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Fold 1/5

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Found 799 validated image filenames belonging to 10 classes.

Found 200 validated image filenames belonging to 10 classes.

Model: "sequential"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ conv2d (Conv2D) │ (None, 126, 126, 32) │ 896 │

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│ max\_pooling2d (MaxPooling2D) │ (None, 63, 63, 32) │ 0 │

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│ conv2d\_1 (Conv2D) │ (None, 61, 61, 64) │ 18,496 │

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│ max\_pooling2d\_1 (MaxPooling2D) │ (None, 30, 30, 64) │ 0 │

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│ conv2d\_2 (Conv2D) │ (None, 28, 28, 128) │ 73,856 │

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│ max\_pooling2d\_2 (MaxPooling2D) │ (None, 14, 14, 128) │ 0 │

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│ flatten (Flatten) │ (None, 25088) │ 0 │

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│ dense (Dense) │ (None, 128) │ 3,211,392 │

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│ dropout (Dropout) │ (None, 128) │ 0 │

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│ dense\_1 (Dense) │ (None, 10) │ 1,290 │

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│ dense\_1 (Dense) │ (None, 10) │ 1,290 │

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Total params: 3,305,930 (12.61 MB)

Total params: 3,305,930 (12.61 MB)

Trainable params: 3,305,930 (12.61 MB)

Trainable params: 3,305,930 (12.61 MB)

Non-trainable params: 0 (0.00 B)

Epoch 1/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 181ms/step - accuracy: 0.1208 - loss: 2.3070 - precision: 0.0000e+00 - recall: 0.0000e+00 - val\_accuracy: 0.2100 - val\_loss: 2.1494 - val\_precision: 0.0000e+00 - val\_recall: 0.0000e+00

Epoch 2/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 5s 190ms/step - accuracy: 0.2200 - loss: 2.0889 - precision: 0.3263 - recall: 0.0088 - val\_accuracy: 0.3400 - val\_loss: 1.8921 - val\_precision: 0.6667 - val\_recall: 0.0500

Epoch 3/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 5s 207ms/step - accuracy: 0.3110 - loss: 1.8999 - precision: 0.6306 - recall: 0.0641 - val\_accuracy: 0.3700 - val\_loss: 1.7639 - val\_precision: 0.7500 - val\_recall: 0.1050

Epoch 4/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 232ms/step - accuracy: 0.3368 - loss: 1.7923 - precision: 0.5928 - recall: 0.0780 - val\_accuracy: 0.4300 - val\_loss: 1.6949 - val\_precision: 0.7838 - val\_recall: 0.1450

Epoch 5/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 227ms/step - accuracy: 0.4055 - loss: 1.6493 - precision: 0.6871 - recall: 0.1728 - val\_accuracy: 0.4350 - val\_loss: 1.5562 - val\_precision: 0.6724 - val\_recall: 0.1950

Epoch 6/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 227ms/step - accuracy: 0.4699 - loss: 1.5106 - precision: 0.6731 - recall: 0.2311 - val\_accuracy: 0.5050 - val\_loss: 1.5425 - val\_precision: 0.7660 - val\_recall: 0.1800

Epoch 7/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 239ms/step - accuracy: 0.4934 - loss: 1.4115 - precision: 0.7511 - recall: 0.2495 - val\_accuracy: 0.5450 - val\_loss: 1.4759 - val\_precision: 0.7051 - val\_recall: 0.2750

Epoch 8/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 240ms/step - accuracy: 0.5431 - loss: 1.3098 - precision: 0.7455 - recall: 0.3284 - val\_accuracy: 0.5500 - val\_loss: 1.3635 - val\_precision: 0.7763 - val\_recall: 0.2950

Epoch 9/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 5s 216ms/step - accuracy: 0.5999 - loss: 1.1678 - precision: 0.7767 - recall: 0.3821 - val\_accuracy: 0.5450 - val\_loss: 1.3809 - val\_precision: 0.7538 - val\_recall: 0.2450

Epoch 10/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 5s 207ms/step - accuracy: 0.5926 - loss: 1.2348 - precision: 0.7599 - recall: 0.3518 - val\_accuracy: 0.5300 - val\_loss: 1.4250 - val\_precision: 0.6768 - val\_recall: 0.3350

Epoch 11/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 5s 208ms/step - accuracy: 0.5882 - loss: 1.1806 - precision: 0.7864 - recall: 0.4307 - val\_accuracy: 0.4850 - val\_loss: 1.4439 - val\_precision: 0.6481 - val\_recall: 0.3500

Epoch 12/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 237ms/step - accuracy: 0.6314 - loss: 1.0433 - precision: 0.8147 - recall: 0.4803 - val\_accuracy: 0.5550 - val\_loss: 1.2499 - val\_precision: 0.7283 - val\_recall: 0.3350

Epoch 13/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 223ms/step - accuracy: 0.7089 - loss: 0.9051 - precision: 0.8630 - recall: 0.5117 - val\_accuracy: 0.5500 - val\_loss: 1.3127 - val\_precision: 0.6744 - val\_recall: 0.4350

Epoch 14/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 220ms/step - accuracy: 0.7113 - loss: 0.8908 - precision: 0.8377 - recall: 0.5518 - val\_accuracy: 0.6050 - val\_loss: 1.1960 - val\_precision: 0.7458 - val\_recall: 0.4400

Epoch 15/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 5s 210ms/step - accuracy: 0.6993 - loss: 0.8724 - precision: 0.7706 - recall: 0.5415 - val\_accuracy: 0.6050 - val\_loss: 1.2695 - val\_precision: 0.6940 - val\_recall: 0.4650

Epoch 16/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 222ms/step - accuracy: 0.7028 - loss: 0.8840 - precision: 0.8291 - recall: 0.5498 - val\_accuracy: 0.6250 - val\_loss: 1.2004 - val\_precision: 0.7310 - val\_recall: 0.5300

Epoch 17/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 5s 211ms/step - accuracy: 0.7607 - loss: 0.7060 - precision: 0.8442 - recall: 0.6690 - val\_accuracy: 0.6150 - val\_loss: 1.1917 - val\_precision: 0.7153 - val\_recall: 0.4900

Epoch 18/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 5s 218ms/step - accuracy: 0.7826 - loss: 0.6175 - precision: 0.8710 - recall: 0.6865 - val\_accuracy: 0.6050 - val\_loss: 1.2095 - val\_precision: 0.7034 - val\_recall: 0.5100

Epoch 19/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 5s 205ms/step - accuracy: 0.7654 - loss: 0.6923 - precision: 0.8654 - recall: 0.6585 - val\_accuracy: 0.5800 - val\_loss: 1.2387 - val\_precision: 0.6620 - val\_recall: 0.4700

Epoch 20/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 5s 216ms/step - accuracy: 0.7408 - loss: 0.6938 - precision: 0.8378 - recall: 0.6644 - val\_accuracy: 0.6250 - val\_loss: 1.2438 - val\_precision: 0.7279 - val\_recall: 0.5350

Epoch 21/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 226ms/step - accuracy: 0.7934 - loss: 0.5514 - precision: 0.8847 - recall: 0.7146 - val\_accuracy: 0.6050 - val\_loss: 1.2157 - val\_precision: 0.6835 - val\_recall: 0.5400

Epoch 22/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 233ms/step - accuracy: 0.8433 - loss: 0.4933 - precision: 0.8927 - recall: 0.7786 - val\_accuracy: 0.6400 - val\_loss: 1.2028 - val\_precision: 0.6959 - val\_recall: 0.5150

Epoch 23/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 254ms/step - accuracy: 0.8403 - loss: 0.4949 - precision: 0.9070 - recall: 0.7774 - val\_accuracy: 0.6150 - val\_loss: 1.1784 - val\_precision: 0.6867 - val\_recall: 0.5150

