Epoch 1/50

/usr/local/lib/python3.10/dist-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()

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 3s/step - accuracy: 0.9622 - dice\_coef: 0.2522 - dice\_coef\_edema: 0.0952 - dice\_coef\_enhancing: 0.0293 - dice\_coef\_necrotic: 0.0335 - loss: 0.2139 - mean\_io\_u: 0.4863 - precision: 0.9587 - sensitivity: 0.9378 - specificity: 0.9945

Epoch 1: val\_loss improved from inf to 0.06796, saving model to model\_01-0.067960.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **1146s** 4s/step - accuracy: 0.9623 - dice\_coef: 0.2522 - dice\_coef\_edema: 0.0953 - dice\_coef\_enhancing: 0.0293 - dice\_coef\_necrotic: 0.0335 - loss: 0.2135 - mean\_io\_u: 0.4864 - precision: 0.9588 - sensitivity: 0.9379 - specificity: 0.9945 - val\_accuracy: 0.9846 - val\_dice\_coef: 0.2672 - val\_dice\_coef\_edema: 0.0931 - val\_dice\_coef\_enhancing: 0.0214 - val\_dice\_coef\_necrotic: 0.0354 - val\_loss: 0.0680 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9846 - val\_sensitivity: 0.9846 - val\_specificity: 0.9949 - learning\_rate: 0.0010

Epoch 2/50

/usr/lib/python3.10/contextlib.py:153: UserWarning: Your input ran out of data; interrupting training. Make sure that your dataset or generator can generate at least `steps\_per\_epoch \* epochs` batches. You may need to use the `.repeat()` function when building your dataset.

self.gen.throw(typ, value, traceback)

Epoch 2: val\_loss improved from 0.06796 to 0.06796, saving model to model\_02-0.067960.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **35s** 140ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9846 - val\_dice\_coef: 0.2672 - val\_dice\_coef\_edema: 0.0931 - val\_dice\_coef\_enhancing: 0.0214 - val\_dice\_coef\_necrotic: 0.0354 - val\_loss: 0.0680 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9846 - val\_sensitivity: 0.9846 - val\_specificity: 0.9949 - learning\_rate: 0.0010

Epoch 3/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 862ms/step - accuracy: 0.9839 - dice\_coef: 0.2757 - dice\_coef\_edema: 0.1410 - dice\_coef\_enhancing: 0.0537 - dice\_coef\_necrotic: 0.0696 - loss: 0.0707 - mean\_io\_u: 0.5110 - precision: 0.9840 - sensitivity: 0.9833 - specificity: 0.9947

Epoch 3: ReduceLROnPlateau reducing learning rate to 0.00020000000949949026.

Epoch 3: val\_loss did not improve from 0.06796

**250/250** ━━━━━━━━━━━━━━━━━━━━ **302s** 1s/step - accuracy: 0.9839 - dice\_coef: 0.2757 - dice\_coef\_edema: 0.1410 - dice\_coef\_enhancing: 0.0537 - dice\_coef\_necrotic: 0.0696 - loss: 0.0707 - mean\_io\_u: 0.5109 - precision: 0.9840 - sensitivity: 0.9833 - specificity: 0.9947 - val\_accuracy: 0.9846 - val\_dice\_coef: 0.2795 - val\_dice\_coef\_edema: 0.2073 - val\_dice\_coef\_enhancing: 0.0468 - val\_dice\_coef\_necrotic: 0.0589 - val\_loss: 0.0707 - val\_mean\_io\_u: 0.2511 - val\_precision: 0.9844 - val\_sensitivity: 0.9844 - val\_specificity: 0.9948 - learning\_rate: 0.0010

Epoch 4/50

Epoch 4: val\_loss did not improve from 0.06796

**250/250** ━━━━━━━━━━━━━━━━━━━━ **37s** 147ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9846 - val\_dice\_coef: 0.2795 - val\_dice\_coef\_edema: 0.2073 - val\_dice\_coef\_enhancing: 0.0468 - val\_dice\_coef\_necrotic: 0.0589 - val\_loss: 0.0707 - val\_mean\_io\_u: 0.2511 - val\_precision: 0.9844 - val\_sensitivity: 0.9844 - val\_specificity: 0.9948 - learning\_rate: 2.0000e-04

