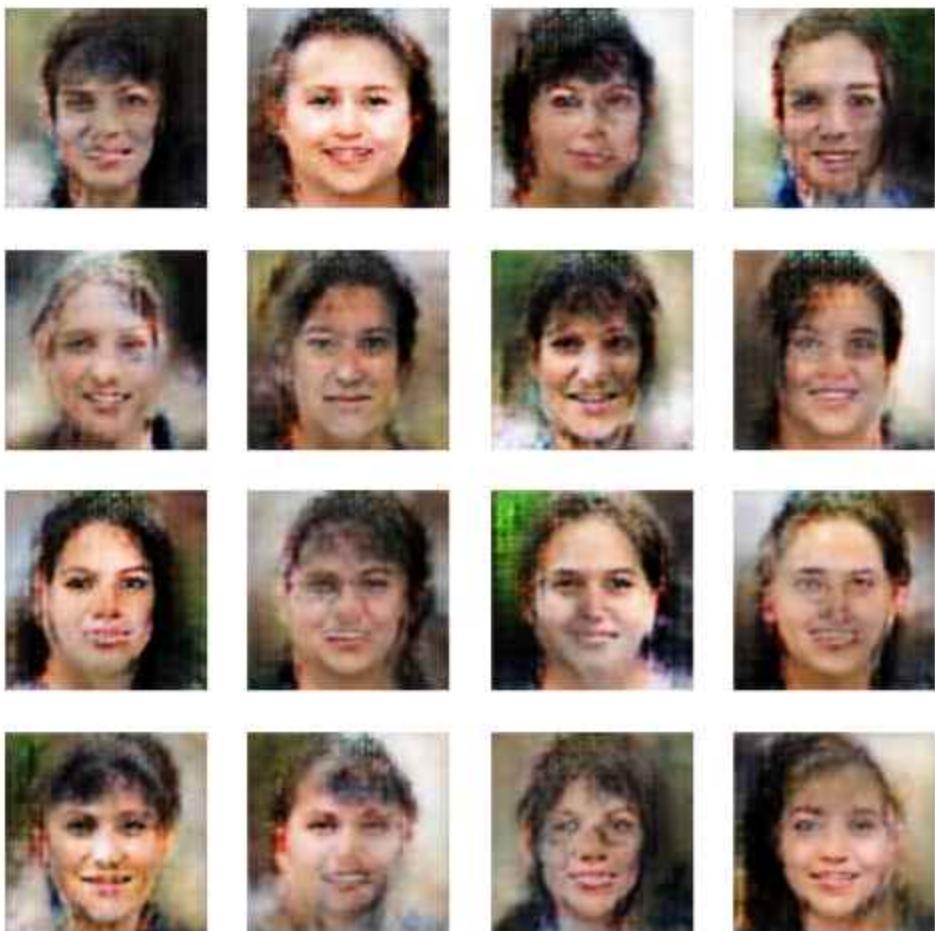
Epoch 152/400 | G: 1.024 D: 0.893

Epoch 153/400 | G: 0.799 D: 0.952

Epoch 154/400 | G: 1.590 D: 0.888

Epoch 155/400 | G: 0.923 D: 0.872

Epoch 155



Epoch 156/400 | G: 0.794 D: 0.979

Epoch 157/400 | G: 2.003 D: 0.816

Epoch 158/400 | G: 1.487 D: 0.684

Epoch 159/400 | G: 1.247 D: 0.785

Epoch 160/400 | G: 1.151 D: 0.876

Epoch 160



Epoch 161/400 | G: 0.677 D: 0.972

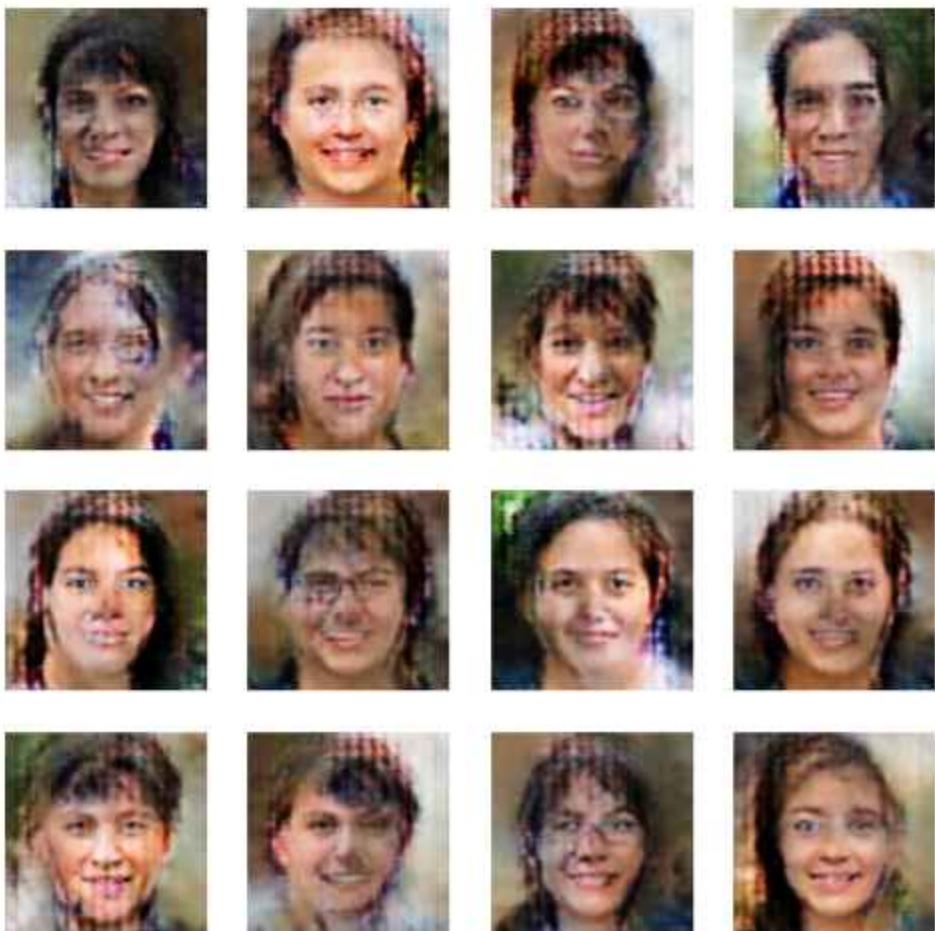
Epoch 162/400 | G: 1.167 D: 1.062

Epoch 163/400 | G: 1.749 D: 0.918

Epoch 164/400 | G: 1.567 D: 0.909

Epoch 165/400 | G: 1.137 D: 0.787

Epoch 165



Epoch 166/400 | G: 1.539 D: 0.845

Epoch 167/400 | G: 0.795 D: 0.965

Epoch 168/400 | G: 1.714 D: 1.076

Epoch 169/400 | G: 1.629 D: 0.986

Epoch 170/400 | G: 0.863 D: 0.886

Epoch 170



Epoch 171/400 | G: 1.098 D: 0.849

Epoch 172/400 | G: 2.703 D: 1.231

Epoch 173/400 | G: 2.402 D: 1.612

Epoch 174/400 | G: 0.954 D: 0.893

Epoch 175/400 | G: 0.964 D: 0.856

Epoch 175



Epoch 176/400 | G: 1.652 D: 0.770

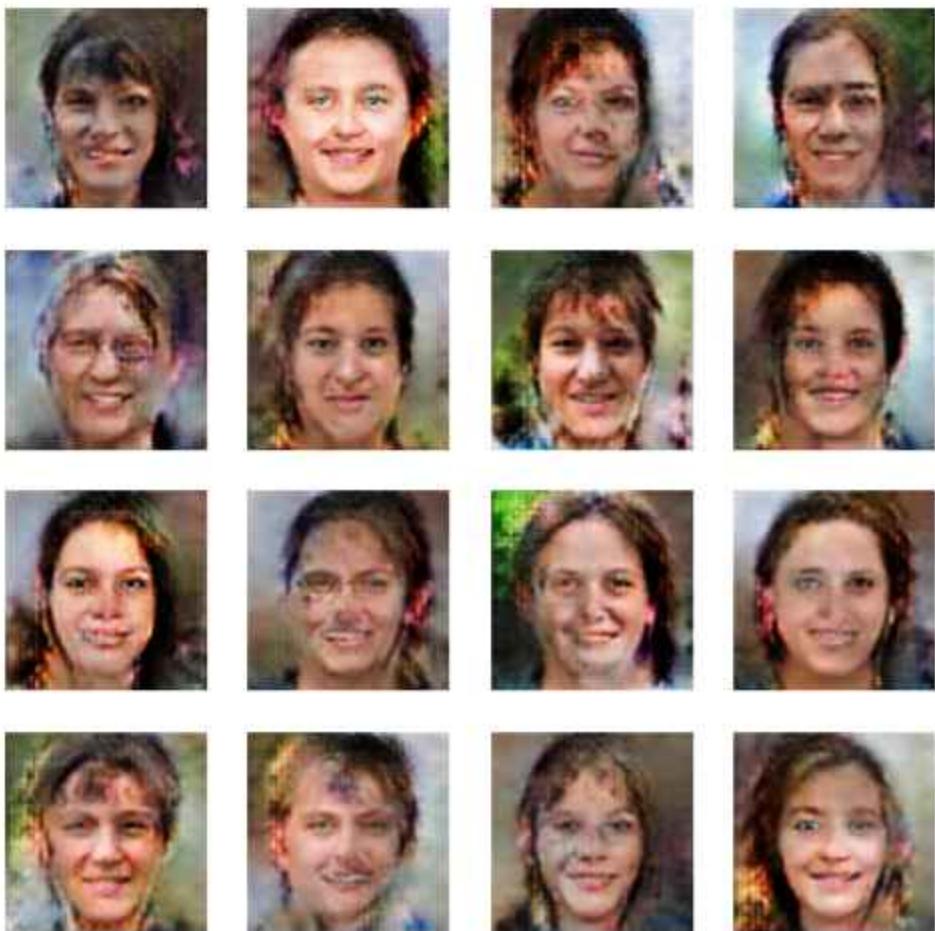
Epoch 177/400 | G: 0.685 D: 1.055

Epoch 178/400 | G: 1.008 D: 0.856

Epoch 179/400 | G: 1.053 D: 0.812

Epoch 180/400 | G: 1.390 D: 0.733

Epoch 180



Epoch 181/400 | G: 0.455 D: 1.292

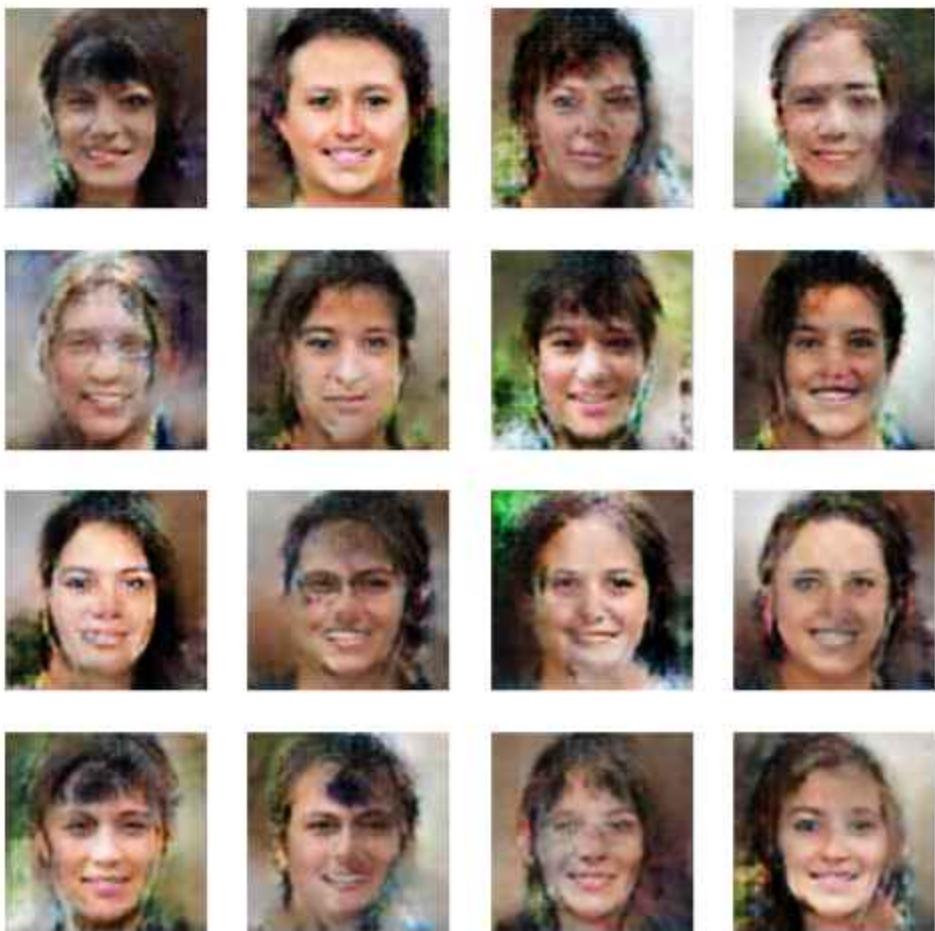
Epoch 182/400 | G: 0.808 D: 0.927

Epoch 183/400 | G: 0.756 D: 0.930

Epoch 184/400 | G: 1.013 D: 0.826

Epoch 185/400 | G: 0.915 D: 0.844

Epoch 185



Epoch 186/400 | G: 1.300 D: 0.703

