```
C:\Users\arina\PycharmProjects\PythonProject\.venv\Scripts\python.exe "C:\Users\arina\PycharmProjects\PythonProject\Deepfake Detection\main.py"
2025-09-24 21:50:37.664533: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point round-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2025-09-24 21:50:46.531928: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point round-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
Using TensorFlow 2.20.0
Config: {
  "model_name": "resnet50",
  "data_dir": "C:/Users/arina/PycharmProjects/PythonProject/Deepfake Detection/Frames/Celeb Dataset 224",
  "epochs": 20,
  "batch_size": 32,
  "seed": 42,
  "base_trainable_at": -40,
  "warmup_epochs": 3,
  "learning_rate": 0.001,
  "fine_tune_lr": 2e-05,
  "use_class_weights": false,
  "mixed_precision": false,
  "output_dir": "C:/Users/arina/PycharmProjects/PythonProject/Deepfake Detection/Model/Fine Tune/ResNet50_Celeb"
}
Found 56902 images belonging to 2 classes.
Found 12197 images belonging to 2 classes.
Found 12195 images belonging to 2 classes.
2025-09-24 21:50:59.623791: I tensorflow/core/platform/cpu_feature_guard.cc:210] This TensorFlow binary is optimized to use available CPU instructions in performance-critical operations.
```

```
23 To enable the following instructions: SSE3 SSE4.1
   SSE4.2, in other operations, rebuild TensorFlow with
   the appropriate compiler flags.
24 C:\Users\arina\PycharmProjects\PythonProject\.venv\
   Lib\site-packages\keras\src\trainers\data_adapters\
   py_dataset_adapter.py:121: UserWarning: Your `
   PyDataset` class should call `super().__init__(**
   kwargs)` in its constructor. `**kwargs` can include `
   workers`, `use_multiprocessing`, `max_queue_size`. Do
    not pass these arguments to `fit()`, as they will be
    ignored.
25   self._warn_if_super_not_called()
26 Epoch 1/3
27 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
   : 0.8930 - loss: 0.3774
28 Epoch 1: val_accuracy improved from -inf to 0.90391,
   saving model to C:/Users/arina/PycharmProjects/
   PythonProject/Deepfake Detection/Model/Fine Tune/
   ResNet50_Celeb\best_warmup.keras
29 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 7302s 4s/step -
   accuracy: 0.8930 - loss: 0.3774 - val_accuracy: 0.
   9039 - val_loss: 0.3563 - learning_rate: 0.0010
30 Epoch 2/3
31 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 3s/step - accuracy
   : 0.8989 - loss: 0.3422
32 Epoch 2: val_accuracy improved from 0.90391 to 0.
   90399, saving model to C:/Users/arina/PycharmProjects
   /PythonProject/Deepfake Detection/Model/Fine Tune/
   ResNet50_Celeb\best_warmup.keras
33 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 6221s 3s/step -
   accuracy: 0.8989 - loss: 0.3422 - val_accuracy: 0.
   9040 - val_loss: 0.3283 - learning_rate: 0.0010
34 Epoch 3/3
35 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 3s/step - accuracy
   : 0.8964 - loss: 0.3410
36 Epoch 3: val_accuracy did not improve from 0.90399
37 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 6396s 4s/step -
   accuracy: 0.8964 - loss: 0.3410 - val_accuracy: 0.
   9012 - val_loss: 0.3143 - learning_rate: 0.0010
38 Epoch 1/20
39 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
```

```
39 : 0.9006 - loss: 0.3227
40 Epoch 1: val_accuracy improved from -inf to 0.91383,
   saving model to C:/Users/arina/PycharmProjects/
   PythonProject/Deepfake Detection/Model/Fine Tune/
   ResNet50_Celeb\best_finetune.keras
41 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8704s 5s/step -
   accuracy: 0.9006 - loss: 0.3227 - val_accuracy: 0.
   9138 - val_loss: 0.2547 - learning_rate: 2.0000e-05
42 Epoch 2/20
43 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
   : 0.9137 - loss: 0.2566
44 Epoch 2: val_accuracy improved from 0.91383 to 0.
   92187, saving model to C:/Users/arina/PycharmProjects
   /PythonProject/Deepfake Detection/Model/Fine Tune/
   ResNet50_Celeb\best_finetune.keras
45 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8659s 5s/step -
   accuracy: 0.9137 - loss: 0.2566 - val_accuracy: 0.
   9219 - val_loss: 0.2282 - learning_rate: 2.0000e-05
46 Epoch 3/20
47 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
   : 0.9217 - loss: 0.2269
48 Epoch 3: val_accuracy did not improve from 0.92187
49 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8749s 5s/step -
   accuracy: 0.9217 - loss: 0.2269 - val_accuracy: 0.