Epoch 5/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 812ms/step - accuracy: 0.9832 - dice\_coef: 0.2743 - dice\_coef\_edema: 0.1651 - dice\_coef\_enhancing: 0.0410 - dice\_coef\_necrotic: 0.0569 - loss: 0.0758 - mean\_io\_u: 0.4619 - precision: 0.9831 - sensitivity: 0.9828 - specificity: 0.9944

Epoch 5: val\_loss improved from 0.06796 to 0.06555, saving model to model\_05-0.065552.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **284s** 1s/step - accuracy: 0.9832 - dice\_coef: 0.2743 - dice\_coef\_edema: 0.1651 - dice\_coef\_enhancing: 0.0410 - dice\_coef\_necrotic: 0.0569 - loss: 0.0757 - mean\_io\_u: 0.4620 - precision: 0.9831 - sensitivity: 0.9828 - specificity: 0.9944 - val\_accuracy: 0.9846 - val\_dice\_coef: 0.2748 - val\_dice\_coef\_edema: 0.1438 - val\_dice\_coef\_enhancing: 0.0356 - val\_dice\_coef\_necrotic: 0.0455 - val\_loss: 0.0656 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9846 - val\_sensitivity: 0.9846 - val\_specificity: 0.9949 - learning\_rate: 2.0000e-04

Epoch 6/50

Epoch 6: val\_loss did not improve from 0.06555

**250/250** ━━━━━━━━━━━━━━━━━━━━ **38s** 151ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9846 - val\_dice\_coef: 0.2748 - val\_dice\_coef\_edema: 0.1438 - val\_dice\_coef\_enhancing: 0.0356 - val\_dice\_coef\_necrotic: 0.0455 - val\_loss: 0.0656 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9846 - val\_sensitivity: 0.9846 - val\_specificity: 0.9949 - learning\_rate: 2.0000e-04

Epoch 7/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 833ms/step - accuracy: 0.9824 - dice\_coef: 0.2827 - dice\_coef\_edema: 0.1865 - dice\_coef\_enhancing: 0.0594 - dice\_coef\_necrotic: 0.0715 - loss: 0.0704 - mean\_io\_u: 0.5147 - precision: 0.9824 - sensitivity: 0.9818 - specificity: 0.9941

Epoch 7: val\_loss improved from 0.06555 to 0.06313, saving model to model\_07-0.063134.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **295s** 1s/step - accuracy: 0.9824 - dice\_coef: 0.2827 - dice\_coef\_edema: 0.1865 - dice\_coef\_enhancing: 0.0594 - dice\_coef\_necrotic: 0.0715 - loss: 0.0704 - mean\_io\_u: 0.5147 - precision: 0.9824 - sensitivity: 0.9818 - specificity: 0.9941 - val\_accuracy: 0.9846 - val\_dice\_coef: 0.2952 - val\_dice\_coef\_edema: 0.1902 - val\_dice\_coef\_enhancing: 0.1313 - val\_dice\_coef\_necrotic: 0.1139 - val\_loss: 0.0631 - val\_mean\_io\_u: 0.3222 - val\_precision: 0.9874 - val\_sensitivity: 0.9798 - val\_specificity: 0.9958 - learning\_rate: 2.0000e-04

Epoch 8/50

Epoch 8: val\_loss improved from 0.06313 to 0.06313, saving model to model\_08-0.063134.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **37s** 150ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9846 - val\_dice\_coef: 0.2952 - val\_dice\_coef\_edema: 0.1902 - val\_dice\_coef\_enhancing: 0.1313 - val\_dice\_coef\_necrotic: 0.1139 - val\_loss: 0.0631 - val\_mean\_io\_u: 0.3222 - val\_precision: 0.9874 - val\_sensitivity: 0.9798 - val\_specificity: 0.9958 - learning\_rate: 2.0000e-04

Epoch 9/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 924ms/step - accuracy: 0.9836 - dice\_coef: 0.3076 - dice\_coef\_edema: 0.2439 - dice\_coef\_enhancing: 0.1412 - dice\_coef\_necrotic: 0.1216 - loss: 0.0577 - mean\_io\_u: 0.3629 - precision: 0.9878 - sensitivity: 0.9800 - specificity: 0.9959