Epoch 187/400 | G: 4.046 D: 2.134

Epoch 188/400 | G: 0.962 D: 1.262

Epoch 189/400 | G: 0.973 D: 0.954

Epoch 190/400 | G: 1.008 D: 0.931

Epoch 190



Epoch 191/400 | G: 1.286 D: 0.933

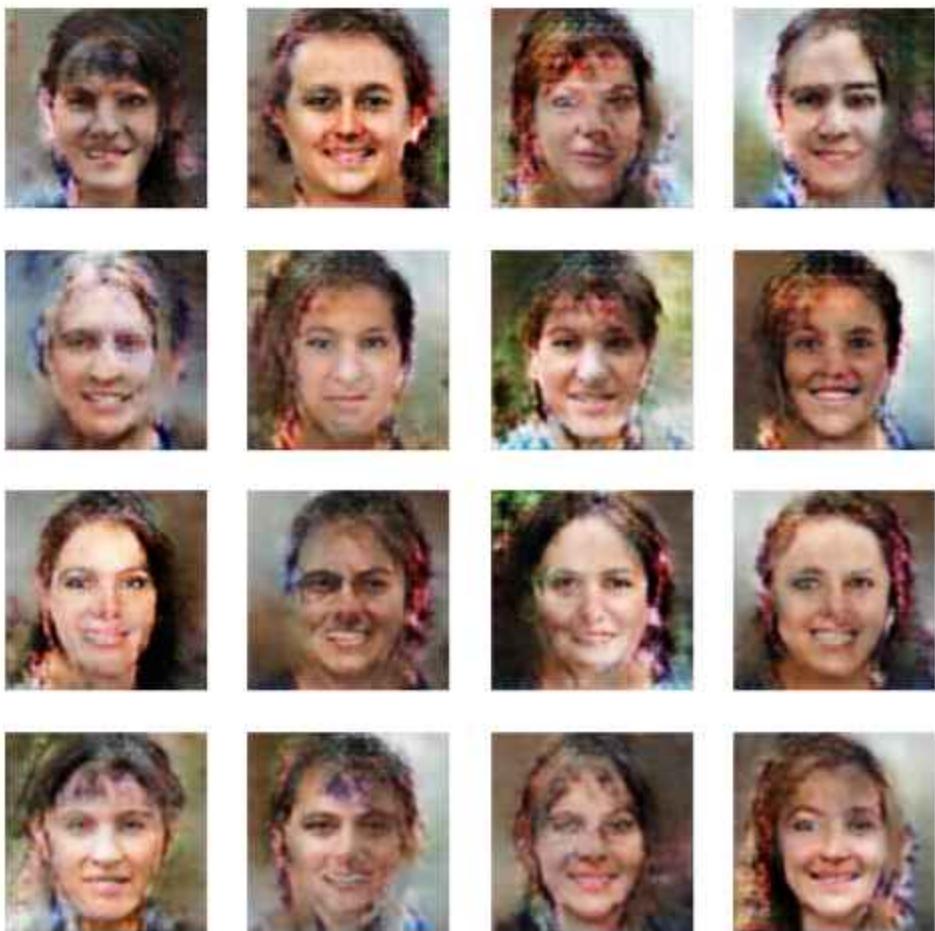
Epoch 192/400 | G: 0.715 D: 1.065

Epoch 193/400 | G: 1.082 D: 0.826

Epoch 194/400 | G: 1.246 D: 0.613

Epoch 195/400 | G: 1.779 D: 1.047

Epoch 195



Epoch 196/400 | G: 0.883 D: 0.876

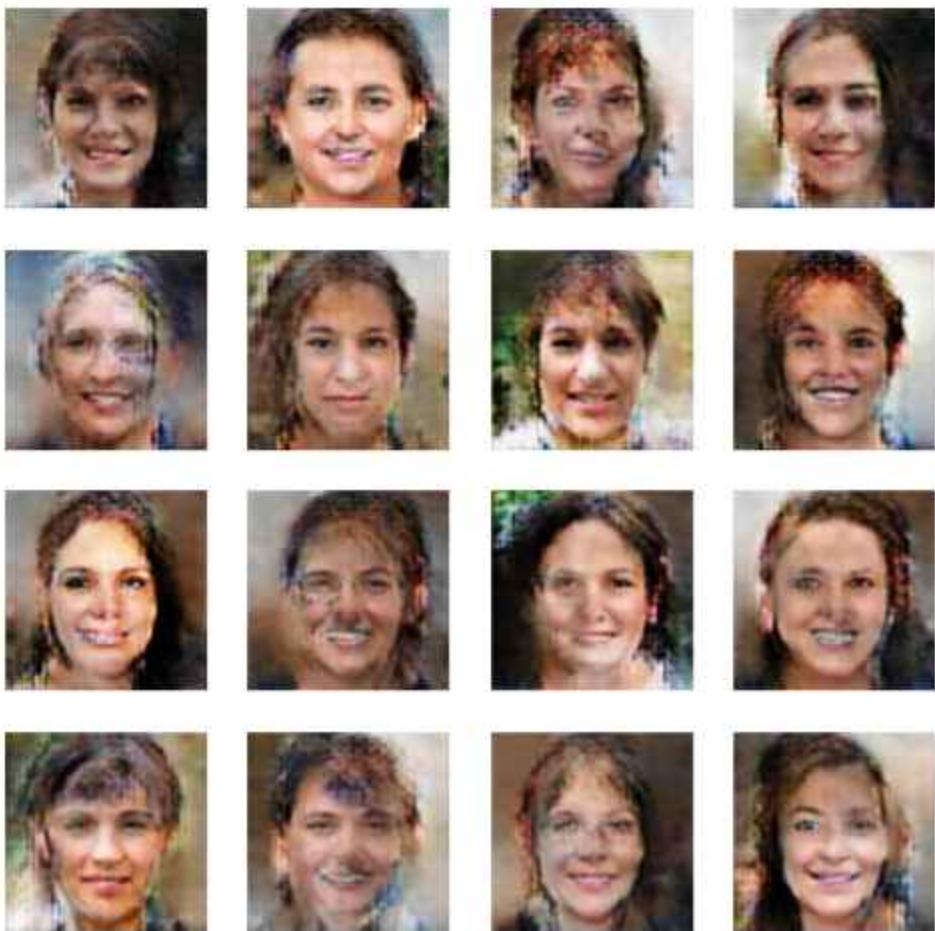
Epoch 197/400 | G: 2.059 D: 0.861

Epoch 198/400 | G: 1.451 D: 0.846

Epoch 199/400 | G: 0.617 D: 1.146

Epoch 200/400 | G: 1.176 D: 0.868

Epoch 200



Epoch 201/400 | G: 1.058 D: 0.816

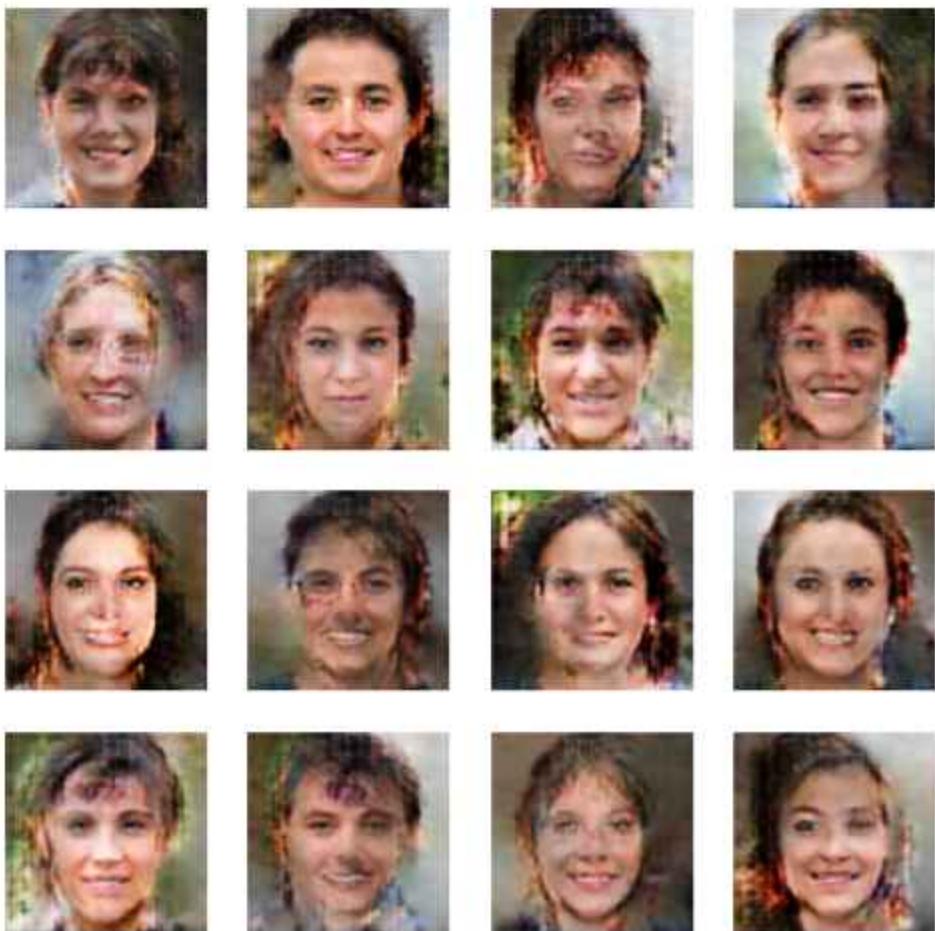
Epoch 202/400 | G: 0.714 D: 0.960

Epoch 203/400 | G: 1.397 D: 0.974

Epoch 204/400 | G: 1.365 D: 0.801

Epoch 205/400 | G: 1.426 D: 0.902

Epoch 205



Epoch 206/400 | G: 1.486 D: 0.753

Epoch 207/400 | G: 1.186 D: 0.931

Epoch 208/400 | G: 2.400 D: 1.157

Epoch 209/400 | G: 1.180 D: 0.727

Epoch 210/400 | G: 1.006 D: 0.766

Epoch 210



Epoch 211/400 | G: 3.043 D: 1.485

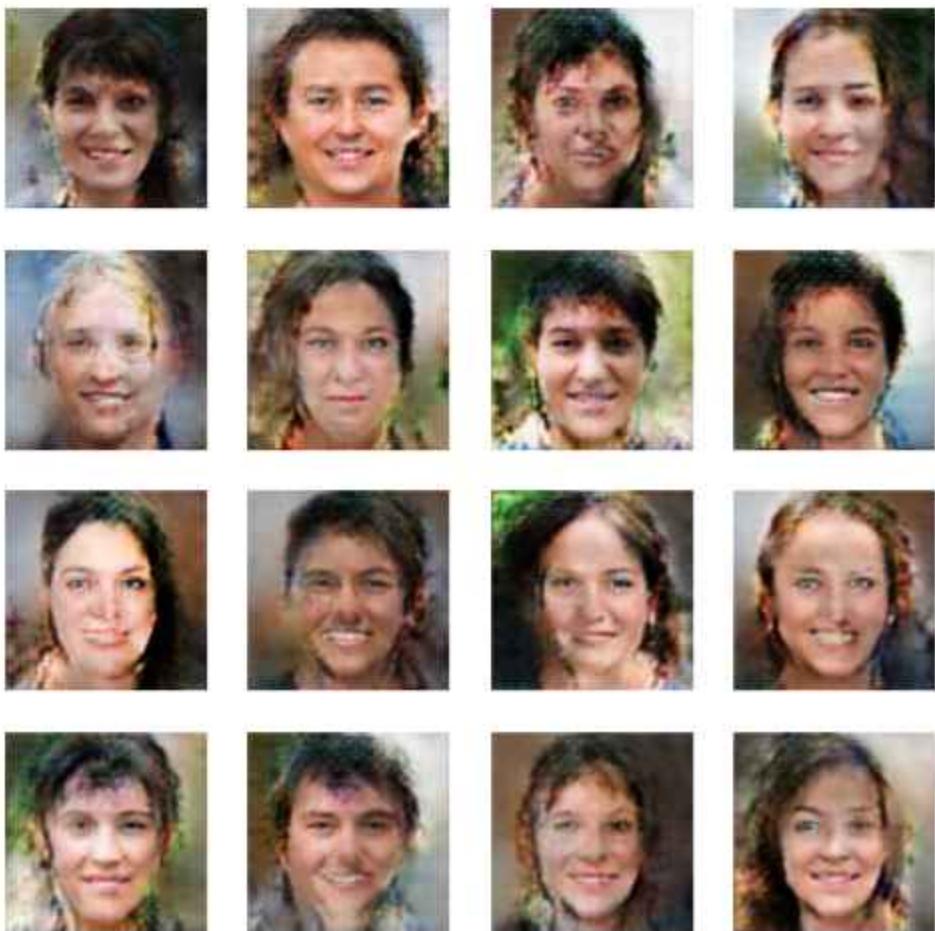
Epoch 212/400 | G: 1.134 D: 0.775

Epoch 213/400 | G: 1.522 D: 0.679

Epoch 214/400 | G: 1.022 D: 0.721

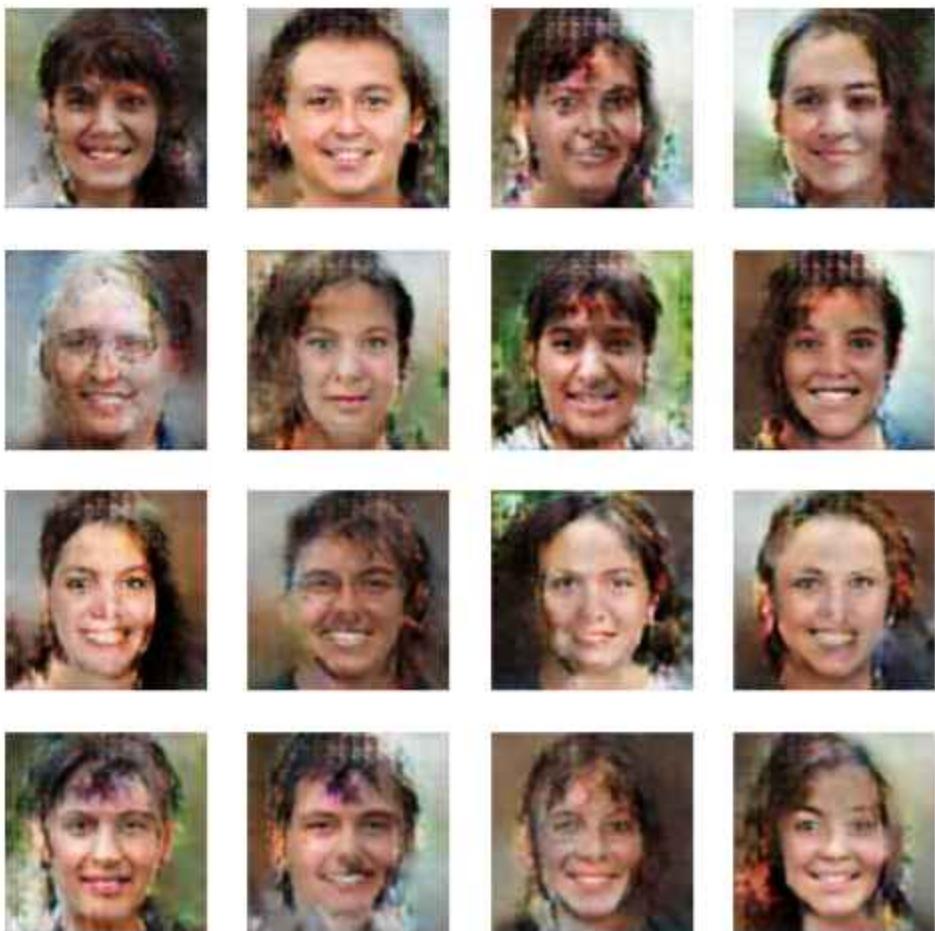
Epoch 215/400 | G: 1.494 D: 0.848

Epoch 215



Epoch 216/400 | G: 1.314 D: 0.628
Epoch 217/400 | G: 1.553 D: 0.574
Epoch 218/400 | G: 3.062 D: 1.272
Epoch 219/400 | G: 1.516 D: 0.814
Epoch 220/400 | G: 1.663 D: 0.790