Epoch 24/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 247ms/step - accuracy: 0.8485 - loss: 0.4249 - precision: 0.9180 - recall: 0.7778 - val\_accuracy: 0.6100 - val\_loss: 1.1885 - val\_precision: 0.6788 - val\_recall: 0.5600

Epoch 25/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 252ms/step - accuracy: 0.8567 - loss: 0.4132 - precision: 0.9079 - recall: 0.7996 - val\_accuracy: 0.6550 - val\_loss: 1.2450 - val\_precision: 0.7301 - val\_recall: 0.5950

Epoch 26/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 233ms/step - accuracy: 0.8652 - loss: 0.3767 - precision: 0.9322 - recall: 0.8311 - val\_accuracy: 0.6050 - val\_loss: 1.3356 - val\_precision: 0.6491 - val\_recall: 0.5550

Epoch 27/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 237ms/step - accuracy: 0.8991 - loss: 0.3197 - precision: 0.9370 - recall: 0.8559 - val\_accuracy: 0.5800 - val\_loss: 1.3118 - val\_precision: 0.6353 - val\_recall: 0.5400

Epoch 28/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 235ms/step - accuracy: 0.9020 - loss: 0.2713 - precision: 0.9533 - recall: 0.8744 - val\_accuracy: 0.6450 - val\_loss: 1.3374 - val\_precision: 0.6923 - val\_recall: 0.6300

Epoch 29/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 236ms/step - accuracy: 0.9038 - loss: 0.2675 - precision: 0.9373 - recall: 0.8598 - val\_accuracy: 0.6100 - val\_loss: 1.3281 - val\_precision: 0.6726 - val\_recall: 0.5650

Epoch 30/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 250ms/step - accuracy: 0.9130 - loss: 0.2628 - precision: 0.9401 - recall: 0.8800 - val\_accuracy: 0.6300 - val\_loss: 1.3614 - val\_precision: 0.6954 - val\_recall: 0.6050

Epoch 31/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 257ms/step - accuracy: 0.9359 - loss: 0.2112 - precision: 0.9560 - recall: 0.9123 - val\_accuracy: 0.6000 - val\_loss: 1.4198 - val\_precision: 0.6395 - val\_recall: 0.5500

Epoch 32/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 264ms/step - accuracy: 0.9296 - loss: 0.2087 - precision: 0.9541 - recall: 0.9181 - val\_accuracy: 0.6200 - val\_loss: 1.4057 - val\_precision: 0.6796 - val\_recall: 0.6150

Epoch 33/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 295ms/step - accuracy: 0.9368 - loss: 0.2131 - precision: 0.9509 - recall: 0.9132 - val\_accuracy: 0.6550 - val\_loss: 1.6005 - val\_precision: 0.6816 - val\_recall: 0.6100

Epoch 34/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 317ms/step - accuracy: 0.9426 - loss: 0.2130 - precision: 0.9608 - recall: 0.9157 - val\_accuracy: 0.6200 - val\_loss: 1.5948 - val\_precision: 0.6609 - val\_recall: 0.5750

Epoch 35/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 286ms/step - accuracy: 0.9730 - loss: 0.1241 - precision: 0.9780 - recall: 0.9588 - val\_accuracy: 0.6250 - val\_loss: 1.4560 - val\_precision: 0.6854 - val\_recall: 0.6100

Tiempo de entrenamiento fold 1: 206.15 s

7/7 ━━━━━━━━━━━━━━━━━━━━ 1s 158ms/step

F1-score fold 1: 0.6495

Métricas adicionales: Accuracy=0.6550 Precision=0.7301 Recall=0.5950

Mejor modelo actualizado y guardado.

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Fold 2/5

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Found 799 validated image filenames belonging to 10 classes.

Found 200 validated image filenames belonging to 10 classes.

Model: "sequential\_1"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

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│ conv2d\_3 (Conv2D) │ (None, 126, 126, 32) │ 896 │

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│ max\_pooling2d\_3 (MaxPooling2D) │ (None, 63, 63, 32) │ 0 │

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│ conv2d\_4 (Conv2D) │ (None, 61, 61, 64) │ 18,496 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ max\_pooling2d\_4 (MaxPooling2D) │ (None, 30, 30, 64) │ 0 │

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│ conv2d\_5 (Conv2D) │ (None, 28, 28, 128) │ 73,856 │

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│ max\_pooling2d\_5 (MaxPooling2D) │ (None, 14, 14, 128) │ 0 │

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│ flatten\_1 (Flatten) │ (None, 25088) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ dense\_2 (Dense) │ (None, 128) │ 3,211,392 │

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│ dropout\_1 (Dropout) │ (None, 128) │ 0 │

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│ dense\_3 (Dense) │ (None, 10) │ 1,290 │

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Total params: 3,305,930 (12.61 MB)

Trainable params: 3,305,930 (12.61 MB)

Non-trainable params: 0 (0.00 B)

/home/diego/tensorflow/lib/python3.10/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.

self.\_warn\_if\_super\_not\_called()

Epoch 1/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 9s 317ms/step - accuracy: 0.0988 - loss: 2.2924 - precision: 0.0692 - recall: 2.9502e-04 - val\_accuracy: 0.2250 - val\_loss: 1.9976 - val\_precision: 0.6000 - val\_recall: 0.0600

Epoch 2/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 304ms/step - accuracy: 0.2428 - loss: 2.0187 - precision: 0.4084 - recall: 0.0215 - val\_accuracy: 0.3200 - val\_loss: 1.8765 - val\_precision: 0.7778 - val\_recall: 0.1050

Epoch 3/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 313ms/step - accuracy: 0.3272 - loss: 1.9038 - precision: 0.6806 - recall: 0.0914 - val\_accuracy: 0.3800 - val\_loss: 1.7197 - val\_precision: 0.7805 - val\_recall: 0.1600

Epoch 4/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 243ms/step - accuracy: 0.3833 - loss: 1.7109 - precision: 0.7528 - recall: 0.1463 - val\_accuracy: 0.4200 - val\_loss: 1.6114 - val\_precision: 0.7429 - val\_recall: 0.1300

Epoch 5/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 275ms/step - accuracy: 0.4289 - loss: 1.6305 - precision: 0.7176 - recall: 0.1345 - val\_accuracy: 0.4350 - val\_loss: 1.5354 - val\_precision: 0.8750 - val\_recall: 0.1400

Epoch 6/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 250ms/step - accuracy: 0.4114 - loss: 1.6081 - precision: 0.7737 - recall: 0.1760 - val\_accuracy: 0.4350 - val\_loss: 1.4688 - val\_precision: 0.7143 - val\_recall: 0.1750

Epoch 7/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 249ms/step - accuracy: 0.4542 - loss: 1.4861 - precision: 0.7356 - recall: 0.2107 - val\_accuracy: 0.5050 - val\_loss: 1.3793 - val\_precision: 0.8125 - val\_recall: 0.2600

Epoch 8/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 237ms/step - accuracy: 0.5039 - loss: 1.4307 - precision: 0.6405 - recall: 0.2313 - val\_accuracy: 0.4750 - val\_loss: 1.3706 - val\_precision: 0.6795 - val\_recall: 0.2650

Epoch 9/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 234ms/step - accuracy: 0.5283 - loss: 1.3426 - precision: 0.7230 - recall: 0.3337 - val\_accuracy: 0.4950 - val\_loss: 1.3166 - val\_precision: 0.8400 - val\_recall: 0.3150

Epoch 10/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 236ms/step - accuracy: 0.5301 - loss: 1.3115 - precision: 0.7205 - recall: 0.2913 - val\_accuracy: 0.4850 - val\_loss: 1.4039 - val\_precision: 0.7222 - val\_recall: 0.3250