Epoch 9: val\_loss improved from 0.06313 to 0.05285, saving model to model\_09-0.052848.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **311s** 1s/step - accuracy: 0.9836 - dice\_coef: 0.3076 - dice\_coef\_edema: 0.2439 - dice\_coef\_enhancing: 0.1414 - dice\_coef\_necrotic: 0.1216 - loss: 0.0577 - mean\_io\_u: 0.3634 - precision: 0.9878 - sensitivity: 0.9800 - specificity: 0.9959 - val\_accuracy: 0.9853 - val\_dice\_coef: 0.3193 - val\_dice\_coef\_edema: 0.2369 - val\_dice\_coef\_enhancing: 0.1748 - val\_dice\_coef\_necrotic: 0.1435 - val\_loss: 0.0528 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9885 - val\_sensitivity: 0.9836 - val\_specificity: 0.9961 - learning\_rate: 2.0000e-04

Epoch 10/50

Epoch 10: val\_loss improved from 0.05285 to 0.05285, saving model to model\_10-0.052848.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **39s** 156ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9853 - val\_dice\_coef: 0.3193 - val\_dice\_coef\_edema: 0.2369 - val\_dice\_coef\_enhancing: 0.1748 - val\_dice\_coef\_necrotic: 0.1435 - val\_loss: 0.0528 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9885 - val\_sensitivity: 0.9836 - val\_specificity: 0.9961 - learning\_rate: 2.0000e-04

Epoch 11/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 909ms/step - accuracy: 0.9853 - dice\_coef: 0.3410 - dice\_coef\_edema: 0.3059 - dice\_coef\_enhancing: 0.2605 - dice\_coef\_necrotic: 0.1769 - loss: 0.0523 - mean\_io\_u: 0.4910 - precision: 0.9896 - sensitivity: 0.9817 - specificity: 0.9964

Epoch 11: val\_loss improved from 0.05285 to 0.04470, saving model to model\_11-0.044700.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **313s** 1s/step - accuracy: 0.9853 - dice\_coef: 0.3410 - dice\_coef\_edema: 0.3061 - dice\_coef\_enhancing: 0.2605 - dice\_coef\_necrotic: 0.1769 - loss: 0.0523 - mean\_io\_u: 0.4911 - precision: 0.9896 - sensitivity: 0.9817 - specificity: 0.9964 - val\_accuracy: 0.9875 - val\_dice\_coef: 0.3597 - val\_dice\_coef\_edema: 0.3203 - val\_dice\_coef\_enhancing: 0.3014 - val\_dice\_coef\_necrotic: 0.1811 - val\_loss: 0.0447 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9906 - val\_sensitivity: 0.9844 - val\_specificity: 0.9968 - learning\_rate: 2.0000e-04

Epoch 12/50

Epoch 12: val\_loss did not improve from 0.04470

**250/250** ━━━━━━━━━━━━━━━━━━━━ **37s** 150ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9875 - val\_dice\_coef: 0.3597 - val\_dice\_coef\_edema: 0.3203 - val\_dice\_coef\_enhancing: 0.3014 - val\_dice\_coef\_necrotic: 0.1811 - val\_loss: 0.0447 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9906 - val\_sensitivity: 0.9844 - val\_specificity: 0.9968 - learning\_rate: 2.0000e-04

Epoch 13/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 819ms/step - accuracy: 0.9872 - dice\_coef: 0.3740 - dice\_coef\_edema: 0.3963 - dice\_coef\_enhancing: 0.3467 - dice\_coef\_necrotic: 0.2225 - loss: 0.0432 - mean\_io\_u: 0.4924 - precision: 0.9918 - sensitivity: 0.9823 - specificity: 0.9971

Epoch 13: val\_loss improved from 0.04470 to 0.03852, saving model to model\_13-0.038523.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **289s** 1s/step - accuracy: 0.9872 - dice\_coef: 0.3740 - dice\_coef\_edema: 0.3962 - dice\_coef\_enhancing: 0.3466 - dice\_coef\_necrotic: 0.2225 - loss: 0.0432 - mean\_io\_u: 0.4925 - precision: 0.9918 - sensitivity: 0.9823 - specificity: 0.9971 - val\_accuracy: 0.9890 - val\_dice\_coef: 0.3734 - val\_dice\_coef\_edema: 0.4544 - val\_dice\_coef\_enhancing: 0.3601 - val\_dice\_coef\_necrotic: 0.2133 - val\_loss: 0.0385 - val\_mean\_io\_u: 0.3392 - val\_precision: 0.9935 - val\_sensitivity: 0.9837 - val\_specificity: 0.9977 - learning\_rate: 2.0000e-04