Epoch 220



Epoch 221/400 | G: 1.827 D: 0.916

Epoch 222/400 | G: 1.606 D: 0.804

Epoch 223/400 | G: 1.822 D: 0.911

Epoch 224/400 | G: 1.134 D: 0.777

Epoch 225/400 | G: 1.546 D: 0.891

Epoch 225



Epoch 226/400 | G: 0.768 D: 0.920

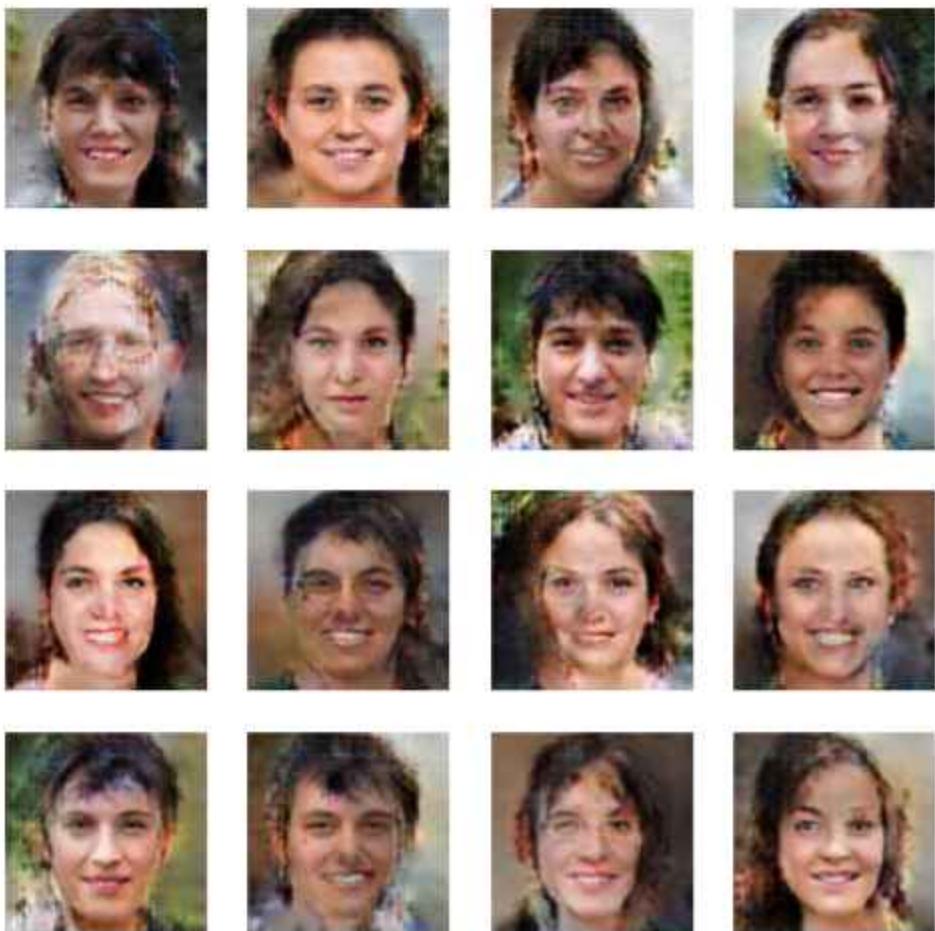
Epoch 227/400 | G: 1.500 D: 0.651

Epoch 228/400 | G: 0.845 D: 0.774

Epoch 229/400 | G: 1.678 D: 0.708

Epoch 230/400 | G: 1.398 D: 0.732

Epoch 230



Epoch 231/400 | G: 1.360 D: 0.832

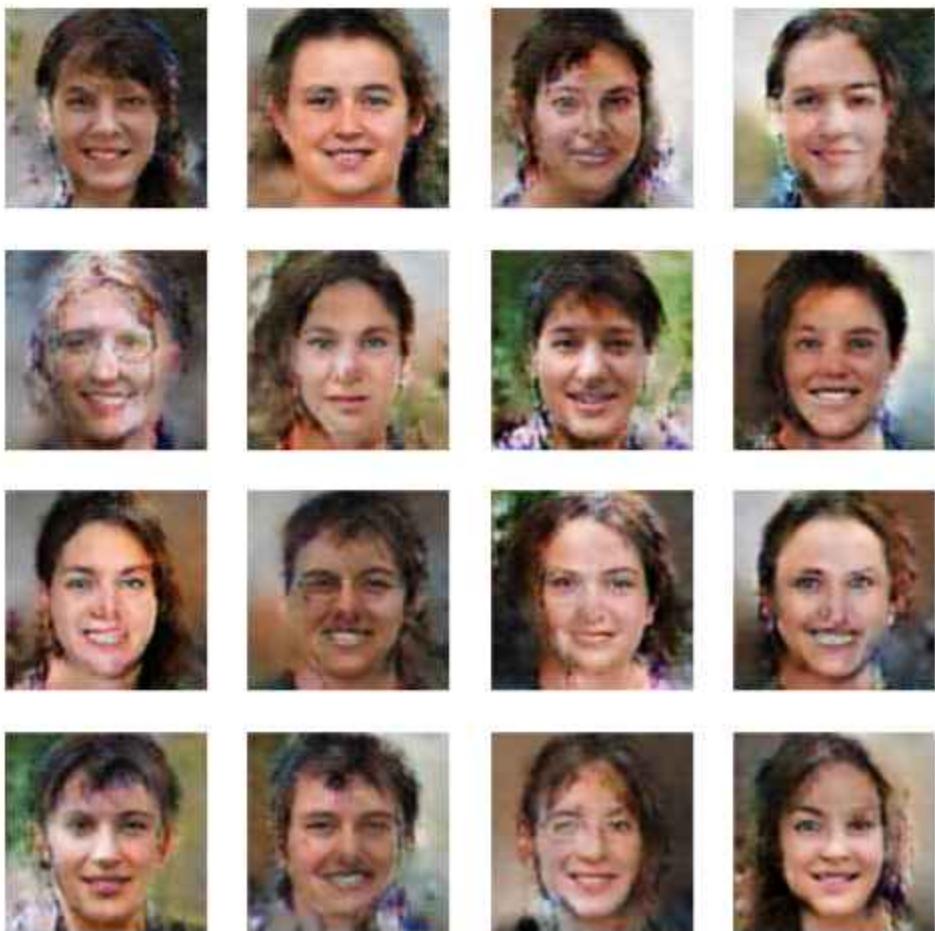
Epoch 232/400 | G: 2.881 D: 0.995

Epoch 233/400 | G: 1.394 D: 0.821

Epoch 234/400 | G: 0.726 D: 0.881

Epoch 235/400 | G: 1.393 D: 0.757

Epoch 235



Epoch 236/400 | G: 0.802 D: 0.858

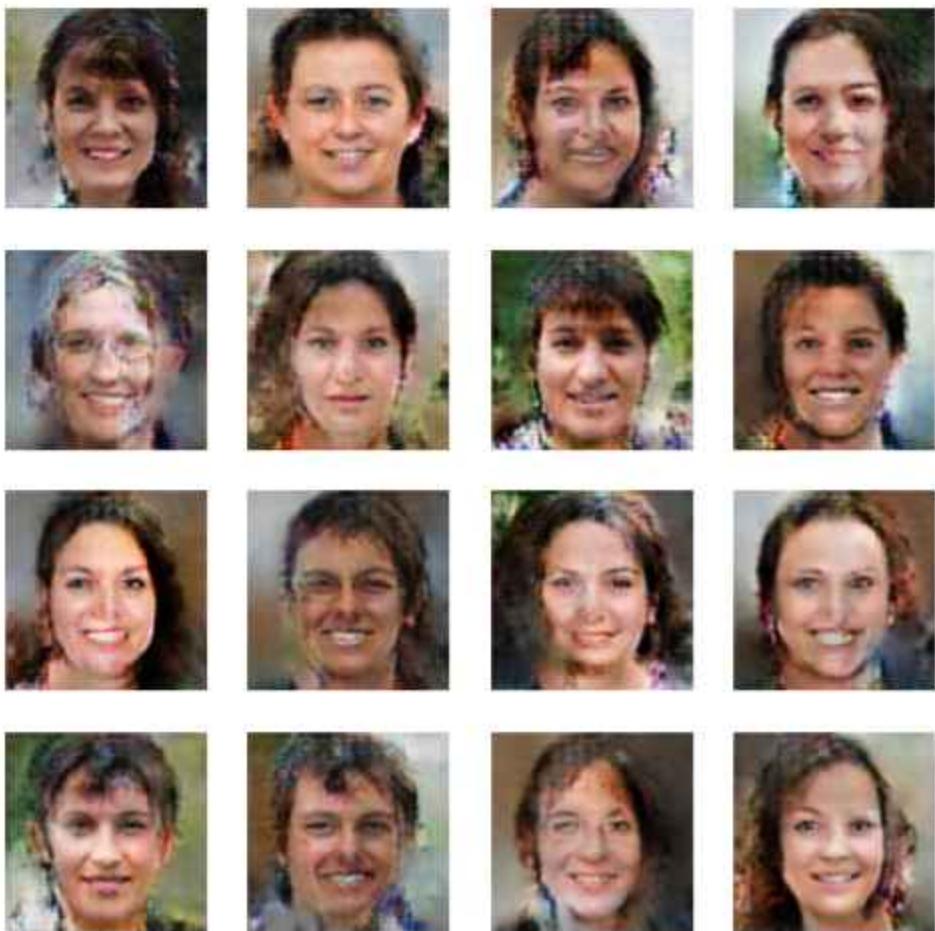
Epoch 237/400 | G: 1.163 D: 0.809

Epoch 238/400 | G: 0.870 D: 0.804

Epoch 239/400 | G: 0.994 D: 0.670

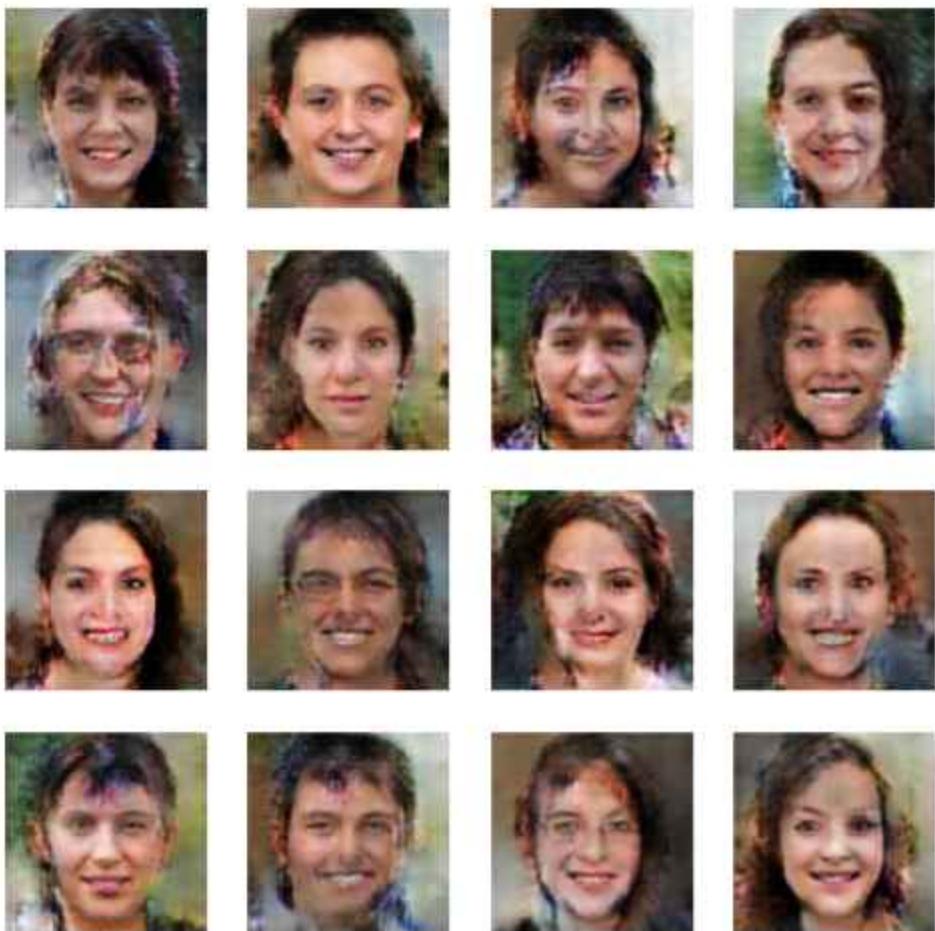
Epoch 240/400 | G: 1.531 D: 0.730

Epoch 240



Epoch 241/400 | G: 0.925 D: 0.753
Epoch 242/400 | G: 1.387 D: 0.694
Epoch 243/400 | G: 0.777 D: 0.815
Epoch 244/400 | G: 0.521 D: 1.293
Epoch 245/400 | G: 2.456 D: 0.590

Epoch 245



Epoch 246/400 | G: 1.376 D: 0.674
Epoch 247/400 | G: 1.185 D: 0.713
Epoch 248/400 | G: 0.563 D: 1.259
Epoch 249/400 | G: 1.045 D: 0.696
Epoch 250/400 | G: 1.328 D: 0.735