Epoch 11/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 258ms/step - accuracy: 0.5732 - loss: 1.1645 - precision: 0.7545 - recall: 0.3742 - val\_accuracy: 0.5150 - val\_loss: 1.3124 - val\_precision: 0.6923 - val\_recall: 0.3600

Epoch 12/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 254ms/step - accuracy: 0.5776 - loss: 1.1586 - precision: 0.7753 - recall: 0.4047 - val\_accuracy: 0.4900 - val\_loss: 1.2305 - val\_precision: 0.6423 - val\_recall: 0.3950

Epoch 13/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 251ms/step - accuracy: 0.6158 - loss: 1.0670 - precision: 0.7779 - recall: 0.4655 - val\_accuracy: 0.5450 - val\_loss: 1.1977 - val\_precision: 0.6905 - val\_recall: 0.4350

Epoch 14/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 266ms/step - accuracy: 0.6372 - loss: 1.0139 - precision: 0.7557 - recall: 0.5163 - val\_accuracy: 0.5450 - val\_loss: 1.1798 - val\_precision: 0.7670 - val\_recall: 0.3950

Epoch 15/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 265ms/step - accuracy: 0.6546 - loss: 0.9405 - precision: 0.8306 - recall: 0.5040 - val\_accuracy: 0.5600 - val\_loss: 1.1924 - val\_precision: 0.7750 - val\_recall: 0.4650

Epoch 16/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 267ms/step - accuracy: 0.7018 - loss: 0.8410 - precision: 0.8449 - recall: 0.5995 - val\_accuracy: 0.5350 - val\_loss: 1.2126 - val\_precision: 0.6357 - val\_recall: 0.4100

Epoch 17/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 260ms/step - accuracy: 0.7642 - loss: 0.7148 - precision: 0.8824 - recall: 0.6672 - val\_accuracy: 0.5900 - val\_loss: 1.0832 - val\_precision: 0.7481 - val\_recall: 0.5050

Epoch 18/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 265ms/step - accuracy: 0.7915 - loss: 0.6713 - precision: 0.8736 - recall: 0.6777 - val\_accuracy: 0.5950 - val\_loss: 1.1261 - val\_precision: 0.7183 - val\_recall: 0.5100

Epoch 19/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 260ms/step - accuracy: 0.8044 - loss: 0.5929 - precision: 0.8792 - recall: 0.7247 - val\_accuracy: 0.5650 - val\_loss: 1.2667 - val\_precision: 0.6471 - val\_recall: 0.4950

Epoch 20/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 243ms/step - accuracy: 0.7544 - loss: 0.6325 - precision: 0.8563 - recall: 0.6949 - val\_accuracy: 0.6100 - val\_loss: 1.0867 - val\_precision: 0.7025 - val\_recall: 0.5550

Epoch 21/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 280ms/step - accuracy: 0.8225 - loss: 0.5252 - precision: 0.8914 - recall: 0.7782 - val\_accuracy: 0.6150 - val\_loss: 1.1062 - val\_precision: 0.7391 - val\_recall: 0.5100

Epoch 22/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 257ms/step - accuracy: 0.8647 - loss: 0.4293 - precision: 0.9232 - recall: 0.7909 - val\_accuracy: 0.5900 - val\_loss: 1.3704 - val\_precision: 0.6584 - val\_recall: 0.5300

Epoch 23/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 243ms/step - accuracy: 0.7617 - loss: 0.6451 - precision: 0.8309 - recall: 0.7076 - val\_accuracy: 0.5950 - val\_loss: 1.2853 - val\_precision: 0.6897 - val\_recall: 0.5000

Epoch 24/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 242ms/step - accuracy: 0.8263 - loss: 0.4690 - precision: 0.9225 - recall: 0.7694 - val\_accuracy: 0.5900 - val\_loss: 1.2711 - val\_precision: 0.6974 - val\_recall: 0.5300

Epoch 25/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 258ms/step - accuracy: 0.8717 - loss: 0.3691 - precision: 0.9164 - recall: 0.8219 - val\_accuracy: 0.6050 - val\_loss: 1.1081 - val\_precision: 0.6772 - val\_recall: 0.5350

Epoch 26/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 268ms/step - accuracy: 0.9014 - loss: 0.3358 - precision: 0.9292 - recall: 0.8403 - val\_accuracy: 0.6350 - val\_loss: 1.1440 - val\_precision: 0.6864 - val\_recall: 0.5800

Epoch 27/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 274ms/step - accuracy: 0.8716 - loss: 0.3782 - precision: 0.9146 - recall: 0.8172 - val\_accuracy: 0.6450 - val\_loss: 1.1402 - val\_precision: 0.6901 - val\_recall: 0.5900

Epoch 28/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 245ms/step - accuracy: 0.9141 - loss: 0.2915 - precision: 0.9465 - recall: 0.8793 - val\_accuracy: 0.6400 - val\_loss: 1.1836 - val\_precision: 0.6705 - val\_recall: 0.5900

Epoch 29/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 249ms/step - accuracy: 0.9056 - loss: 0.2759 - precision: 0.9444 - recall: 0.8709 - val\_accuracy: 0.6050 - val\_loss: 1.2297 - val\_precision: 0.6550 - val\_recall: 0.5600

Epoch 30/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 262ms/step - accuracy: 0.9375 - loss: 0.2217 - precision: 0.9607 - recall: 0.9124 - val\_accuracy: 0.6450 - val\_loss: 1.2663 - val\_precision: 0.6839 - val\_recall: 0.5950

Epoch 31/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 252ms/step - accuracy: 0.9466 - loss: 0.1942 - precision: 0.9579 - recall: 0.9177 - val\_accuracy: 0.6050 - val\_loss: 1.1751 - val\_precision: 0.6842 - val\_recall: 0.5850

Epoch 32/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 245ms/step - accuracy: 0.9584 - loss: 0.1504 - precision: 0.9687 - recall: 0.9432 - val\_accuracy: 0.6150 - val\_loss: 1.1582 - val\_precision: 0.6724 - val\_recall: 0.5850

Epoch 33/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 245ms/step - accuracy: 0.9570 - loss: 0.1608 - precision: 0.9748 - recall: 0.9383 - val\_accuracy: 0.6300 - val\_loss: 1.4192 - val\_precision: 0.6543 - val\_recall: 0.6150

Epoch 34/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 242ms/step - accuracy: 0.9372 - loss: 0.1854 - precision: 0.9547 - recall: 0.9223 - val\_accuracy: 0.6100 - val\_loss: 1.2635 - val\_precision: 0.6761 - val\_recall: 0.5950

Epoch 35/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 252ms/step - accuracy: 0.9660 - loss: 0.1427 - precision: 0.9720 - recall: 0.9510 - val\_accuracy: 0.6300 - val\_loss: 1.4795 - val\_precision: 0.6611 - val\_recall: 0.5950

Epoch 36/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 264ms/step - accuracy: 0.9531 - loss: 0.1354 - precision: 0.9700 - recall: 0.9461 - val\_accuracy: 0.5900 - val\_loss: 1.3594 - val\_precision: 0.6203 - val\_recall: 0.5800

Epoch 37/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 259ms/step - accuracy: 0.9617 - loss: 0.1175 - precision: 0.9765 - recall: 0.9507 - val\_accuracy: 0.6000 - val\_loss: 1.5230 - val\_precision: 0.6474 - val\_recall: 0.5600

Tiempo de entrenamiento fold 2: 242.04 s

7/7 ━━━━━━━━━━━━━━━━━━━━ 1s 146ms/step

F1-score fold 2: 0.6341

Métricas adicionales: Accuracy=0.6450 Precision=0.6901 Recall=0.5900

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Fold 3/5

============================

Found 799 validated image filenames belonging to 10 classes.