   9215 - val_loss: 0.2228 - learning_rate: 2.0000e-05
50 Epoch 4/20
51 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
   : 0.9221 - loss: 0.2209
52 Epoch 4: val_accuracy did not improve from 0.92187
53 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8919s 5s/step -
   accuracy: 0.9221 - loss: 0.2209 - val_accuracy: 0.
   9069 - val_loss: 0.2421 - learning_rate: 2.0000e-05
54 Epoch 5/20
55 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
   : 0.9268 - loss: 0.2065
56 Epoch 5: val_accuracy did not improve from 0.92187
57 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8833s 5s/step -
   accuracy: 0.9268 - loss: 0.2065 - val_accuracy: 0.
   9055 - val_loss: 0.2378 - learning_rate: 2.0000e-05
58 Epoch 6/20
59 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
```

```
59 : 0.9301 - loss: 0.1947
60 Epoch 6: val_accuracy improved from 0.92187 to 0.
   93531, saving model to C:/Users/arina/PycharmProjects
   /PythonProject/Deepfake Detection/Model/Fine Tune/
   ResNet50_Celeb\best_finetune.keras
61 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8879s 5s/step -
   accuracy: 0.9301 - loss: 0.1947 - val_accuracy: 0.
   9353 - val_loss: 0.1891 - learning_rate: 2.0000e-05
62 Epoch 7/20
63 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
   : 0.9340 - loss: 0.1857
64 Epoch 7: val_accuracy did not improve from 0.93531
65 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8824s 5s/step -
   accuracy: 0.9340 - loss: 0.1857 - val_accuracy: 0.
   8974 - val_loss: 0.2548 - learning_rate: 2.0000e-05
66 Epoch 8/20
67 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
   : 0.9343 - loss: 0.1802
68 Epoch 8: val_accuracy did not improve from 0.93531
69 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8832s 5s/step -
   accuracy: 0.9343 - loss: 0.1802 - val_accuracy: 0.
   8947 - val_loss: 0.2533 - learning_rate: 2.0000e-05
70 Epoch 9/20
71 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
   : 0.9345 - loss: 0.1797
72 Epoch 9: val_accuracy did not improve from 0.93531
73 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8825s 5s/step -
   accuracy: 0.9345 - loss: 0.1797 - val_accuracy: 0.
   9211 - val_loss: 0.2050 - learning_rate: 2.0000e-05
74 Epoch 10/20
75 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
   : 0.9388 - loss: 0.1666
76 Epoch 10: val_accuracy did not improve from 0.93531
77 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8817s 5s/step -
   accuracy: 0.9388 - loss: 0.1666 - val_accuracy: 0.
   8957 - val_loss: 0.2557 - learning_rate: 1.0000e-05
78 Epoch 11/20
79 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy
   : 0.9401 - loss: 0.1613
80 Epoch 11: val_accuracy did not improve from 0.93531
81 1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8885s 5s/step -
```

```
accuracy: 0.9401 - loss: 0.1613 - val_accuracy: 0.9174 - val_loss: 0.2026 - learning_rate: 1.0000e-05
Epoch 12/20
1779/1779 ━━━━━━━━━━━━━━━━━━━━ 0s 4s/step - accuracy: 0.9448 - loss: 0.1518
Epoch 12: val_accuracy did not improve from 0.93531
1779/1779 ━━━━━━━━━━━━━━━━━━━━ 8874s 5s/step - accuracy: 0.9448 - loss: 0.1518 - val_accuracy: 0.9003 - val_loss: 0.2389 - learning_rate: 1.0000e-05
Saved final model to: C:/Users/arina/PycharmProjects/PythonProject/Deepfake Detection/Model/Fine Tune/ResNet50_Celeb\resnet50.keras
Evaluating on test set...
382/382 ━━━━━━━━━━━━━━━━━━━━ 1137s 3s/step - accuracy: 0.8069 - loss: 0.4663
Test accuracy: 0.9343 | Test loss: 0.1858
382/382 ━━━━━━━━━━━━━━━━━━━━ 1145s 3s/step

Classification Report:

                   precision    recall  f1-score   support

      Celeb-real       0.82      0.41      0.54      1172
Celeb-synthesis       0.94      0.99      0.96     11023

        accuracy                           0.93     12195
       macro avg       0.88      0.70      0.75     12195
    weighted avg       0.93      0.93      0.92     12195

Confusion Matrix:
 [[  476   696]
 [  105 10918]]

Process finished with exit code 0

```