Epoch 250



Epoch 251/400 | G: 0.971 D: 0.715

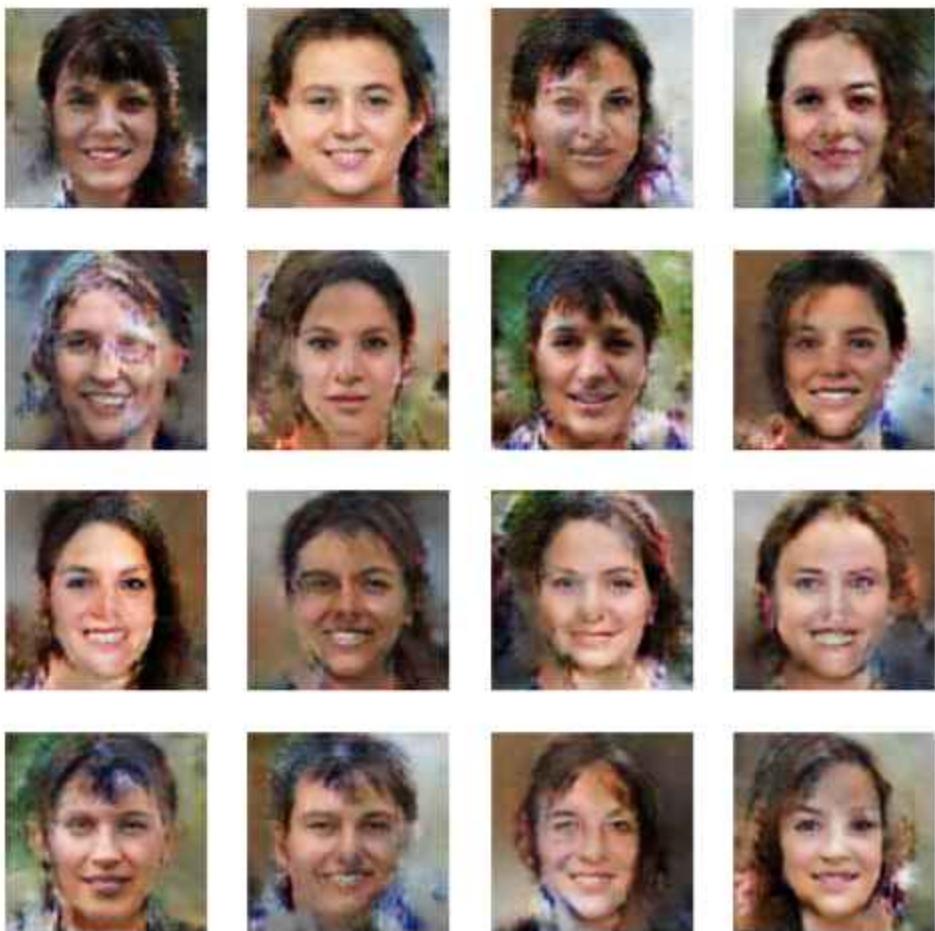
Epoch 252/400 | G: 1.513 D: 0.707

Epoch 253/400 | G: 1.350 D: 0.713

Epoch 254/400 | G: 0.654 D: 1.004

Epoch 255/400 | G: 1.092 D: 0.728

Epoch 255



Epoch 256/400 | G: 1.092 D: 0.821

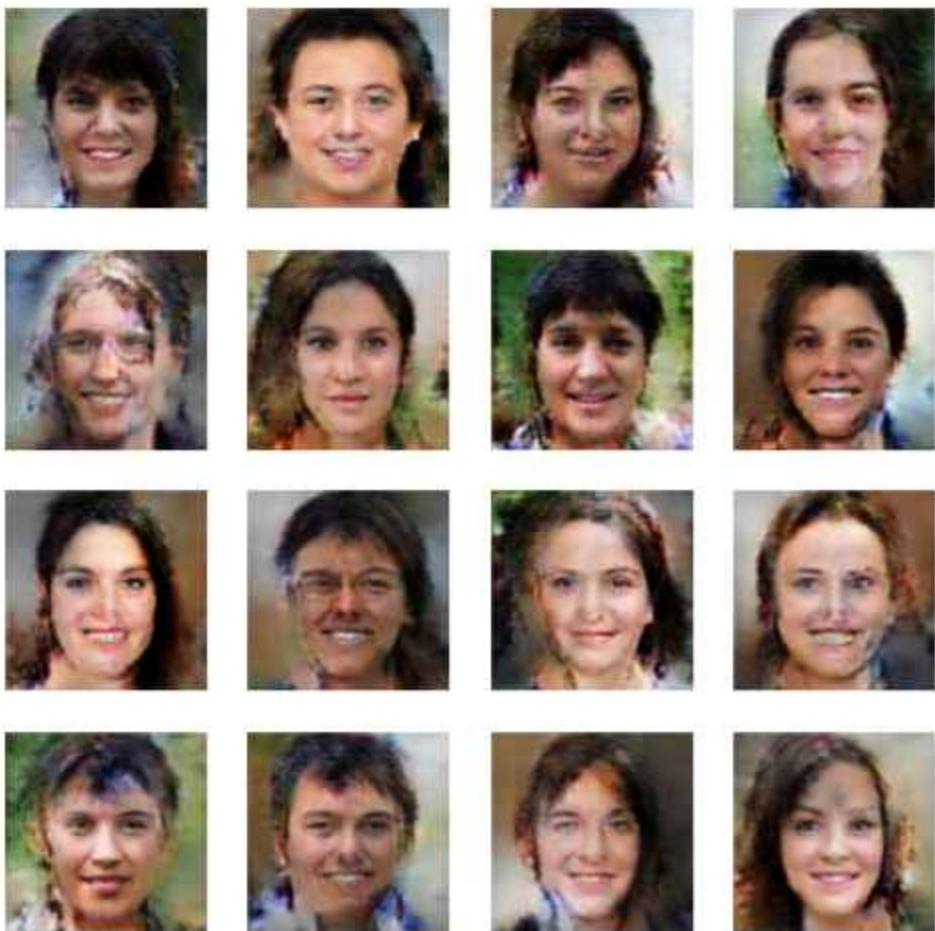
Epoch 257/400 | G: 1.871 D: 0.637

Epoch 258/400 | G: 1.472 D: 0.706

Epoch 259/400 | G: 1.174 D: 0.562

Epoch 260/400 | G: 0.989 D: 0.734

Epoch 260



Epoch 261/400 | G: 0.976 D: 0.941

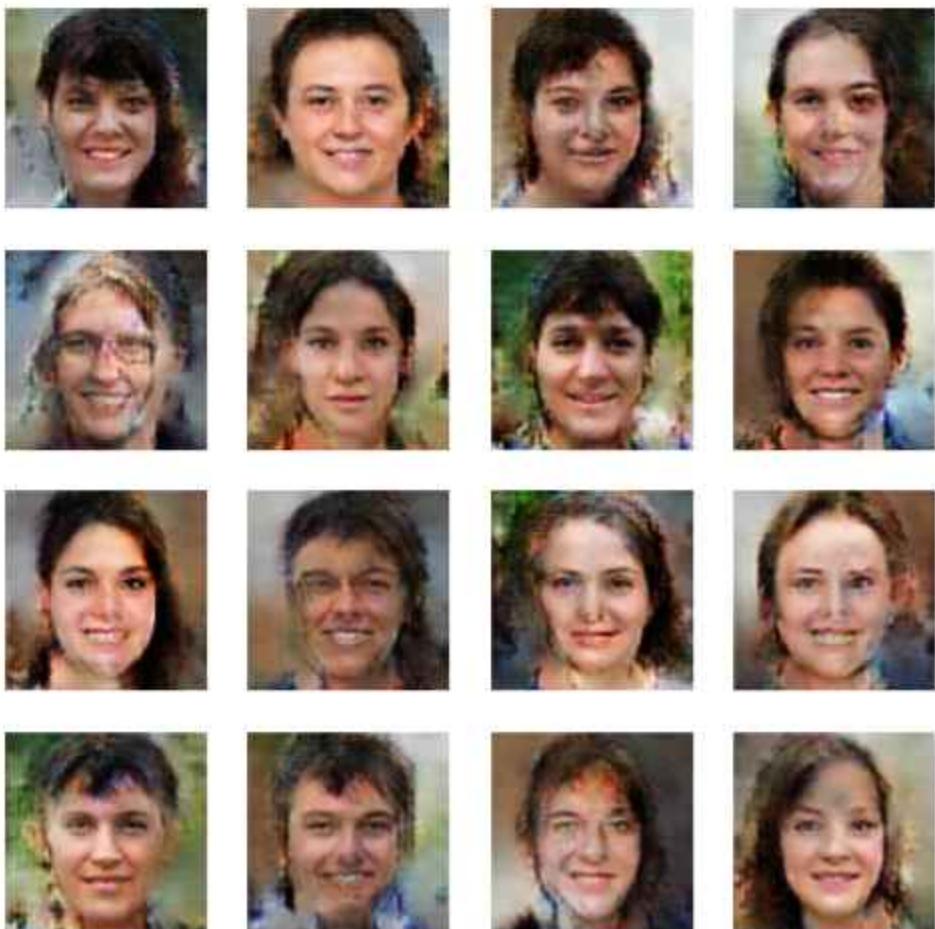
Epoch 262/400 | G: 1.180 D: 0.793

Epoch 263/400 | G: 0.934 D: 0.824

Epoch 264/400 | G: 1.691 D: 0.615

Epoch 265/400 | G: 1.594 D: 0.844

Epoch 265



Epoch 266/400 | G: 0.739 D: 0.938

Epoch 267/400 | G: 1.102 D: 0.683

Epoch 268/400 | G: 1.650 D: 0.738

Epoch 269/400 | G: 0.776 D: 0.794

Epoch 270/400 | G: 0.678 D: 0.939

Epoch 270



Epoch 271/400 | G: 1.185 D: 0.597

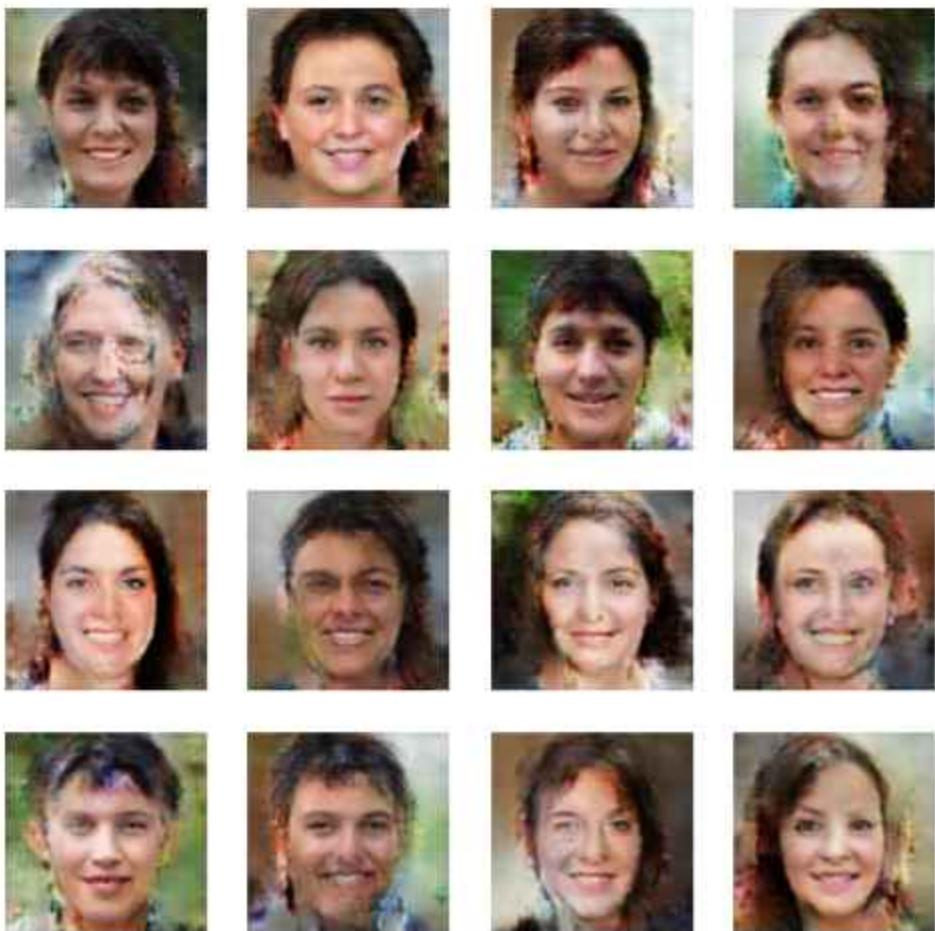
Epoch 272/400 | G: 1.399 D: 0.687

Epoch 273/400 | G: 1.139 D: 0.620

Epoch 274/400 | G: 0.714 D: 0.869

Epoch 275/400 | G: 0.533 D: 1.154

Epoch 275



Epoch 276/400 | G: 1.248 D: 0.745

Epoch 277/400 | G: 1.672 D: 0.521

Epoch 278/400 | G: 2.470 D: 0.664

Epoch 279/400 | G: 2.031 D: 0.540

Epoch 280/400 | G: 2.101 D: 0.537

Epoch 280



Epoch 281/400 | G: 0.779 D: 0.845

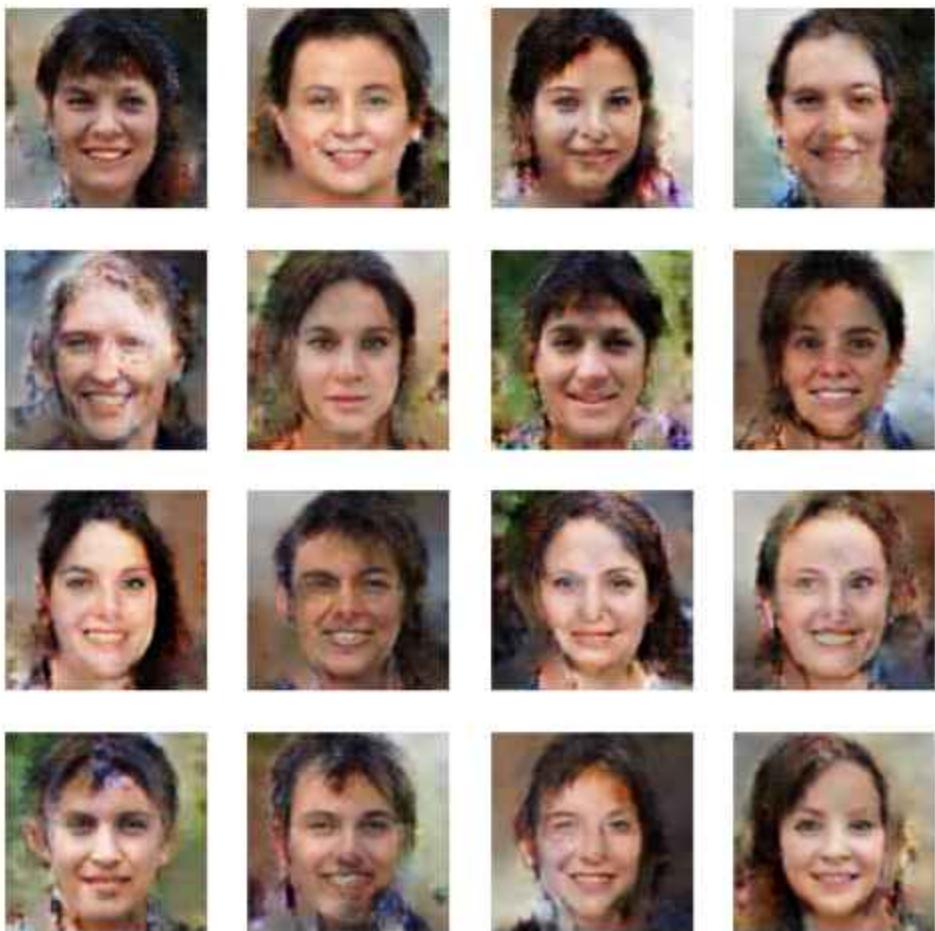
Epoch 282/400 | G: 0.897 D: 0.782

Epoch 283/400 | G: 1.852 D: 0.617

Epoch 284/400 | G: 2.316 D: 0.597

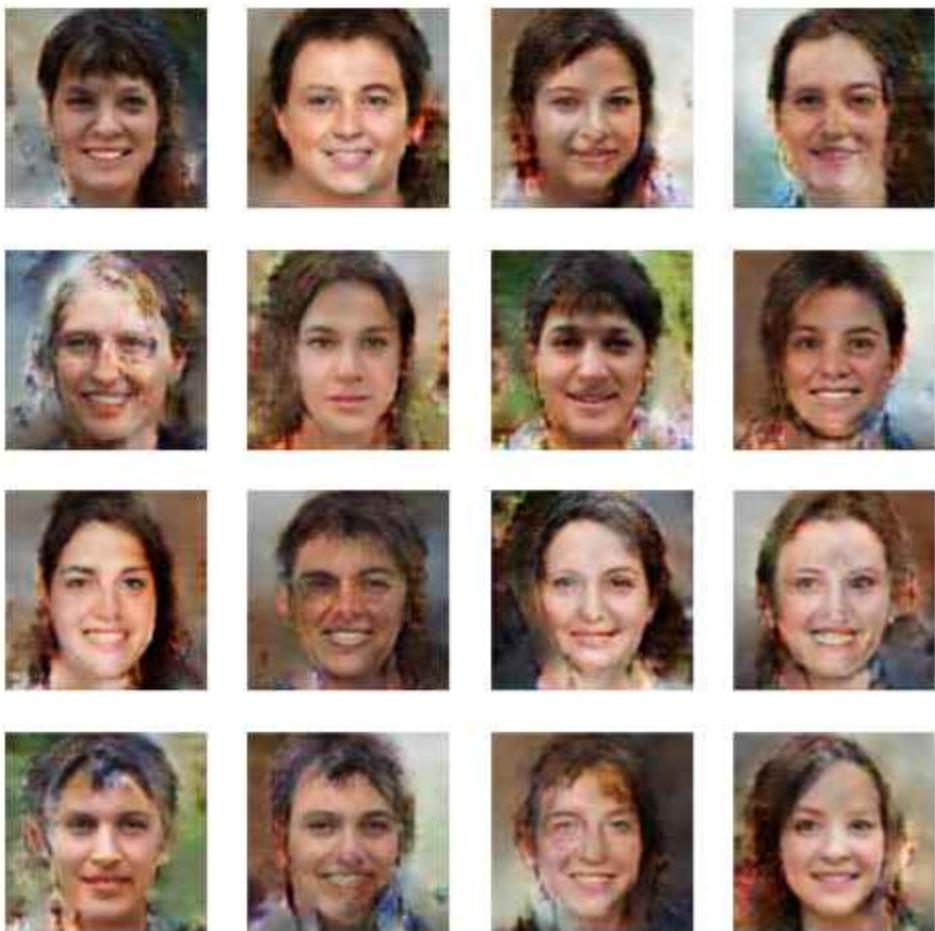
Epoch 285/400 | G: 2.651 D: 0.793

Epoch 285



Epoch 286/400 | G: 1.561 D: 0.546
Epoch 287/400 | G: 2.242 D: 0.546
Epoch 288/400 | G: 2.110 D: 0.581
Epoch 289/400 | G: 1.848 D: 0.442
Epoch 290/400 | G: 1.849 D: 0.492