Found 200 validated image filenames belonging to 10 classes.

Model: "sequential\_2"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ conv2d\_6 (Conv2D) │ (None, 126, 126, 32) │ 896 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ max\_pooling2d\_6 (MaxPooling2D) │ (None, 63, 63, 32) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ conv2d\_7 (Conv2D) │ (None, 61, 61, 64) │ 18,496 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ max\_pooling2d\_7 (MaxPooling2D) │ (None, 30, 30, 64) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ conv2d\_8 (Conv2D) │ (None, 28, 28, 128) │ 73,856 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ max\_pooling2d\_8 (MaxPooling2D) │ (None, 14, 14, 128) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ flatten\_2 (Flatten) │ (None, 25088) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ dense\_4 (Dense) │ (None, 128) │ 3,211,392 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ dropout\_2 (Dropout) │ (None, 128) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ dense\_5 (Dense) │ (None, 10) │ 1,290 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 3,305,930 (12.61 MB)

Trainable params: 3,305,930 (12.61 MB)

Non-trainable params: 0 (0.00 B)

/home/diego/tensorflow/lib/python3.10/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.

self.\_warn\_if\_super\_not\_called()

Epoch 1/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 286ms/step - accuracy: 0.0933 - loss: 2.3173 - precision: 0.0000e+00 - recall: 0.0000e+00 - val\_accuracy: 0.1900 - val\_loss: 2.1331 - val\_precision: 0.0000e+00 - val\_recall: 0.0000e+00

Epoch 2/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 281ms/step - accuracy: 0.2493 - loss: 2.0533 - precision: 0.5574 - recall: 0.0215 - val\_accuracy: 0.3350 - val\_loss: 1.9082 - val\_precision: 0.8000 - val\_recall: 0.0600

Epoch 3/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 254ms/step - accuracy: 0.2991 - loss: 1.9119 - precision: 0.6266 - recall: 0.0794 - val\_accuracy: 0.3350 - val\_loss: 1.8166 - val\_precision: 0.6579 - val\_recall: 0.1250

Epoch 4/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 286ms/step - accuracy: 0.3889 - loss: 1.7233 - precision: 0.7980 - recall: 0.1229 - val\_accuracy: 0.4300 - val\_loss: 1.6151 - val\_precision: 0.6170 - val\_recall: 0.1450

Epoch 5/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 249ms/step - accuracy: 0.4432 - loss: 1.5364 - precision: 0.7382 - recall: 0.1782 - val\_accuracy: 0.4600 - val\_loss: 1.5184 - val\_precision: 0.7955 - val\_recall: 0.1750

Epoch 6/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 287ms/step - accuracy: 0.4586 - loss: 1.5210 - precision: 0.7594 - recall: 0.2115 - val\_accuracy: 0.5200 - val\_loss: 1.3919 - val\_precision: 0.7586 - val\_recall: 0.2200

Epoch 7/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 252ms/step - accuracy: 0.5209 - loss: 1.3506 - precision: 0.7878 - recall: 0.2974 - val\_accuracy: 0.4600 - val\_loss: 1.5061 - val\_precision: 0.6190 - val\_recall: 0.2600

Epoch 8/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 233ms/step - accuracy: 0.4732 - loss: 1.4095 - precision: 0.7256 - recall: 0.2870 - val\_accuracy: 0.5150 - val\_loss: 1.4844 - val\_precision: 0.6000 - val\_recall: 0.2550

Epoch 9/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 259ms/step - accuracy: 0.5571 - loss: 1.2988 - precision: 0.7759 - recall: 0.3175 - val\_accuracy: 0.5350 - val\_loss: 1.3626 - val\_precision: 0.7324 - val\_recall: 0.2600

Epoch 10/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 265ms/step - accuracy: 0.5792 - loss: 1.2136 - precision: 0.7782 - recall: 0.3720 - val\_accuracy: 0.5450 - val\_loss: 1.3606 - val\_precision: 0.6500 - val\_recall: 0.3250

Epoch 11/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 247ms/step - accuracy: 0.5725 - loss: 1.1930 - precision: 0.7334 - recall: 0.3699 - val\_accuracy: 0.4750 - val\_loss: 1.4998 - val\_precision: 0.5140 - val\_recall: 0.2750

Epoch 12/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 246ms/step - accuracy: 0.6493 - loss: 1.0320 - precision: 0.8120 - recall: 0.4600 - val\_accuracy: 0.5550 - val\_loss: 1.2769 - val\_precision: 0.6667 - val\_recall: 0.4200

Epoch 13/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 252ms/step - accuracy: 0.6257 - loss: 1.0808 - precision: 0.7680 - recall: 0.4413 - val\_accuracy: 0.5250 - val\_loss: 1.2865 - val\_precision: 0.7030 - val\_recall: 0.3550

Epoch 14/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 274ms/step - accuracy: 0.6575 - loss: 0.9922 - precision: 0.8528 - recall: 0.4754 - val\_accuracy: 0.5700 - val\_loss: 1.3476 - val\_precision: 0.6457 - val\_recall: 0.4100

Epoch 15/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 271ms/step - accuracy: 0.6458 - loss: 0.9233 - precision: 0.8395 - recall: 0.5228 - val\_accuracy: 0.5700 - val\_loss: 1.2621 - val\_precision: 0.6519 - val\_recall: 0.4400

Epoch 16/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 256ms/step - accuracy: 0.6996 - loss: 0.8639 - precision: 0.8643 - recall: 0.5484 - val\_accuracy: 0.5700 - val\_loss: 1.2366 - val\_precision: 0.6571 - val\_recall: 0.4600

Epoch 17/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 261ms/step - accuracy: 0.7097 - loss: 0.8017 - precision: 0.8368 - recall: 0.6060 - val\_accuracy: 0.5950 - val\_loss: 1.2914 - val\_precision: 0.6803 - val\_recall: 0.5000

Epoch 18/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 251ms/step - accuracy: 0.7700 - loss: 0.6901 - precision: 0.8701 - recall: 0.6628 - val\_accuracy: 0.5250 - val\_loss: 1.3329 - val\_precision: 0.6138 - val\_recall: 0.4450

Epoch 19/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 268ms/step - accuracy: 0.7472 - loss: 0.7225 - precision: 0.8534 - recall: 0.6188 - val\_accuracy: 0.6050 - val\_loss: 1.1337 - val\_precision: 0.7015 - val\_recall: 0.4700

Epoch 20/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 262ms/step - accuracy: 0.7414 - loss: 0.7216 - precision: 0.8545 - recall: 0.6271 - val\_accuracy: 0.6150 - val\_loss: 1.2589 - val\_precision: 0.6828 - val\_recall: 0.4950

Epoch 21/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 261ms/step - accuracy: 0.8073 - loss: 0.5803 - precision: 0.8862 - recall: 0.6968 - val\_accuracy: 0.6200 - val\_loss: 1.3084 - val\_precision: 0.6800 - val\_recall: 0.5100

Epoch 22/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 331ms/step - accuracy: 0.8085 - loss: 0.5879 - precision: 0.8908 - recall: 0.7107 - val\_accuracy: 0.6200 - val\_loss: 1.2676 - val\_precision: 0.6832 - val\_recall: 0.5500

Epoch 23/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 248ms/step - accuracy: 0.7615 - loss: 0.7299 - precision: 0.8354 - recall: 0.6535 - val\_accuracy: 0.6300 - val\_loss: 1.1563 - val\_precision: 0.7462 - val\_recall: 0.4850