Epoch 14/50

Epoch 14: val\_loss did not improve from 0.03852

**250/250** ━━━━━━━━━━━━━━━━━━━━ **38s** 154ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9890 - val\_dice\_coef: 0.3734 - val\_dice\_coef\_edema: 0.4544 - val\_dice\_coef\_enhancing: 0.3601 - val\_dice\_coef\_necrotic: 0.2133 - val\_loss: 0.0385 - val\_mean\_io\_u: 0.3392 - val\_precision: 0.9935 - val\_sensitivity: 0.9837 - val\_specificity: 0.9977 - learning\_rate: 2.0000e-04

Epoch 15/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 877ms/step - accuracy: 0.9870 - dice\_coef: 0.4013 - dice\_coef\_edema: 0.4695 - dice\_coef\_enhancing: 0.3856 - dice\_coef\_necrotic: 0.2405 - loss: 0.0410 - mean\_io\_u: 0.4499 - precision: 0.9920 - sensitivity: 0.9818 - specificity: 0.9972

Epoch 15: val\_loss improved from 0.03852 to 0.03757, saving model to model\_15-0.037572.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **367s** 1s/step - accuracy: 0.9870 - dice\_coef: 0.4013 - dice\_coef\_edema: 0.4694 - dice\_coef\_enhancing: 0.3856 - dice\_coef\_necrotic: 0.2405 - loss: 0.0410 - mean\_io\_u: 0.4501 - precision: 0.9920 - sensitivity: 0.9818 - specificity: 0.9972 - val\_accuracy: 0.9875 - val\_dice\_coef: 0.3921 - val\_dice\_coef\_edema: 0.4820 - val\_dice\_coef\_enhancing: 0.2923 - val\_dice\_coef\_necrotic: 0.3133 - val\_loss: 0.0376 - val\_mean\_io\_u: 0.3467 - val\_precision: 0.9928 - val\_sensitivity: 0.9831 - val\_specificity: 0.9975 - learning\_rate: 2.0000e-04

Epoch 16/50

Epoch 16: val\_loss did not improve from 0.03757

**250/250** ━━━━━━━━━━━━━━━━━━━━ **40s** 158ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9875 - val\_dice\_coef: 0.3921 - val\_dice\_coef\_edema: 0.4820 - val\_dice\_coef\_enhancing: 0.2923 - val\_dice\_coef\_necrotic: 0.3133 - val\_loss: 0.0376 - val\_mean\_io\_u: 0.3467 - val\_precision: 0.9928 - val\_sensitivity: 0.9831 - val\_specificity: 0.9975 - learning\_rate: 2.0000e-04

Epoch 17/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 856ms/step - accuracy: 0.9869 - dice\_coef: 0.4056 - dice\_coef\_edema: 0.4794 - dice\_coef\_enhancing: 0.3953 - dice\_coef\_necrotic: 0.2587 - loss: 0.0406 - mean\_io\_u: 0.4203 - precision: 0.9913 - sensitivity: 0.9822 - specificity: 0.9970

Epoch 17: val\_loss improved from 0.03757 to 0.03627, saving model to model\_17-0.036268.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **300s** 1s/step - accuracy: 0.9869 - dice\_coef: 0.4056 - dice\_coef\_edema: 0.4794 - dice\_coef\_enhancing: 0.3954 - dice\_coef\_necrotic: 0.2588 - loss: 0.0406 - mean\_io\_u: 0.4206 - precision: 0.9913 - sensitivity: 0.9822 - specificity: 0.9970 - val\_accuracy: 0.9892 - val\_dice\_coef: 0.3866 - val\_dice\_coef\_edema: 0.5137 - val\_dice\_coef\_enhancing: 0.3132 - val\_dice\_coef\_necrotic: 0.2181 - val\_loss: 0.0363 - val\_mean\_io\_u: 0.3488 - val\_precision: 0.9916 - val\_sensitivity: 0.9869 - val\_specificity: 0.9971 - learning\_rate: 2.0000e-04