Epoch 290



Epoch 291/400 | G: 1.738 D: 0.545

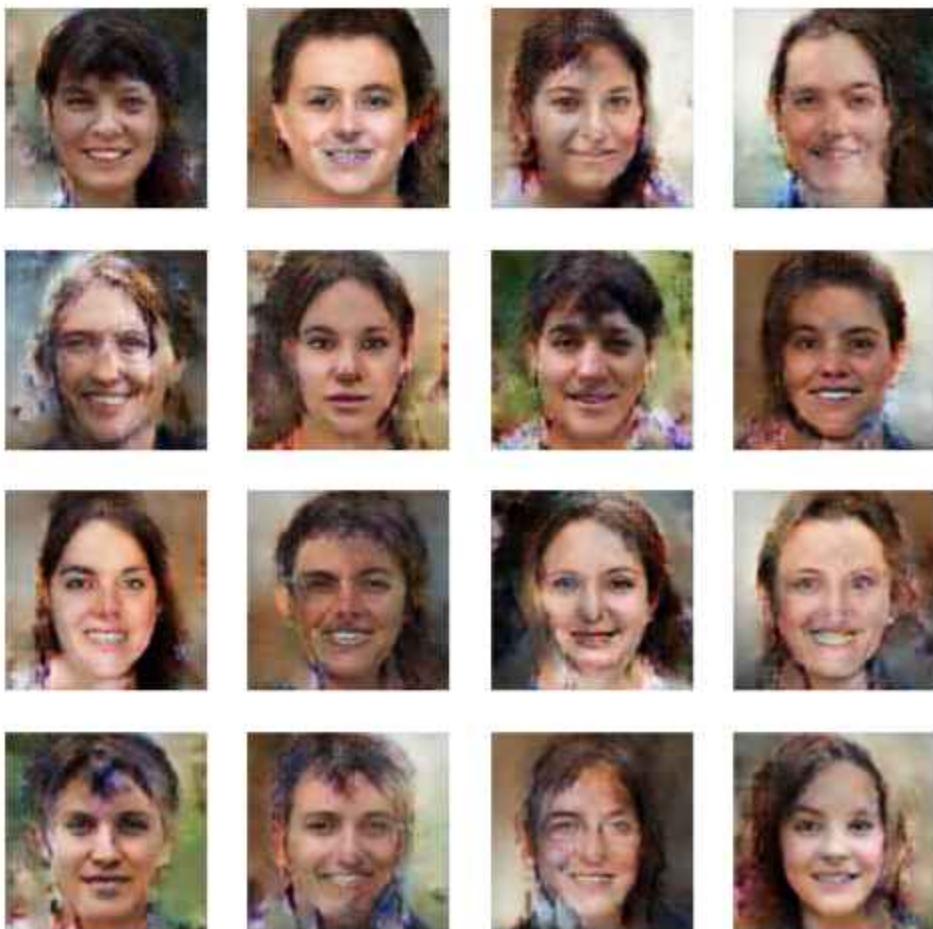
Epoch 292/400 | G: 2.240 D: 0.484

Epoch 293/400 | G: 1.625 D: 0.518

Epoch 294/400 | G: 3.591 D: 1.155

Epoch 295/400 | G: 1.971 D: 0.721

Epoch 295



Epoch 296/400 | G: 1.568 D: 0.568

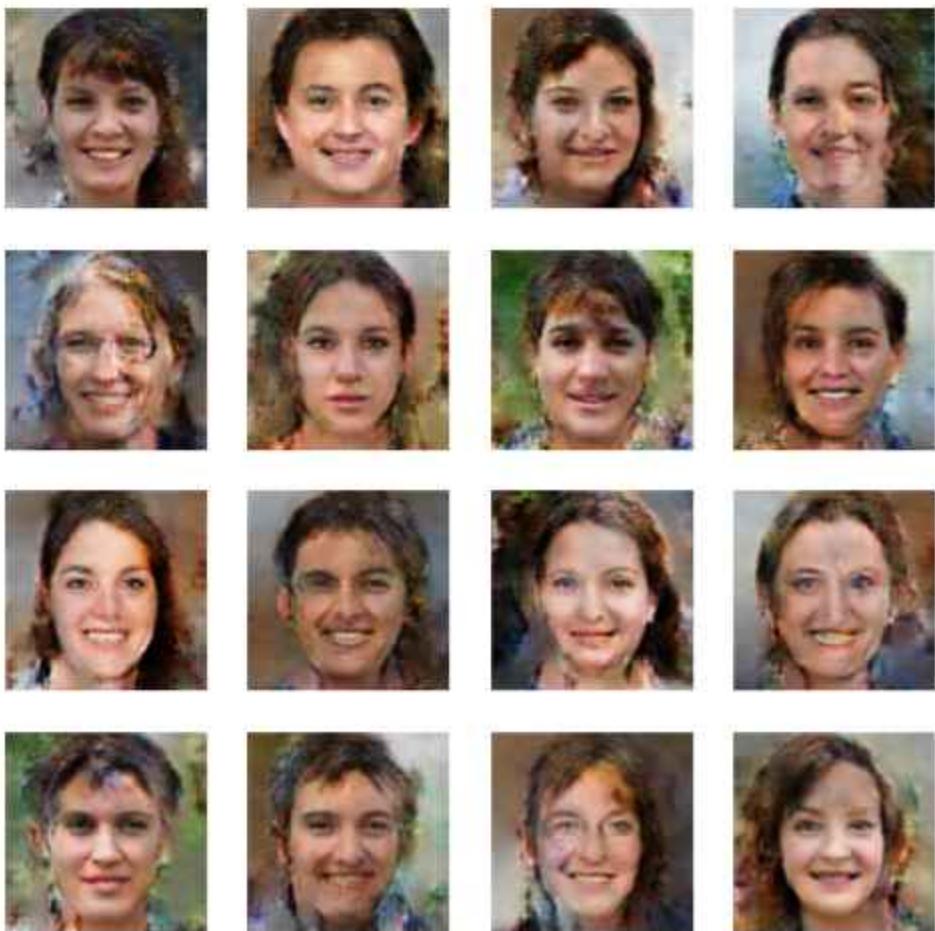
Epoch 297/400 | G: 2.236 D: 0.707

Epoch 298/400 | G: 1.555 D: 0.548

Epoch 299/400 | G: 2.135 D: 0.553

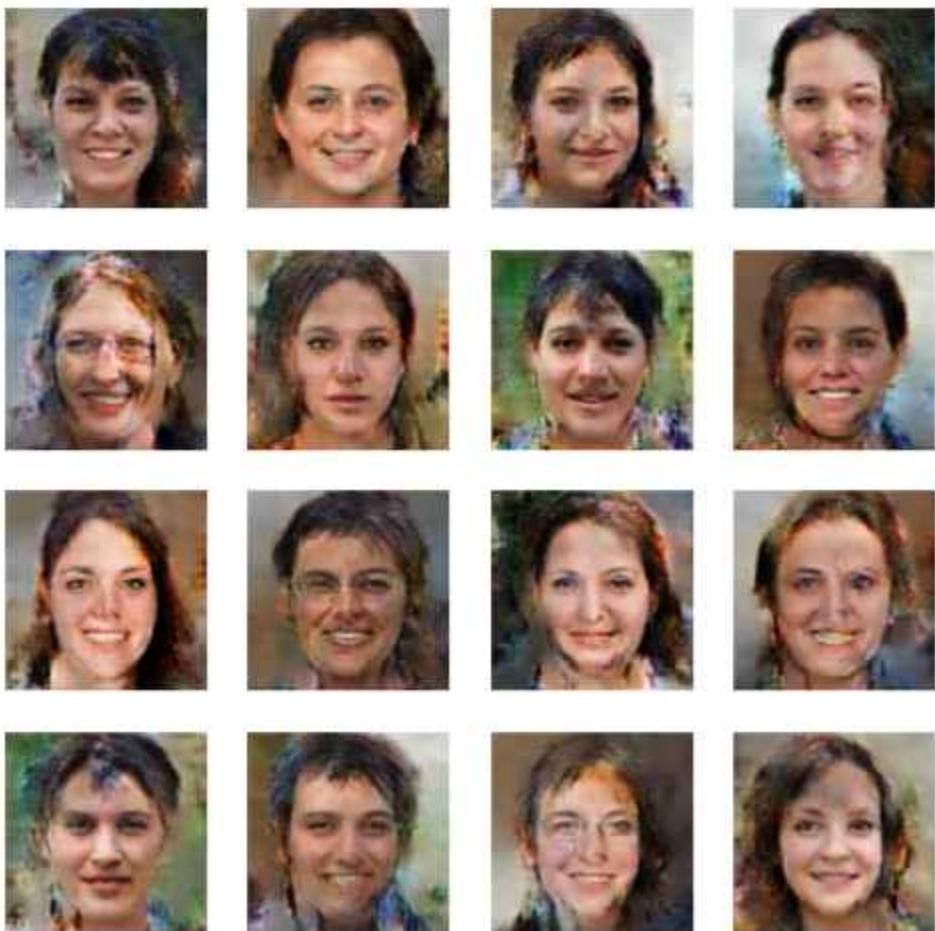
Epoch 300/400 | G: 1.072 D: 0.735

Epoch 300



Epoch 301/400 | G: 1.364 D: 0.537
Epoch 302/400 | G: 1.518 D: 0.494
Epoch 303/400 | G: 3.694 D: 1.116
Epoch 304/400 | G: 2.553 D: 0.692
Epoch 305/400 | G: 1.404 D: 0.519