Epoch 24/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 270ms/step - accuracy: 0.8232 - loss: 0.5295 - precision: 0.9120 - recall: 0.7277 - val\_accuracy: 0.6400 - val\_loss: 1.2901 - val\_precision: 0.6706 - val\_recall: 0.5700

Epoch 25/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 273ms/step - accuracy: 0.8441 - loss: 0.4781 - precision: 0.8866 - recall: 0.7747 - val\_accuracy: 0.6450 - val\_loss: 1.1835 - val\_precision: 0.6946 - val\_recall: 0.5800

Epoch 26/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 239ms/step - accuracy: 0.8880 - loss: 0.3657 - precision: 0.9294 - recall: 0.8484 - val\_accuracy: 0.5650 - val\_loss: 1.4179 - val\_precision: 0.6405 - val\_recall: 0.4900

Epoch 27/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 250ms/step - accuracy: 0.8278 - loss: 0.4779 - precision: 0.8887 - recall: 0.7613 - val\_accuracy: 0.6550 - val\_loss: 1.2184 - val\_precision: 0.6784 - val\_recall: 0.5800

Epoch 28/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 247ms/step - accuracy: 0.8731 - loss: 0.3813 - precision: 0.9259 - recall: 0.8203 - val\_accuracy: 0.6550 - val\_loss: 1.2352 - val\_precision: 0.7000 - val\_recall: 0.5950

Epoch 29/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 260ms/step - accuracy: 0.9013 - loss: 0.3625 - precision: 0.9397 - recall: 0.8408 - val\_accuracy: 0.6500 - val\_loss: 1.3811 - val\_precision: 0.6776 - val\_recall: 0.6200

Epoch 30/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 247ms/step - accuracy: 0.8910 - loss: 0.2717 - precision: 0.9286 - recall: 0.8689 - val\_accuracy: 0.6350 - val\_loss: 1.3263 - val\_precision: 0.6538 - val\_recall: 0.5950

Epoch 31/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 250ms/step - accuracy: 0.8915 - loss: 0.2888 - precision: 0.9265 - recall: 0.8635 - val\_accuracy: 0.6400 - val\_loss: 1.4132 - val\_precision: 0.6630 - val\_recall: 0.6000

Epoch 32/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 263ms/step - accuracy: 0.8991 - loss: 0.2709 - precision: 0.9271 - recall: 0.8799 - val\_accuracy: 0.6200 - val\_loss: 1.4465 - val\_precision: 0.6573 - val\_recall: 0.5850

Epoch 33/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 272ms/step - accuracy: 0.9312 - loss: 0.2377 - precision: 0.9516 - recall: 0.8991 - val\_accuracy: 0.6650 - val\_loss: 1.4226 - val\_precision: 0.6800 - val\_recall: 0.5950

Epoch 34/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 306ms/step - accuracy: 0.9265 - loss: 0.2162 - precision: 0.9512 - recall: 0.8956 - val\_accuracy: 0.6450 - val\_loss: 1.3630 - val\_precision: 0.6959 - val\_recall: 0.5950

Epoch 35/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 321ms/step - accuracy: 0.9390 - loss: 0.1935 - precision: 0.9615 - recall: 0.9164 - val\_accuracy: 0.5700 - val\_loss: 1.7942 - val\_precision: 0.5978 - val\_recall: 0.5500

Epoch 36/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 329ms/step - accuracy: 0.9458 - loss: 0.1782 - precision: 0.9655 - recall: 0.9319 - val\_accuracy: 0.6500 - val\_loss: 1.6616 - val\_precision: 0.6800 - val\_recall: 0.5950

Epoch 37/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 315ms/step - accuracy: 0.9211 - loss: 0.2375 - precision: 0.9514 - recall: 0.9034 - val\_accuracy: 0.6100 - val\_loss: 1.5761 - val\_precision: 0.6290 - val\_recall: 0.5850

Epoch 38/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 312ms/step - accuracy: 0.9549 - loss: 0.1410 - precision: 0.9723 - recall: 0.9378 - val\_accuracy: 0.5950 - val\_loss: 1.6861 - val\_precision: 0.6215 - val\_recall: 0.5500

Epoch 39/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 312ms/step - accuracy: 0.9328 - loss: 0.1650 - precision: 0.9455 - recall: 0.9183 - val\_accuracy: 0.6200 - val\_loss: 1.6303 - val\_precision: 0.6578 - val\_recall: 0.6150

Epoch 40/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 254ms/step - accuracy: 0.9617 - loss: 0.1482 - precision: 0.9738 - recall: 0.9391 - val\_accuracy: 0.6500 - val\_loss: 1.5031 - val\_precision: 0.6757 - val\_recall: 0.6250

Epoch 41/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 238ms/step - accuracy: 0.9724 - loss: 0.0928 - precision: 0.9784 - recall: 0.9635 - val\_accuracy: 0.6450 - val\_loss: 1.5483 - val\_precision: 0.6721 - val\_recall: 0.6150

Epoch 42/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 234ms/step - accuracy: 0.9733 - loss: 0.0997 - precision: 0.9816 - recall: 0.9666 - val\_accuracy: 0.6300 - val\_loss: 1.6210 - val\_precision: 0.6703 - val\_recall: 0.6200

Epoch 43/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 236ms/step - accuracy: 0.9639 - loss: 0.1163 - precision: 0.9639 - recall: 0.9558 - val\_accuracy: 0.6350 - val\_loss: 1.6462 - val\_precision: 0.6889 - val\_recall: 0.6200

Tiempo de entrenamiento fold 3: 289.54 s

7/7 ━━━━━━━━━━━━━━━━━━━━ 1s 104ms/step

F1-score fold 3: 0.6578

Métricas adicionales: Accuracy=0.6650 Precision=0.6800 Recall=0.5950

Mejor modelo actualizado y guardado.

============================

Fold 4/5

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Found 799 validated image filenames belonging to 10 classes.

Found 200 validated image filenames belonging to 10 classes.

Model: "sequential\_3"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ conv2d\_9 (Conv2D) │ (None, 126, 126, 32) │ 896 │

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│ max\_pooling2d\_9 (MaxPooling2D) │ (None, 63, 63, 32) │ 0 │

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│ conv2d\_10 (Conv2D) │ (None, 61, 61, 64) │ 18,496 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ max\_pooling2d\_10 (MaxPooling2D) │ (None, 30, 30, 64) │ 0 │

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│ conv2d\_11 (Conv2D) │ (None, 28, 28, 128) │ 73,856 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ max\_pooling2d\_11 (MaxPooling2D) │ (None, 14, 14, 128) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ flatten\_3 (Flatten) │ (None, 25088) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ dense\_6 (Dense) │ (None, 128) │ 3,211,392 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ dropout\_3 (Dropout) │ (None, 128) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ dense\_7 (Dense) │ (None, 10) │ 1,290 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 3,305,930 (12.61 MB)

Trainable params: 3,305,930 (12.61 MB)

Non-trainable params: 0 (0.00 B)

/home/diego/tensorflow/lib/python3.10/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.

self.\_warn\_if\_super\_not\_called()

Epoch 1/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 279ms/step - accuracy: 0.1524 - loss: 2.2562 - precision: 0.0385 - recall: 1.4635e-04 - val\_accuracy: 0.1850 - val\_loss: 2.0332 - val\_precision: 0.0000e+00 - val\_recall: 0.0000e+00

Epoch 2/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 266ms/step - accuracy: 0.2443 - loss: 2.0141 - precision: 0.6081 - recall: 0.0279 - val\_accuracy: 0.3200 - val\_loss: 1.8814 - val\_precision: 0.7727 - val\_recall: 0.0850

Epoch 3/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 247ms/step - accuracy: 0.3072 - loss: 1.8579 - precision: 0.6535 - recall: 0.0812 - val\_accuracy: 0.3750 - val\_loss: 1.8088 - val\_precision: 0.7222 - val\_recall: 0.1300