Epoch 18/50

Epoch 18: val\_loss did not improve from 0.03627

**250/250** ━━━━━━━━━━━━━━━━━━━━ **41s** 164ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9892 - val\_dice\_coef: 0.3866 - val\_dice\_coef\_edema: 0.5137 - val\_dice\_coef\_enhancing: 0.3132 - val\_dice\_coef\_necrotic: 0.2181 - val\_loss: 0.0363 - val\_mean\_io\_u: 0.3488 - val\_precision: 0.9916 - val\_sensitivity: 0.9869 - val\_specificity: 0.9971 - learning\_rate: 2.0000e-04

Epoch 19/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 840ms/step - accuracy: 0.9884 - dice\_coef: 0.4236 - dice\_coef\_edema: 0.5249 - dice\_coef\_enhancing: 0.4130 - dice\_coef\_necrotic: 0.2848 - loss: 0.0380 - mean\_io\_u: 0.4465 - precision: 0.9915 - sensitivity: 0.9848 - specificity: 0.9971

Epoch 19: val\_loss improved from 0.03627 to 0.03331, saving model to model\_19-0.033306.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **301s** 1s/step - accuracy: 0.9884 - dice\_coef: 0.4236 - dice\_coef\_edema: 0.5250 - dice\_coef\_enhancing: 0.4131 - dice\_coef\_necrotic: 0.2849 - loss: 0.0380 - mean\_io\_u: 0.4467 - precision: 0.9915 - sensitivity: 0.9848 - specificity: 0.9971 - val\_accuracy: 0.9896 - val\_dice\_coef: 0.4352 - val\_dice\_coef\_edema: 0.5616 - val\_dice\_coef\_enhancing: 0.4356 - val\_dice\_coef\_necrotic: 0.2749 - val\_loss: 0.0333 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9916 - val\_sensitivity: 0.9874 - val\_specificity: 0.9971 - learning\_rate: 2.0000e-04

Epoch 20/50

Epoch 20: val\_loss improved from 0.03331 to 0.03331, saving model to model\_20-0.033306.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **42s** 166ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9896 - val\_dice\_coef: 0.4352 - val\_dice\_coef\_edema: 0.5616 - val\_dice\_coef\_enhancing: 0.4356 - val\_dice\_coef\_necrotic: 0.2749 - val\_loss: 0.0333 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9916 - val\_sensitivity: 0.9874 - val\_specificity: 0.9971 - learning\_rate: 2.0000e-04

Epoch 21/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 917ms/step - accuracy: 0.9895 - dice\_coef: 0.4428 - dice\_coef\_edema: 0.5509 - dice\_coef\_enhancing: 0.4536 - dice\_coef\_necrotic: 0.2921 - loss: 0.0320 - mean\_io\_u: 0.4914 - precision: 0.9920 - sensitivity: 0.9864 - specificity: 0.9973

Epoch 21: val\_loss improved from 0.03331 to 0.03052, saving model to model\_21-0.030524.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **315s** 1s/step - accuracy: 0.9895 - dice\_coef: 0.4428 - dice\_coef\_edema: 0.5509 - dice\_coef\_enhancing: 0.4537 - dice\_coef\_necrotic: 0.2922 - loss: 0.0320 - mean\_io\_u: 0.4914 - precision: 0.9920 - sensitivity: 0.9864 - specificity: 0.9973 - val\_accuracy: 0.9903 - val\_dice\_coef: 0.4535 - val\_dice\_coef\_edema: 0.5732 - val\_dice\_coef\_enhancing: 0.4645 - val\_dice\_coef\_necrotic: 0.2917 - val\_loss: 0.0305 - val\_mean\_io\_u: 0.4006 - val\_precision: 0.9921 - val\_sensitivity: 0.9882 - val\_specificity: 0.9973 - learning\_rate: 2.0000e-04

Epoch 22/50

Epoch 22: val\_loss did not improve from 0.03052

**250/250** ━━━━━━━━━━━━━━━━━━━━ **41s** 165ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9903 - val\_dice\_coef: 0.4535 - val\_dice\_coef\_edema: 0.5732 - val\_dice\_coef\_enhancing: 0.4645 - val\_dice\_coef\_necrotic: 0.2917 - val\_loss: 0.0305 - val\_mean\_io\_u: 0.4006 - val\_precision: 0.9921 - val\_sensitivity: 0.9882 - val\_specificity: 0.9973 - learning\_rate: 2.0000e-04