Epoch 305



Epoch 306/400 | G: 1.983 D: 0.473

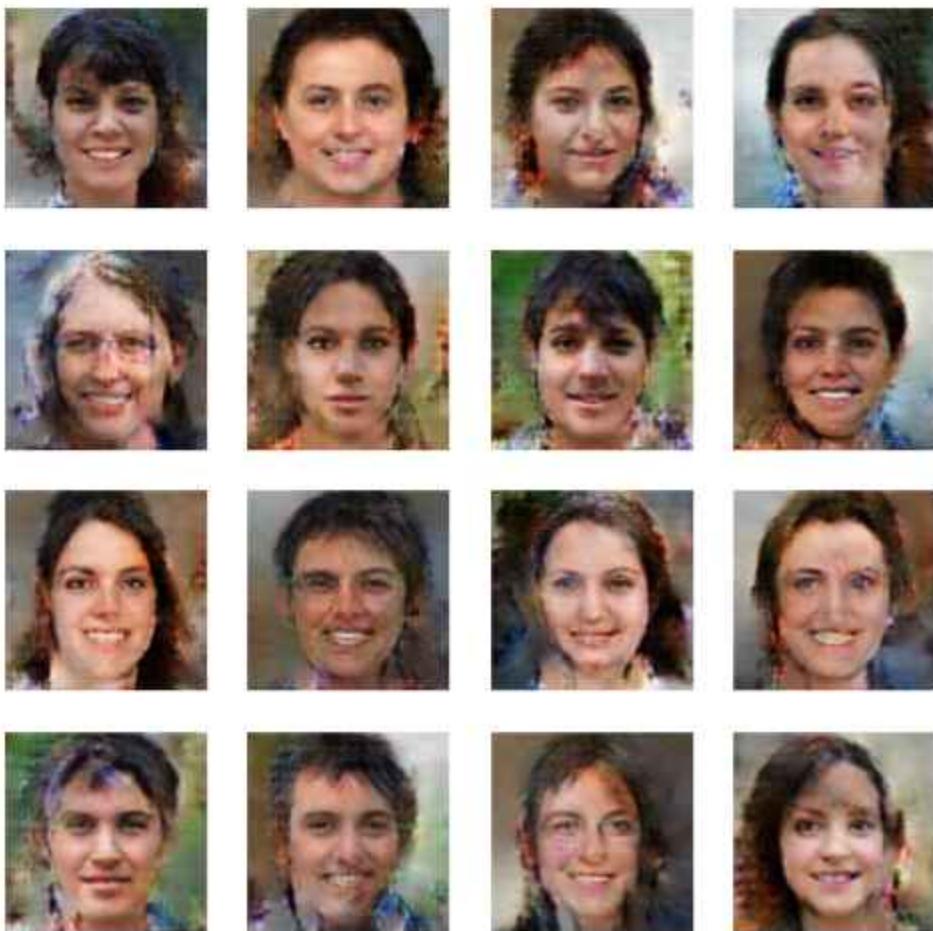
Epoch 307/400 | G: 2.182 D: 0.552

Epoch 308/400 | G: 1.188 D: 0.593

Epoch 309/400 | G: 1.516 D: 0.545

Epoch 310/400 | G: 2.531 D: 0.459

Epoch 310



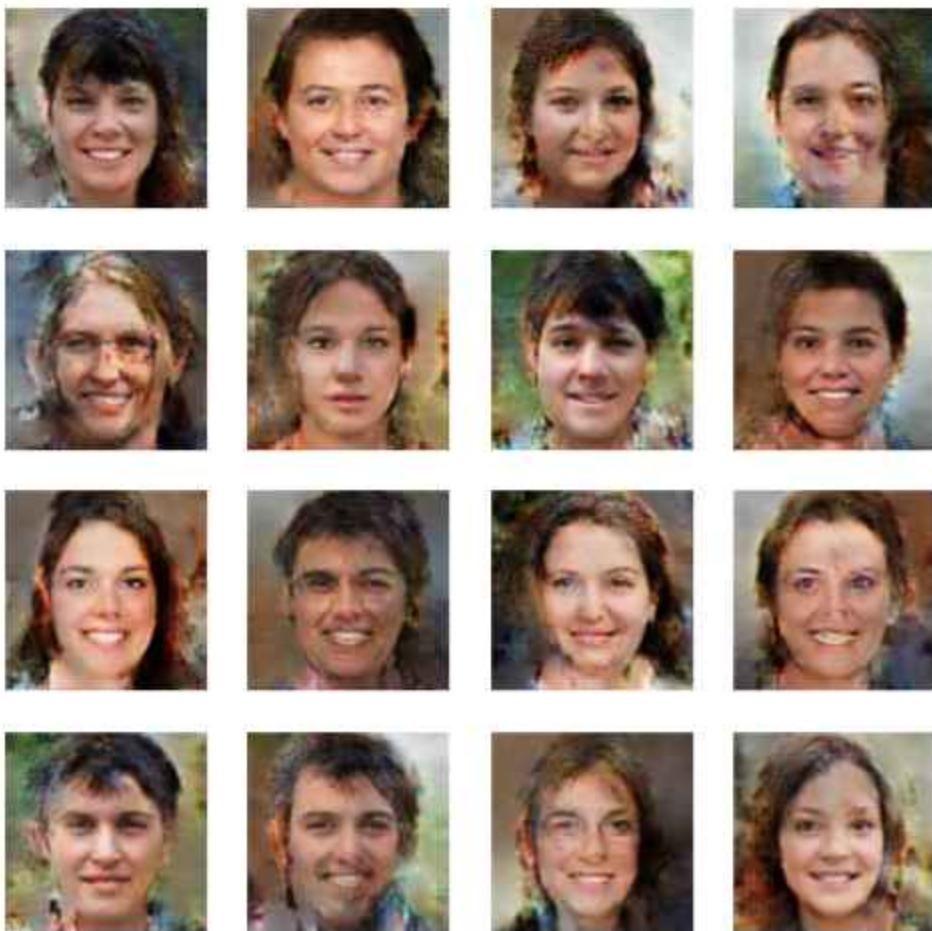
Epoch 311/400 | G: 2.337 D: 0.514
Epoch 312/400 | G: 1.161 D: 0.691
Epoch 313/400 | G: 1.342 D: 0.586
Epoch 314/400 | G: 1.815 D: 0.489
Epoch 315/400 | G: 0.388 D: 1.405

Epoch 315



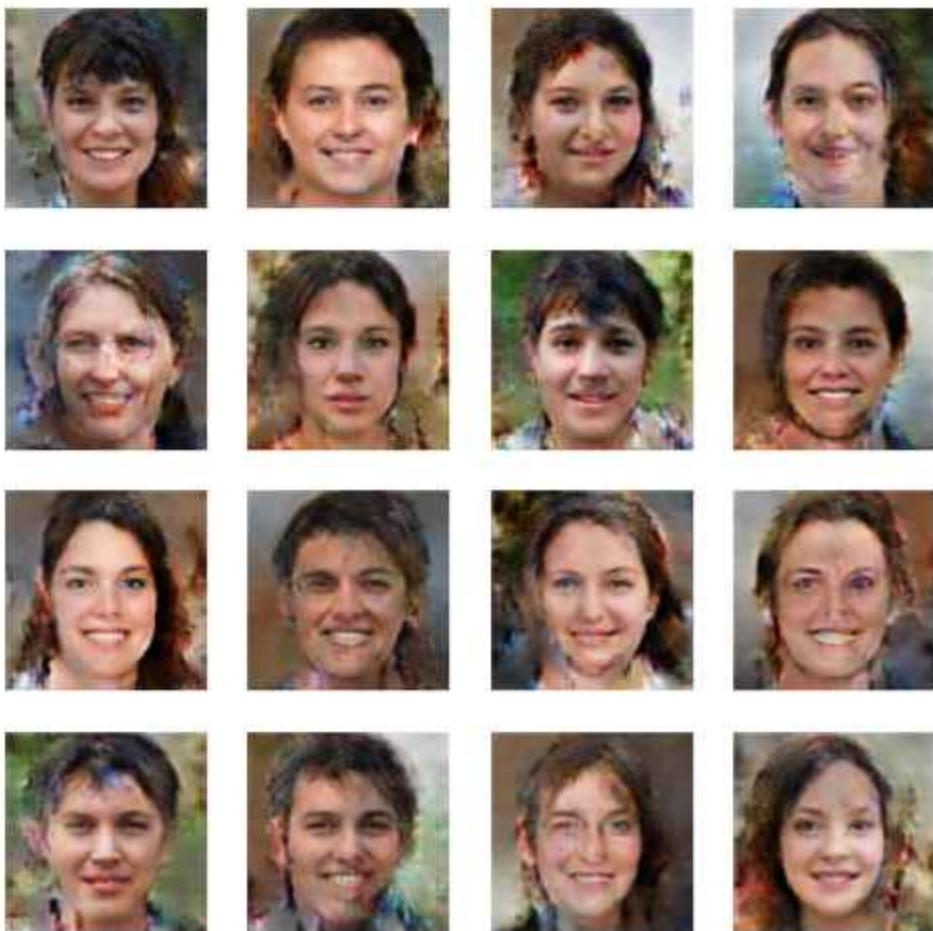
Epoch 316/400 | G: 1.033 D: 0.775
Epoch 317/400 | G: 1.989 D: 0.384
Epoch 318/400 | G: 0.840 D: 0.811
Epoch 319/400 | G: 1.380 D: 0.691
Epoch 320/400 | G: 1.748 D: 0.389

Epoch 320



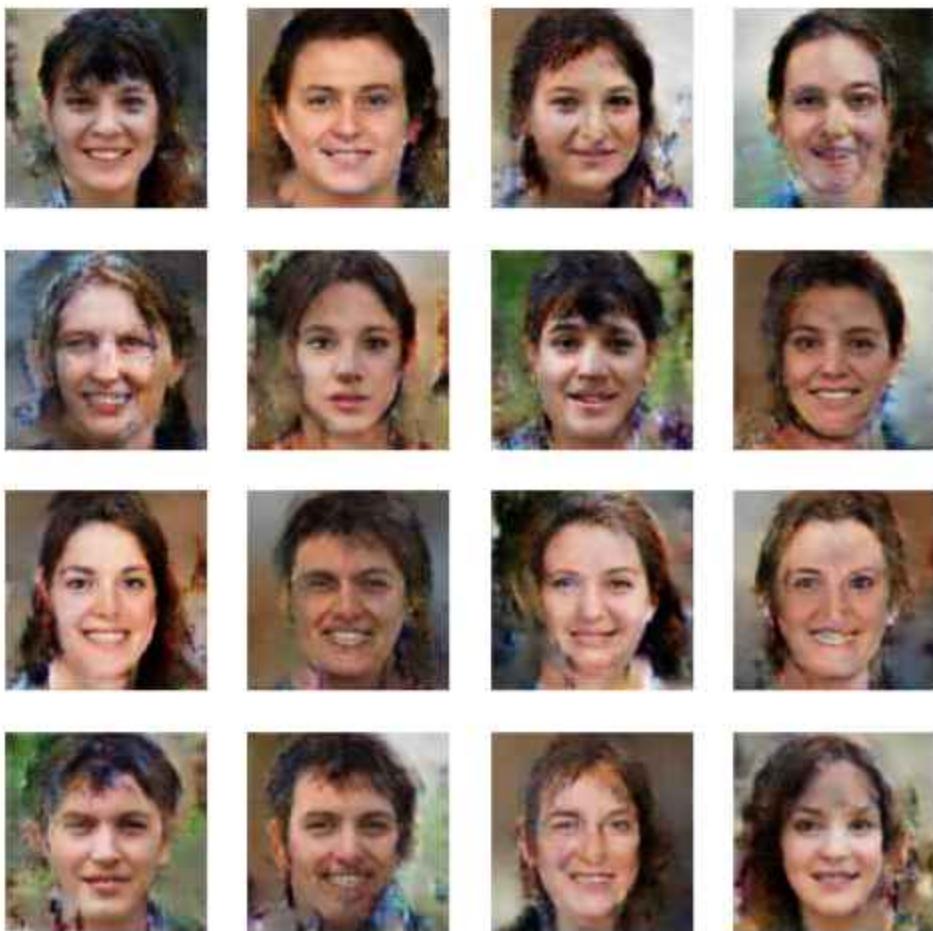
Epoch 321/400 | G: 1.592 D: 0.410
Epoch 322/400 | G: 1.664 D: 0.403
Epoch 323/400 | G: 1.098 D: 0.637
Epoch 324/400 | G: 2.470 D: 0.416
Epoch 325/400 | G: 1.134 D: 0.638

Epoch 325



Epoch 326/400 | G: 2.378 D: 0.466
Epoch 327/400 | G: 1.071 D: 0.571
Epoch 328/400 | G: 0.949 D: 0.630
Epoch 329/400 | G: 2.844 D: 0.466
Epoch 330/400 | G: 1.739 D: 0.433