Epoch 4/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 255ms/step - accuracy: 0.3392 - loss: 1.8243 - precision: 0.7419 - recall: 0.1051 - val\_accuracy: 0.4500 - val\_loss: 1.6432 - val\_precision: 0.7317 - val\_recall: 0.1500

Epoch 5/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 246ms/step - accuracy: 0.4517 - loss: 1.5788 - precision: 0.7193 - recall: 0.1855 - val\_accuracy: 0.4750 - val\_loss: 1.5347 - val\_precision: 0.8438 - val\_recall: 0.1350

Epoch 6/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 256ms/step - accuracy: 0.4705 - loss: 1.5400 - precision: 0.8018 - recall: 0.1890 - val\_accuracy: 0.4650 - val\_loss: 1.5259 - val\_precision: 0.6892 - val\_recall: 0.2550

Epoch 7/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 285ms/step - accuracy: 0.4774 - loss: 1.4390 - precision: 0.6745 - recall: 0.2635 - val\_accuracy: 0.5500 - val\_loss: 1.3547 - val\_precision: 0.8154 - val\_recall: 0.2650

Epoch 8/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 264ms/step - accuracy: 0.5384 - loss: 1.2981 - precision: 0.7385 - recall: 0.3277 - val\_accuracy: 0.5150 - val\_loss: 1.3985 - val\_precision: 0.7069 - val\_recall: 0.2050

Epoch 9/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 256ms/step - accuracy: 0.5697 - loss: 1.2926 - precision: 0.8046 - recall: 0.2909 - val\_accuracy: 0.5500 - val\_loss: 1.2626 - val\_precision: 0.7927 - val\_recall: 0.3250

Epoch 10/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 258ms/step - accuracy: 0.5843 - loss: 1.1713 - precision: 0.7638 - recall: 0.3772 - val\_accuracy: 0.5350 - val\_loss: 1.3417 - val\_precision: 0.7195 - val\_recall: 0.2950

Epoch 11/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 254ms/step - accuracy: 0.5961 - loss: 1.1422 - precision: 0.7592 - recall: 0.3848 - val\_accuracy: 0.5900 - val\_loss: 1.1377 - val\_precision: 0.7826 - val\_recall: 0.3600

Epoch 12/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 250ms/step - accuracy: 0.6503 - loss: 1.0154 - precision: 0.8240 - recall: 0.4556 - val\_accuracy: 0.6200 - val\_loss: 1.1677 - val\_precision: 0.7522 - val\_recall: 0.4250

Epoch 13/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 257ms/step - accuracy: 0.6542 - loss: 0.9707 - precision: 0.7958 - recall: 0.4900 - val\_accuracy: 0.6100 - val\_loss: 1.0618 - val\_precision: 0.7627 - val\_recall: 0.4500

Epoch 14/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 246ms/step - accuracy: 0.6826 - loss: 0.8706 - precision: 0.8273 - recall: 0.5294 - val\_accuracy: 0.6250 - val\_loss: 1.0782 - val\_precision: 0.7557 - val\_recall: 0.4950

Epoch 15/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 252ms/step - accuracy: 0.7051 - loss: 0.8701 - precision: 0.8091 - recall: 0.5638 - val\_accuracy: 0.6500 - val\_loss: 1.1053 - val\_precision: 0.7500 - val\_recall: 0.5400

Epoch 16/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 8s 308ms/step - accuracy: 0.7700 - loss: 0.6911 - precision: 0.8740 - recall: 0.6508 - val\_accuracy: 0.6550 - val\_loss: 1.0133 - val\_precision: 0.8014 - val\_recall: 0.5650

Epoch 17/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 294ms/step - accuracy: 0.7815 - loss: 0.6230 - precision: 0.8861 - recall: 0.6941 - val\_accuracy: 0.6850 - val\_loss: 1.0395 - val\_precision: 0.7500 - val\_recall: 0.5550

Epoch 18/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 275ms/step - accuracy: 0.7757 - loss: 0.6057 - precision: 0.8694 - recall: 0.7038 - val\_accuracy: 0.6550 - val\_loss: 1.0137 - val\_precision: 0.7600 - val\_recall: 0.5700

Epoch 19/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 257ms/step - accuracy: 0.8092 - loss: 0.5721 - precision: 0.8747 - recall: 0.7376 - val\_accuracy: 0.6600 - val\_loss: 1.0554 - val\_precision: 0.7643 - val\_recall: 0.6000

Epoch 20/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 243ms/step - accuracy: 0.8279 - loss: 0.5002 - precision: 0.9032 - recall: 0.7463 - val\_accuracy: 0.6750 - val\_loss: 0.9688 - val\_precision: 0.7667 - val\_recall: 0.5750

Epoch 21/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 281ms/step - accuracy: 0.8332 - loss: 0.5276 - precision: 0.8917 - recall: 0.7415 - val\_accuracy: 0.6950 - val\_loss: 0.9651 - val\_precision: 0.7515 - val\_recall: 0.6350

Epoch 22/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 267ms/step - accuracy: 0.8743 - loss: 0.3620 - precision: 0.9371 - recall: 0.8145 - val\_accuracy: 0.6850 - val\_loss: 1.0045 - val\_precision: 0.7658 - val\_recall: 0.6050

Epoch 23/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 254ms/step - accuracy: 0.8863 - loss: 0.3606 - precision: 0.9305 - recall: 0.8274 - val\_accuracy: 0.6500 - val\_loss: 1.2000 - val\_precision: 0.7186 - val\_recall: 0.6000

Epoch 24/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 246ms/step - accuracy: 0.8594 - loss: 0.3910 - precision: 0.9067 - recall: 0.7954 - val\_accuracy: 0.6750 - val\_loss: 0.9874 - val\_precision: 0.7368 - val\_recall: 0.6300

Epoch 25/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 240ms/step - accuracy: 0.8763 - loss: 0.3424 - precision: 0.9263 - recall: 0.8427 - val\_accuracy: 0.6550 - val\_loss: 1.2177 - val\_precision: 0.7235 - val\_recall: 0.6150

Epoch 26/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 243ms/step - accuracy: 0.8998 - loss: 0.3116 - precision: 0.9304 - recall: 0.8651 - val\_accuracy: 0.6500 - val\_loss: 1.1453 - val\_precision: 0.7022 - val\_recall: 0.6250

Epoch 27/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 237ms/step - accuracy: 0.9258 - loss: 0.2495 - precision: 0.9468 - recall: 0.9055 - val\_accuracy: 0.6650 - val\_loss: 1.1055 - val\_precision: 0.7310 - val\_recall: 0.6250

Epoch 28/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 258ms/step - accuracy: 0.9308 - loss: 0.2364 - precision: 0.9525 - recall: 0.8899 - val\_accuracy: 0.6700 - val\_loss: 1.2492 - val\_precision: 0.7088 - val\_recall: 0.6450

Epoch 29/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 262ms/step - accuracy: 0.9469 - loss: 0.1890 - precision: 0.9636 - recall: 0.9051 - val\_accuracy: 0.6750 - val\_loss: 1.1224 - val\_precision: 0.7247 - val\_recall: 0.6450

Epoch 30/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 271ms/step - accuracy: 0.9576 - loss: 0.1406 - precision: 0.9663 - recall: 0.9475 - val\_accuracy: 0.6900 - val\_loss: 1.2197 - val\_precision: 0.7458 - val\_recall: 0.6600

Epoch 31/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 247ms/step - accuracy: 0.9572 - loss: 0.1788 - precision: 0.9727 - recall: 0.9344 - val\_accuracy: 0.6700 - val\_loss: 1.3282 - val\_precision: 0.6935 - val\_recall: 0.6450

Tiempo de entrenamiento fold 4: 202.83 s

7/7 ━━━━━━━━━━━━━━━━━━━━ 1s 110ms/step

F1-score fold 4: 0.6880

Métricas adicionales: Accuracy=0.6950 Precision=0.7515 Recall=0.6350

Mejor modelo actualizado y guardado.