Epoch 330



Epoch 331/400 | G: 1.891 D: 0.346

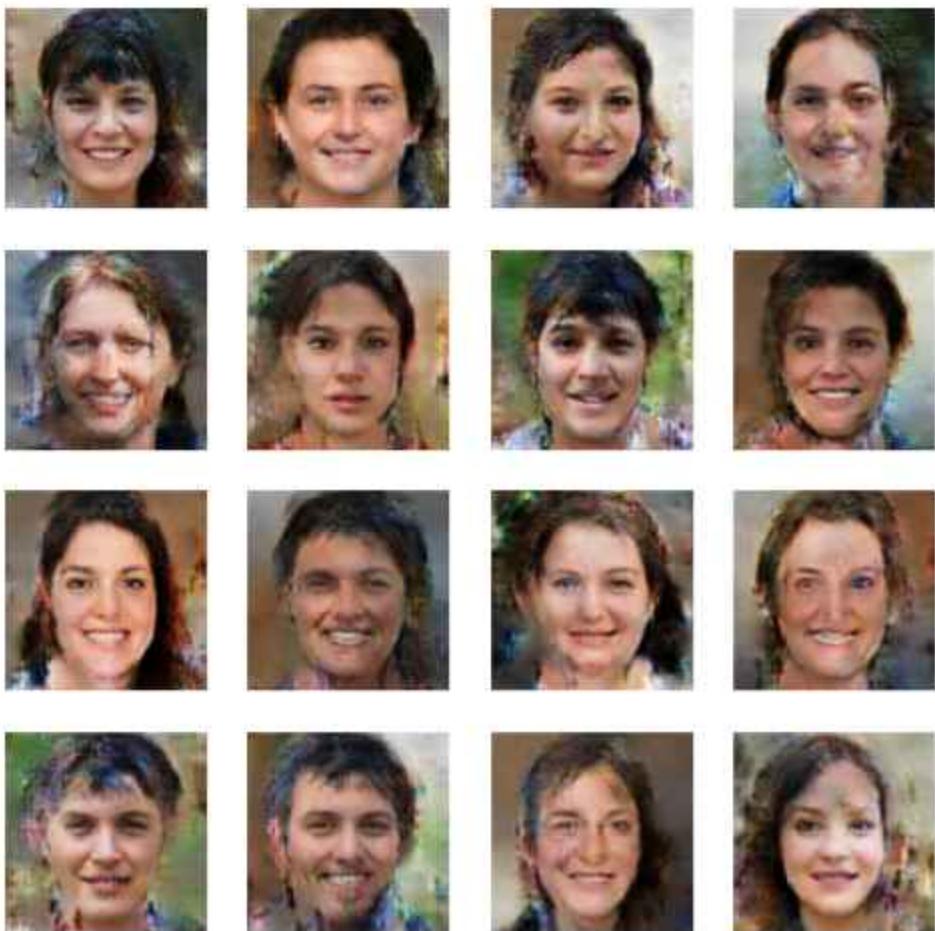
Epoch 332/400 | G: 2.037 D: 0.318

Epoch 333/400 | G: 3.560 D: 0.725

Epoch 334/400 | G: 1.982 D: 0.411

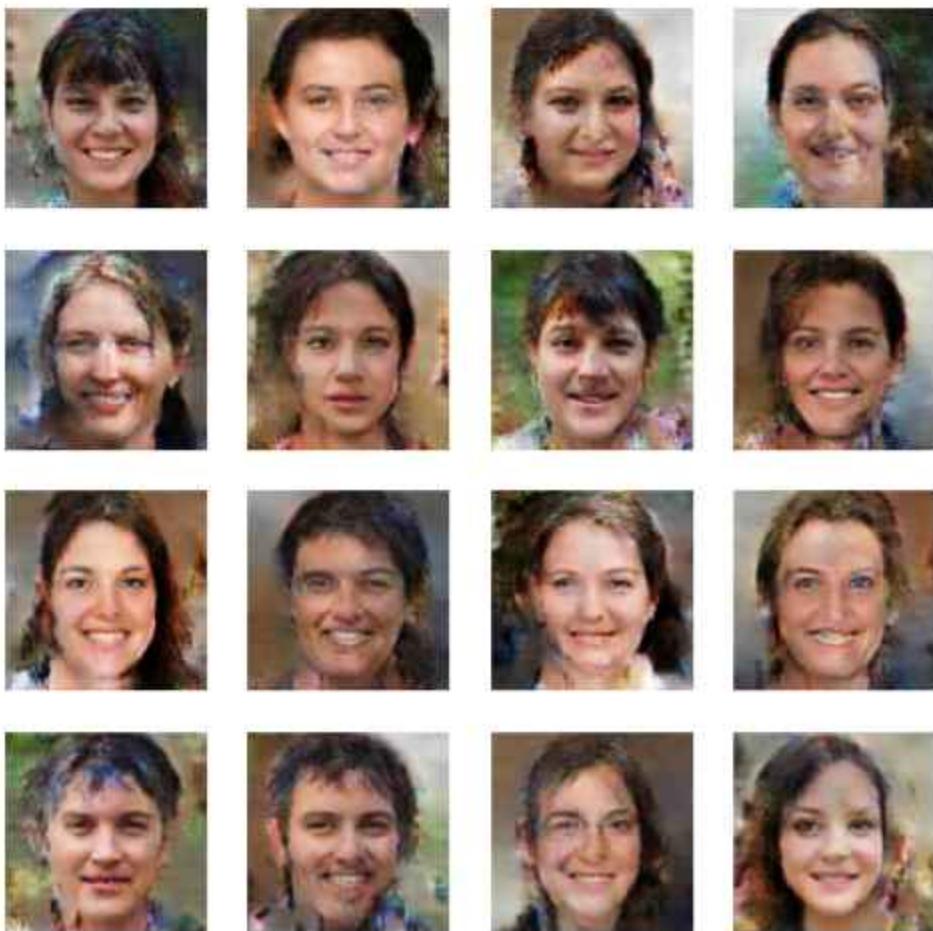
Epoch 335/400 | G: 0.547 D: 1.154

Epoch 335



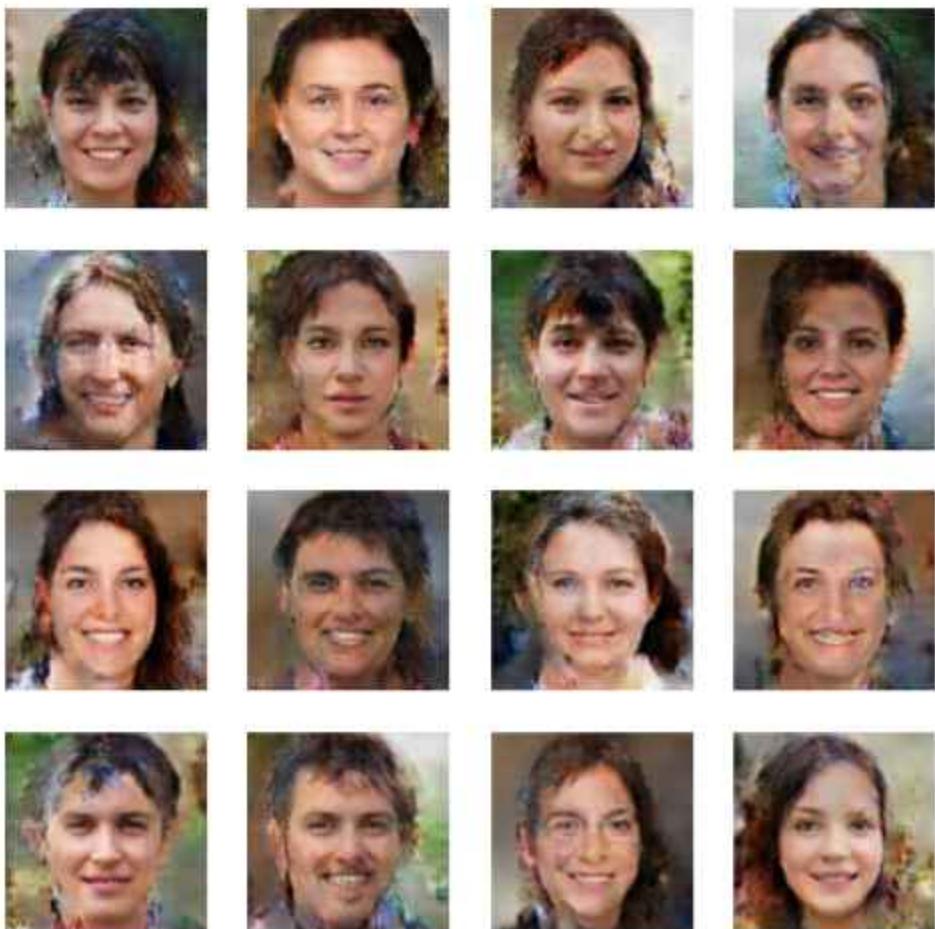
Epoch 336/400 | G: 3.713 D: 0.697
Epoch 337/400 | G: 2.902 D: 0.699
Epoch 338/400 | G: 2.302 D: 0.408
Epoch 339/400 | G: 1.392 D: 0.588
Epoch 340/400 | G: 1.346 D: 0.424

Epoch 340



Epoch 341/400 | G: 1.385 D: 0.440
Epoch 342/400 | G: 1.442 D: 0.432
Epoch 343/400 | G: 2.810 D: 0.403
Epoch 344/400 | G: 1.865 D: 0.381
Epoch 345/400 | G: 3.974 D: 0.911

Epoch 345



Epoch 346/400 | G: 0.953 D: 0.830

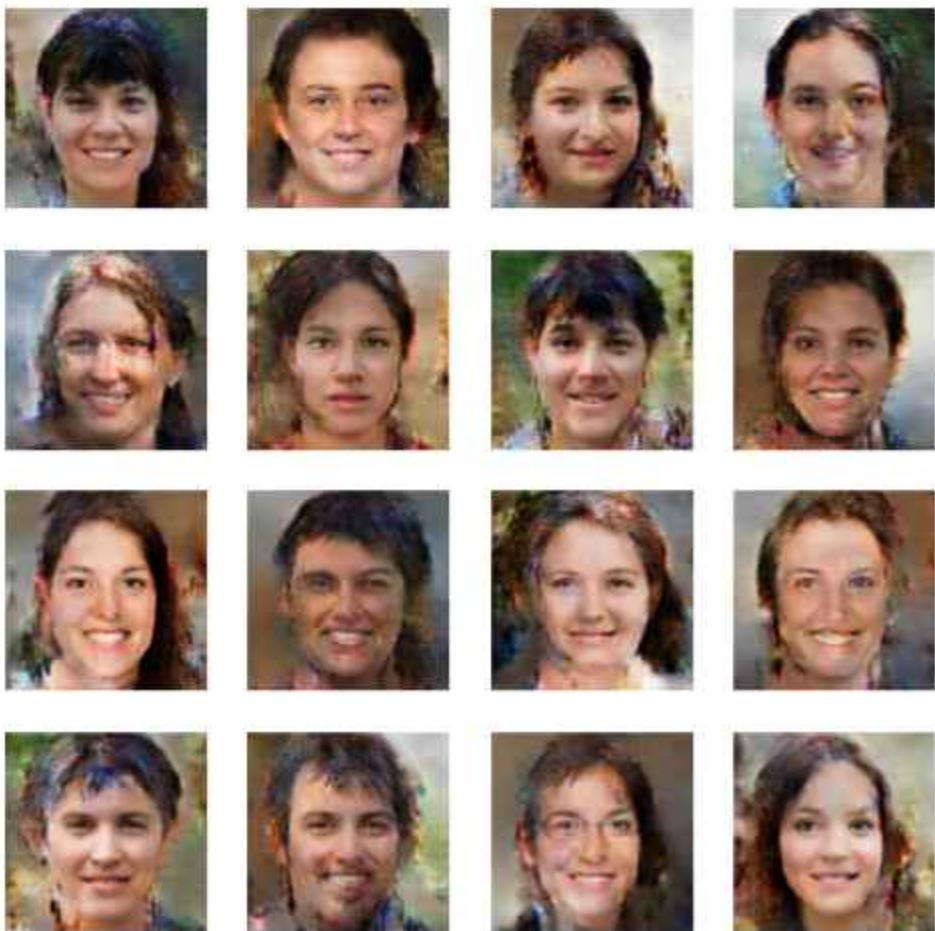
Epoch 347/400 | G: 1.380 D: 0.561

Epoch 348/400 | G: 0.667 D: 0.946

Epoch 349/400 | G: 2.439 D: 0.434

Epoch 350/400 | G: 2.281 D: 0.356

Epoch 350



Epoch 351/400 | G: 1.847 D: 0.306

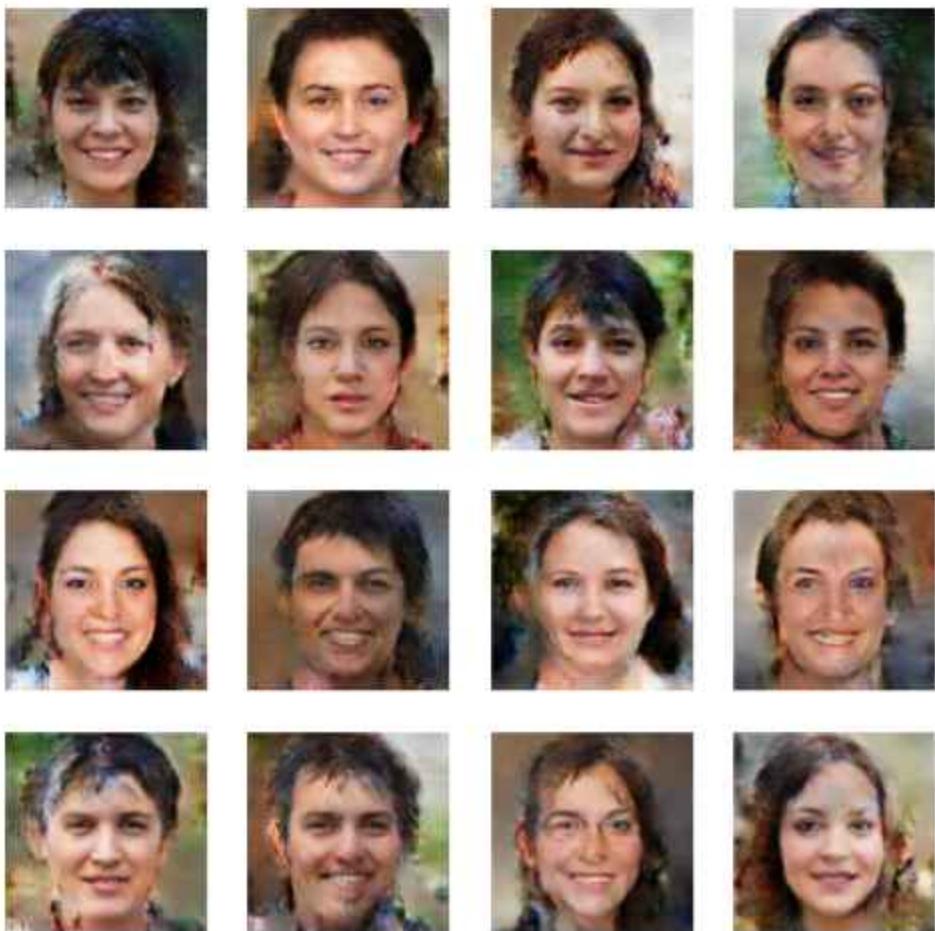
Epoch 352/400 | G: 1.687 D: 0.442

Epoch 353/400 | G: 2.313 D: 0.310

Epoch 354/400 | G: 1.835 D: 0.338

Epoch 355/400 | G: 1.804 D: 0.406

Epoch 355



Epoch 356/400 | G: 4.843 D: 1.915

Epoch 357/400 | G: 2.359 D: 0.820

Epoch 358/400 | G: 2.147 D: 0.374

Epoch 359/400 | G: 1.734 D: 0.551

Epoch 360/400 | G: 2.117 D: 0.401

Epoch 360



Epoch 361/400 | G: 1.585 D: 0.390

Epoch 362/400 | G: 2.286 D: 0.357

Epoch 363/400 | G: 2.395 D: 0.382

Epoch 364/400 | G: 2.845 D: 0.329

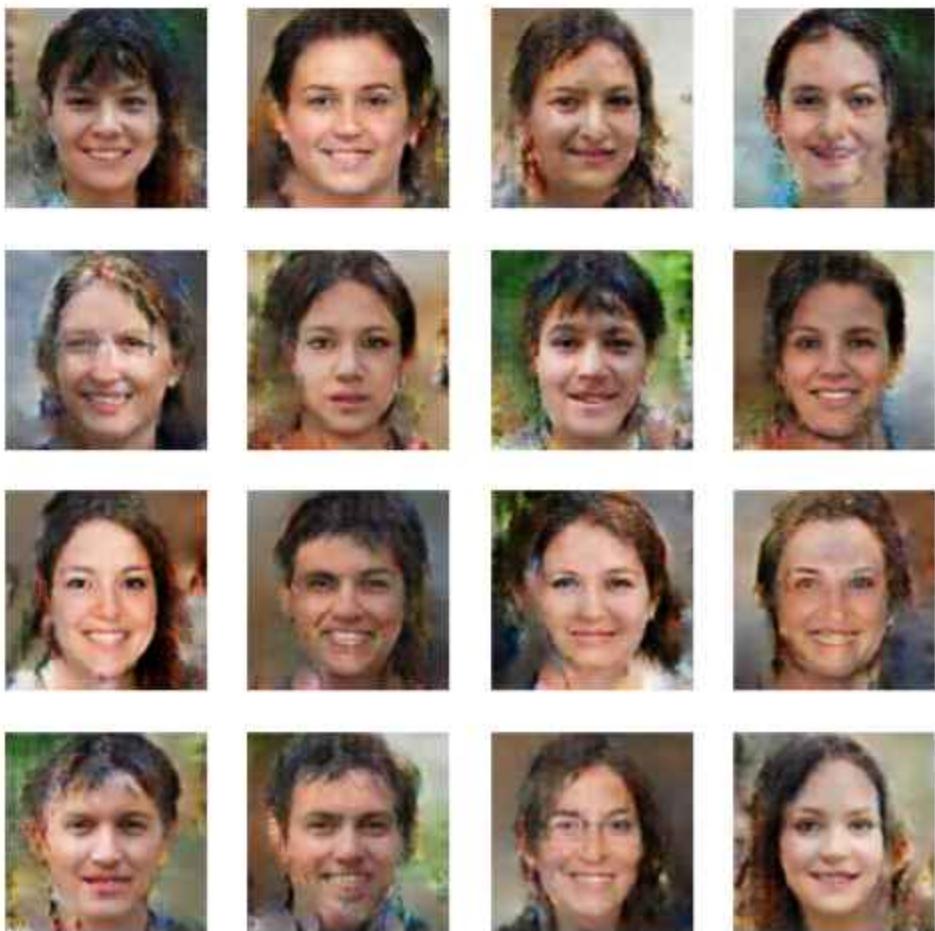
Epoch 365/400 | G: 1.335 D: 0.461

Epoch 365



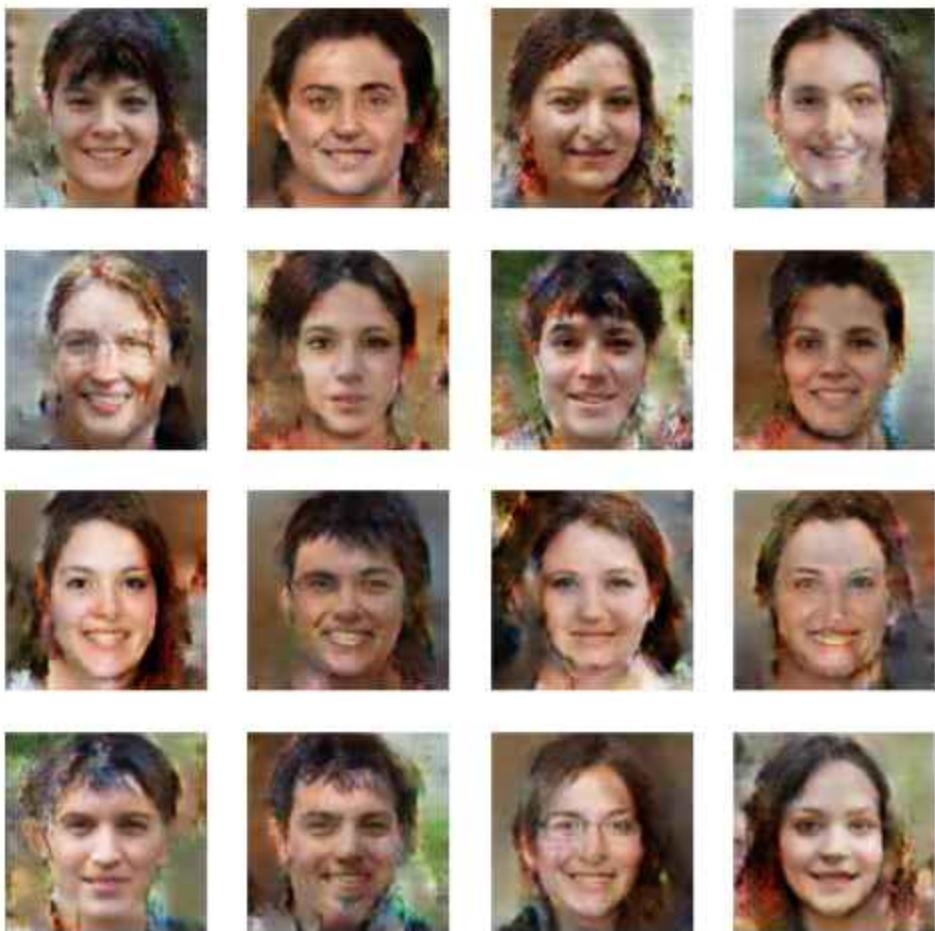
Epoch 366/400 | G: 2.429 D: 0.259
Epoch 367/400 | G: 1.329 D: 0.495
Epoch 368/400 | G: 2.772 D: 0.268
Epoch 369/400 | G: 2.327 D: 0.315
Epoch 370/400 | G: 2.575 D: 0.212

Epoch 370



Epoch 371/400 | G: 2.121 D: 0.266
Epoch 372/400 | G: 1.768 D: 0.314
Epoch 373/400 | G: 3.922 D: 0.805
Epoch 374/400 | G: 0.188 D: 2.525
Epoch 375/400 | G: 2.191 D: 0.747

Epoch 375



Epoch 376/400 | G: 2.393 D: 0.353

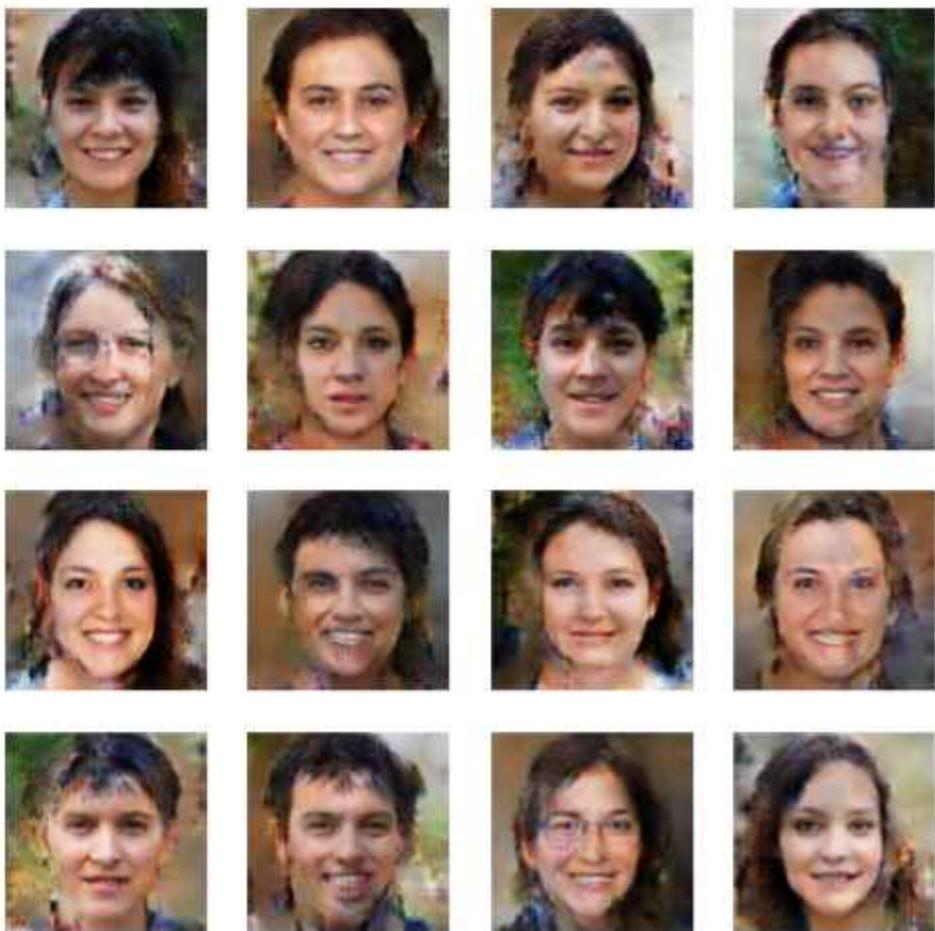
Epoch 377/400 | G: 2.713 D: 0.416

Epoch 378/400 | G: 2.064 D: 0.384

Epoch 379/400 | G: 2.478 D: 0.321

Epoch 380/400 | G: 2.189 D: 0.270

Epoch 380



Epoch 381/400 | G: 0.635 D: 1.095

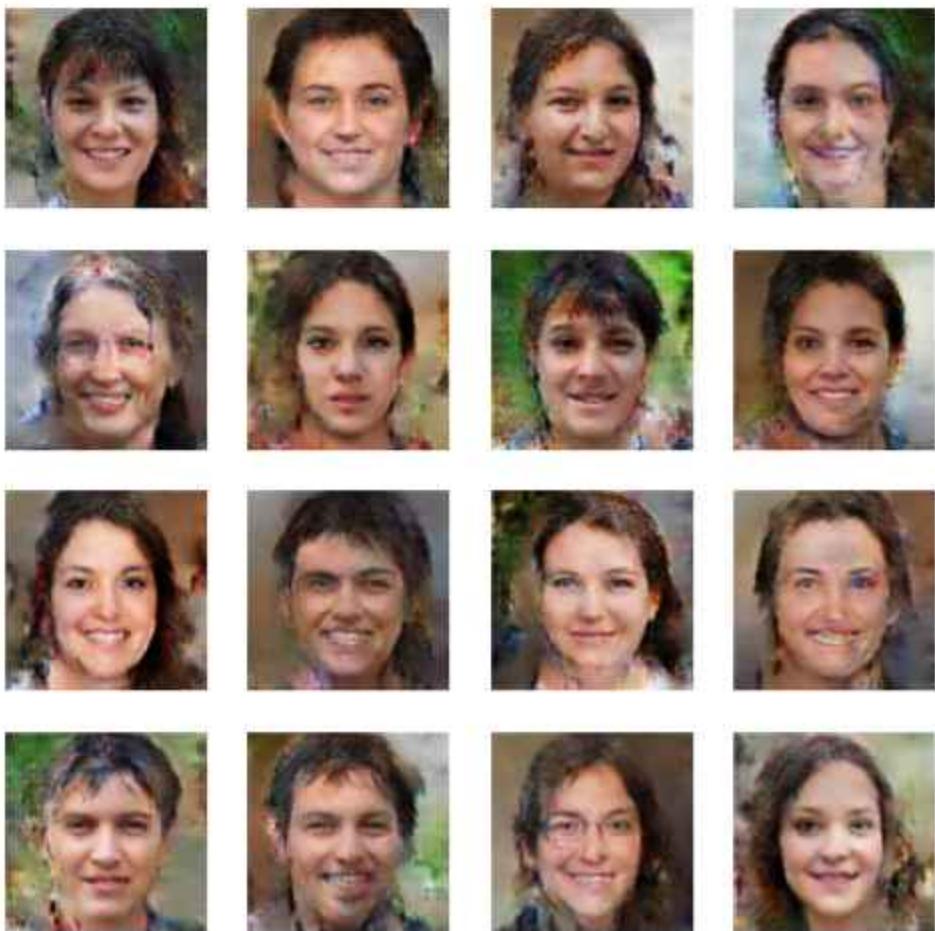
Epoch 382/400 | G: 1.761 D: 0.370

Epoch 383/400 | G: 2.216 D: 0.299

Epoch 384/400 | G: 2.417 D: 0.234

Epoch 385/400 | G: 2.703 D: 0.227

Epoch 385



Epoch 386/400 | G: 2.585 D: 0.228

Epoch 387/400 | G: 2.466 D: 0.221

Epoch 388/400 | G: 2.540 D: 0.209

Epoch 389/400 | G: 2.331 D: 0.252

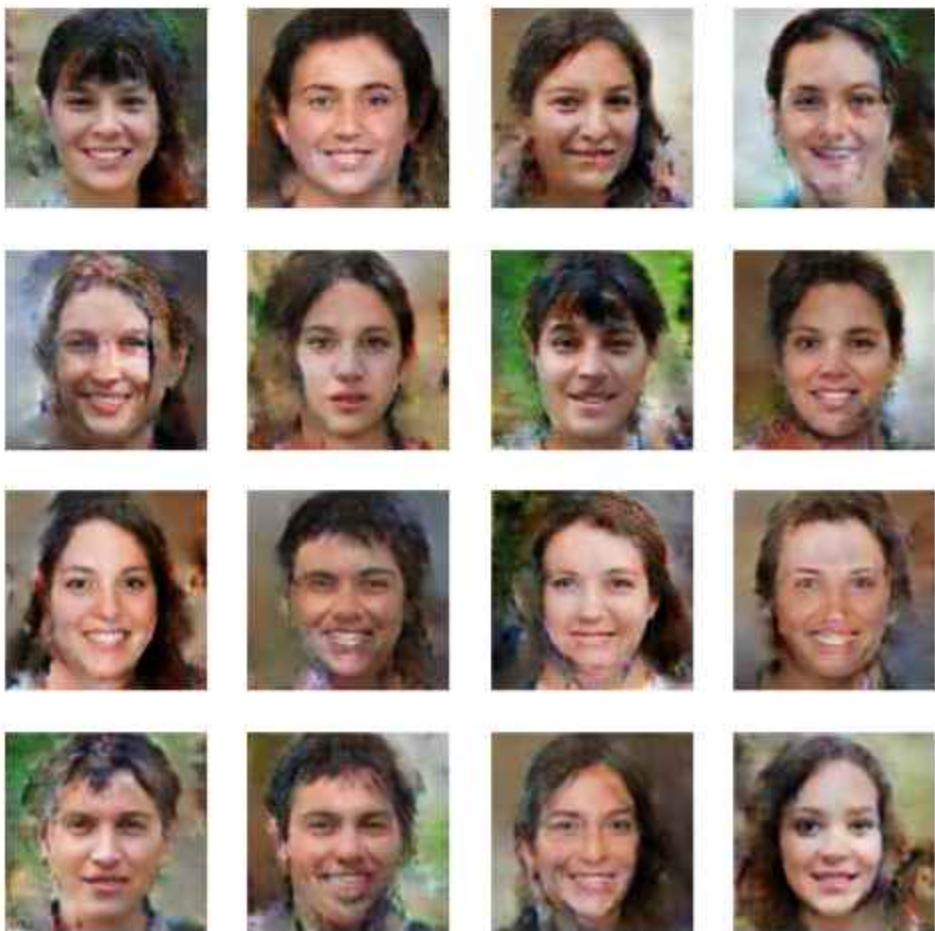
Epoch 390/400 | G: 3.041 D: 0.189

Epoch 390



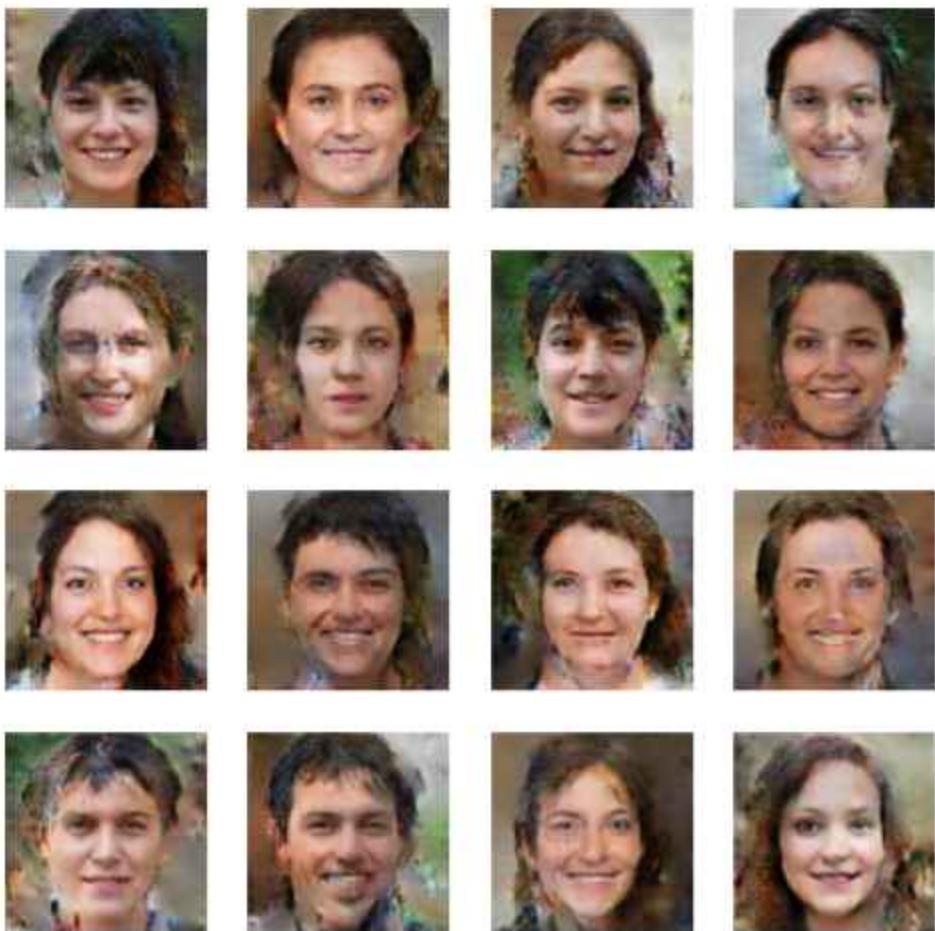
Epoch 391/400 | G: 2.781 D: 0.191
Epoch 392/400 | G: 4.531 D: 0.528
Epoch 393/400 | G: 1.902 D: 0.361
Epoch 394/400 | G: 2.428 D: 0.326
Epoch 395/400 | G: 2.341 D: 0.257

Epoch 395



Epoch 396/400 | G: 3.138 D: 0.236
Epoch 397/400 | G: 3.650 D: 0.366
Epoch 398/400 | G: 1.337 D: 0.769
Epoch 399/400 | G: 3.683 D: 0.316
Epoch 400/400 | G: 2.682 D: 0.347

Epoch 400



```
In [11]: seed = tf.random.normal([16, LATENT_DIM])
show_images(e, seed)
```

Epoch 400