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Fold 5/5

============================

Found 800 validated image filenames belonging to 10 classes.

Found 199 validated image filenames belonging to 10 classes.

Model: "sequential\_4"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ conv2d\_12 (Conv2D) │ (None, 126, 126, 32) │ 896 │

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│ max\_pooling2d\_12 (MaxPooling2D) │ (None, 63, 63, 32) │ 0 │

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│ conv2d\_13 (Conv2D) │ (None, 61, 61, 64) │ 18,496 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ max\_pooling2d\_13 (MaxPooling2D) │ (None, 30, 30, 64) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ conv2d\_14 (Conv2D) │ (None, 28, 28, 128) │ 73,856 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ max\_pooling2d\_14 (MaxPooling2D) │ (None, 14, 14, 128) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ flatten\_4 (Flatten) │ (None, 25088) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ dense\_8 (Dense) │ (None, 128) │ 3,211,392 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ dropout\_4 (Dropout) │ (None, 128) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ dense\_9 (Dense) │ (None, 10) │ 1,290 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 3,305,930 (12.61 MB)

Trainable params: 3,305,930 (12.61 MB)

Non-trainable params: 0 (0.00 B)

/home/diego/tensorflow/lib/python3.10/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.

self.\_warn\_if\_super\_not\_called()

Epoch 1/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 248ms/step - accuracy: 0.1066 - loss: 2.3059 - precision: 0.0000e+00 - recall: 0.0000e+00 - val\_accuracy: 0.1859 - val\_loss: 2.0953 - val\_precision: 1.0000 - val\_recall: 0.0050

Epoch 2/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 283ms/step - accuracy: 0.2299 - loss: 2.0655 - precision: 0.5315 - recall: 0.0250 - val\_accuracy: 0.3065 - val\_loss: 1.9612 - val\_precision: 1.0000 - val\_recall: 0.0101

Epoch 3/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 266ms/step - accuracy: 0.3299 - loss: 1.8599 - precision: 0.7253 - recall: 0.0628 - val\_accuracy: 0.3719 - val\_loss: 1.7924 - val\_precision: 0.7188 - val\_recall: 0.1156

Epoch 4/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 253ms/step - accuracy: 0.3231 - loss: 1.7415 - precision: 0.7561 - recall: 0.1145 - val\_accuracy: 0.3518 - val\_loss: 1.7317 - val\_precision: 0.6458 - val\_recall: 0.1558

Epoch 5/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 285ms/step - accuracy: 0.3868 - loss: 1.6681 - precision: 0.7502 - recall: 0.1293 - val\_accuracy: 0.4673 - val\_loss: 1.5223 - val\_precision: 0.8462 - val\_recall: 0.1658

Epoch 6/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 278ms/step - accuracy: 0.4361 - loss: 1.5310 - precision: 0.7638 - recall: 0.1857 - val\_accuracy: 0.4975 - val\_loss: 1.5049 - val\_precision: 0.7959 - val\_recall: 0.1960

Epoch 7/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 287ms/step - accuracy: 0.4867 - loss: 1.4168 - precision: 0.7977 - recall: 0.2567 - val\_accuracy: 0.4774 - val\_loss: 1.3935 - val\_precision: 0.7846 - val\_recall: 0.2563

Epoch 8/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 280ms/step - accuracy: 0.5266 - loss: 1.2693 - precision: 0.7224 - recall: 0.3058 - val\_accuracy: 0.5025 - val\_loss: 1.3769 - val\_precision: 0.8116 - val\_recall: 0.2814

Epoch 9/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 279ms/step - accuracy: 0.5396 - loss: 1.2584 - precision: 0.7452 - recall: 0.3289 - val\_accuracy: 0.5528 - val\_loss: 1.3068 - val\_precision: 0.7778 - val\_recall: 0.3166

Epoch 10/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 287ms/step - accuracy: 0.5682 - loss: 1.2190 - precision: 0.7772 - recall: 0.3619 - val\_accuracy: 0.5377 - val\_loss: 1.2759 - val\_precision: 0.7609 - val\_recall: 0.3518

Epoch 11/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 9s 230ms/step - accuracy: 0.5657 - loss: 1.1624 - precision: 0.7310 - recall: 0.4101 - val\_accuracy: 0.5879 - val\_loss: 1.2367 - val\_precision: 0.7895 - val\_recall: 0.3769

Epoch 12/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 286ms/step - accuracy: 0.6400 - loss: 1.0626 - precision: 0.7881 - recall: 0.4251 - val\_accuracy: 0.5276 - val\_loss: 1.3175 - val\_precision: 0.6842 - val\_recall: 0.3920

Epoch 13/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 244ms/step - accuracy: 0.6705 - loss: 0.9314 - precision: 0.8040 - recall: 0.5267 - val\_accuracy: 0.5779 - val\_loss: 1.2597 - val\_precision: 0.7411 - val\_recall: 0.4171

Epoch 14/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 275ms/step - accuracy: 0.6278 - loss: 0.9749 - precision: 0.8028 - recall: 0.5182 - val\_accuracy: 0.6231 - val\_loss: 1.1449 - val\_precision: 0.7829 - val\_recall: 0.5075

Epoch 15/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 250ms/step - accuracy: 0.7033 - loss: 0.7920 - precision: 0.8373 - recall: 0.5882 - val\_accuracy: 0.5879 - val\_loss: 1.1192 - val\_precision: 0.7460 - val\_recall: 0.4724

Epoch 16/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 247ms/step - accuracy: 0.7234 - loss: 0.7539 - precision: 0.8609 - recall: 0.6204 - val\_accuracy: 0.6131 - val\_loss: 1.1070 - val\_precision: 0.7559 - val\_recall: 0.4824

Epoch 17/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 266ms/step - accuracy: 0.7683 - loss: 0.6641 - precision: 0.8897 - recall: 0.6603 - val\_accuracy: 0.6432 - val\_loss: 1.0747 - val\_precision: 0.7609 - val\_recall: 0.5276

Epoch 18/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 260ms/step - accuracy: 0.7784 - loss: 0.6216 - precision: 0.8622 - recall: 0.6691 - val\_accuracy: 0.6382 - val\_loss: 1.0764 - val\_precision: 0.7574 - val\_recall: 0.5176

Epoch 19/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 293ms/step - accuracy: 0.8104 - loss: 0.5757 - precision: 0.8836 - recall: 0.7189 - val\_accuracy: 0.6633 - val\_loss: 1.0177 - val\_precision: 0.7290 - val\_recall: 0.5678

Epoch 20/50

2/25 ━━━━━━━━━━━━━━━━━━━━ 4s 185ms/step - accuracy: 0.8516 - loss: 0.4393 - precision: 0.8926 - recall: 0.8438Exception ignored in: <function Image.\_\_del\_\_ at 0x7fd0c0754160>

Traceback (most recent call last):

File "/usr/lib/python3.10/tkinter/\_\_init\_\_.py", line 4056, in \_\_del\_\_

self.tk.call('image', 'delete', self.name)

RuntimeError: main thread is not in main loop

Exception ignored in: <function Variable.\_\_del\_\_ at 0x7fd0c07289d0>

Traceback (most recent call last):

File "/usr/lib/python3.10/tkinter/\_\_init\_\_.py", line 388, in \_\_del\_\_

if self.\_tk.getboolean(self.\_tk.call("info", "exists", self.\_name)):

RuntimeError: main thread is not in main loop

Exception ignored in: <function Variable.\_\_del\_\_ at 0x7fd0c07289d0>

Traceback (most recent call last):

File "/usr/lib/python3.10/tkinter/\_\_init\_\_.py", line 388, in \_\_del\_\_

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File "/usr/lib/python3.10/tkinter/\_\_init\_\_.py", line 388, in \_\_del\_\_

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RuntimeError: main thread is not in main loop

Exception ignored in: <function Variable.\_\_del\_\_ at 0x7fd0c07289d0>

Traceback (most recent call last):

File "/usr/lib/python3.10/tkinter/\_\_init\_\_.py", line 388, in \_\_del\_\_

if self.\_tk.getboolean(self.\_tk.call("info", "exists", self.\_name)):

RuntimeError: main thread is not in main loop

Exception ignored in: <function Image.\_\_del\_\_ at 0x7fd0c0754160>

Traceback (most recent call last):

File "/usr/lib/python3.10/tkinter/\_\_init\_\_.py", line 4056, in \_\_del\_\_

self.tk.call('image', 'delete', self.name)

RuntimeError: main thread is not in main loop

Exception ignored in: <function Variable.\_\_del\_\_ at 0x7fd0c07289d0>

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File "/usr/lib/python3.10/tkinter/\_\_init\_\_.py", line 388, in \_\_del\_\_

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Exception ignored in: <function Variable.\_\_del\_\_ at 0x7fd0c07289d0>

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RuntimeError: main thread is not in main loop

Exception ignored in: <function Variable.\_\_del\_\_ at 0x7fd0c07289d0>

Traceback (most recent call last):

File "/usr/lib/python3.10/tkinter/\_\_init\_\_.py", line 388, in \_\_del\_\_

if self.\_tk.getboolean(self.\_tk.call("info", "exists", self.\_name)):

RuntimeError: main thread is not in main loop

Exception ignored in: <function Variable.\_\_del\_\_ at 0x7fd0c07289d0>

Traceback (most recent call last):

File "/usr/lib/python3.10/tkinter/\_\_init\_\_.py", line 388, in \_\_del\_\_

if self.\_tk.getboolean(self.\_tk.call("info", "exists", self.\_name)):

RuntimeError: main thread is not in main loop

25/25 ━━━━━━━━━━━━━━━━━━━━ 44s 2s/step - accuracy: 0.8171 - loss: 0.5087 - precision: 0.8838 - recall: 0.7551 - val\_accuracy: 0.6382 - val\_loss: 1.0670 - val\_precision: 0.7929 - val\_recall: 0.5578

Epoch 21/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 5s 204ms/step - accuracy: 0.8392 - loss: 0.4420 - precision: 0.9008 - recall: 0.7787 - val\_accuracy: 0.6784 - val\_loss: 1.1030 - val\_precision: 0.7333 - val\_recall: 0.6080

Epoch 22/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 297ms/step - accuracy: 0.8584 - loss: 0.4171 - precision: 0.9053 - recall: 0.8001 - val\_accuracy: 0.6533 - val\_loss: 1.1352 - val\_precision: 0.7169 - val\_recall: 0.5980

Epoch 23/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 257ms/step - accuracy: 0.8583 - loss: 0.4087 - precision: 0.9053 - recall: 0.8060 - val\_accuracy: 0.6332 - val\_loss: 1.3508 - val\_precision: 0.7126 - val\_recall: 0.5980

Epoch 24/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 279ms/step - accuracy: 0.8709 - loss: 0.3736 - precision: 0.9149 - recall: 0.8374 - val\_accuracy: 0.6985 - val\_loss: 1.0726 - val\_precision: 0.7485 - val\_recall: 0.6281

Epoch 25/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 257ms/step - accuracy: 0.8836 - loss: 0.3589 - precision: 0.9304 - recall: 0.8360 - val\_accuracy: 0.6482 - val\_loss: 1.0756 - val\_precision: 0.7239 - val\_recall: 0.5930

Epoch 26/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 7s 265ms/step - accuracy: 0.8790 - loss: 0.3507 - precision: 0.9288 - recall: 0.8316 - val\_accuracy: 0.6181 - val\_loss: 1.3504 - val\_precision: 0.6839 - val\_recall: 0.5980

Epoch 27/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 258ms/step - accuracy: 0.8946 - loss: 0.2881 - precision: 0.9282 - recall: 0.8631 - val\_accuracy: 0.6784 - val\_loss: 1.1693 - val\_precision: 0.7310 - val\_recall: 0.6281

Epoch 28/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 253ms/step - accuracy: 0.9309 - loss: 0.2024 - precision: 0.9522 - recall: 0.9145 - val\_accuracy: 0.6533 - val\_loss: 1.2139 - val\_precision: 0.7102 - val\_recall: 0.6281

Epoch 29/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 258ms/step - accuracy: 0.9268 - loss: 0.2292 - precision: 0.9450 - recall: 0.9002 - val\_accuracy: 0.6784 - val\_loss: 1.1023 - val\_precision: 0.7412 - val\_recall: 0.6332

Epoch 30/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 255ms/step - accuracy: 0.9439 - loss: 0.2020 - precision: 0.9580 - recall: 0.9167 - val\_accuracy: 0.6935 - val\_loss: 1.2729 - val\_precision: 0.7062 - val\_recall: 0.6281

Epoch 31/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 242ms/step - accuracy: 0.9551 - loss: 0.1645 - precision: 0.9618 - recall: 0.9364 - val\_accuracy: 0.6432 - val\_loss: 1.3873 - val\_precision: 0.6776 - val\_recall: 0.6231

Epoch 32/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 232ms/step - accuracy: 0.9601 - loss: 0.1735 - precision: 0.9619 - recall: 0.9224 - val\_accuracy: 0.6683 - val\_loss: 1.2371 - val\_precision: 0.7151 - val\_recall: 0.6181

Epoch 33/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 233ms/step - accuracy: 0.9614 - loss: 0.1533 - precision: 0.9745 - recall: 0.9323 - val\_accuracy: 0.6683 - val\_loss: 1.3549 - val\_precision: 0.7095 - val\_recall: 0.6382

Epoch 34/50

25/25 ━━━━━━━━━━━━━━━━━━━━ 6s 233ms/step - accuracy: 0.9456 - loss: 0.1578 - precision: 0.9611 - recall: 0.9289 - val\_accuracy: 0.6734 - val\_loss: 1.2837 - val\_precision: 0.7257 - val\_recall: 0.6382

Tiempo de entrenamiento fold 5: 264.30 s

7/7 ━━━━━━━━━━━━━━━━━━━━ 1s 109ms/step

F1-score fold 5: 0.6983

Métricas adicionales: Accuracy=0.6985 Precision=0.7485 Recall=0.6281

Mejor modelo actualizado y guardado.

Resultados finales del mejor modelo seleccionado:

7/7 ━━━━━━━━━━━━━━━━━━━━ 1s 97ms/step

Classification report del mejor modelo:

precision recall f1-score support

blues 0.71 0.60 0.65 20

classical 0.82 0.70 0.76 20

country 0.42 0.40 0.41 20

disco 0.60 0.75 0.67 20

hiphop 0.74 0.85 0.79 20

jazz 0.88 0.79 0.83 19

metal 0.90 0.95 0.93 20

pop 0.70 0.70 0.70 20

reggae 0.65 0.65 0.65 20

rock 0.60 0.60 0.60 20

accuracy 0.70 199

macro avg 0.70 0.70 0.70 199

weighted avg 0.70 0.70 0.70 199

Classification report guardado como 'classification\_report\_mejor\_modelo\_cross\_val.txt'