Epoch 23/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 851ms/step - accuracy: 0.9899 - dice\_coef: 0.4618 - dice\_coef\_edema: 0.5778 - dice\_coef\_enhancing: 0.5070 - dice\_coef\_necrotic: 0.3193 - loss: 0.0317 - mean\_io\_u: 0.4409 - precision: 0.9918 - sensitivity: 0.9874 - specificity: 0.9972

Epoch 23: val\_loss improved from 0.03052 to 0.03038, saving model to model\_23-0.030385.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **299s** 1s/step - accuracy: 0.9899 - dice\_coef: 0.4618 - dice\_coef\_edema: 0.5777 - dice\_coef\_enhancing: 0.5069 - dice\_coef\_necrotic: 0.3194 - loss: 0.0317 - mean\_io\_u: 0.4411 - precision: 0.9918 - sensitivity: 0.9874 - specificity: 0.9972 - val\_accuracy: 0.9903 - val\_dice\_coef: 0.4708 - val\_dice\_coef\_edema: 0.5538 - val\_dice\_coef\_enhancing: 0.4984 - val\_dice\_coef\_necrotic: 0.3731 - val\_loss: 0.0304 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9929 - val\_sensitivity: 0.9875 - val\_specificity: 0.9976 - learning\_rate: 2.0000e-04

Epoch 24/50

Epoch 24: val\_loss did not improve from 0.03038

**250/250** ━━━━━━━━━━━━━━━━━━━━ **41s** 163ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9903 - val\_dice\_coef: 0.4708 - val\_dice\_coef\_edema: 0.5538 - val\_dice\_coef\_enhancing: 0.4984 - val\_dice\_coef\_necrotic: 0.3731 - val\_loss: 0.0304 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9929 - val\_sensitivity: 0.9875 - val\_specificity: 0.9976 - learning\_rate: 2.0000e-04

Epoch 25/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 887ms/step - accuracy: 0.9901 - dice\_coef: 0.4745 - dice\_coef\_edema: 0.5928 - dice\_coef\_enhancing: 0.5319 - dice\_coef\_necrotic: 0.3242 - loss: 0.0300 - mean\_io\_u: 0.4953 - precision: 0.9923 - sensitivity: 0.9874 - specificity: 0.9974

Epoch 25: val\_loss improved from 0.03038 to 0.02879, saving model to model\_25-0.028788.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **309s** 1s/step - accuracy: 0.9901 - dice\_coef: 0.4745 - dice\_coef\_edema: 0.5927 - dice\_coef\_enhancing: 0.5319 - dice\_coef\_necrotic: 0.3243 - loss: 0.0300 - mean\_io\_u: 0.4954 - precision: 0.9923 - sensitivity: 0.9874 - specificity: 0.9974 - val\_accuracy: 0.9905 - val\_dice\_coef: 0.4609 - val\_dice\_coef\_edema: 0.5666 - val\_dice\_coef\_enhancing: 0.4938 - val\_dice\_coef\_necrotic: 0.3285 - val\_loss: 0.0288 - val\_mean\_io\_u: 0.3604 - val\_precision: 0.9930 - val\_sensitivity: 0.9875 - val\_specificity: 0.9976 - learning\_rate: 2.0000e-04

Epoch 26/50

Epoch 26: val\_loss improved from 0.02879 to 0.02879, saving model to model\_26-0.028788.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **47s** 189ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9905 - val\_dice\_coef: 0.4609 - val\_dice\_coef\_edema: 0.5666 - val\_dice\_coef\_enhancing: 0.4938 - val\_dice\_coef\_necrotic: 0.3285 - val\_loss: 0.0288 - val\_mean\_io\_u: 0.3604 - val\_precision: 0.9930 - val\_sensitivity: 0.9875 - val\_specificity: 0.9976 - learning\_rate: 2.0000e-04

Epoch 27/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 946ms/step - accuracy: 0.9904 - dice\_coef: 0.4864 - dice\_coef\_edema: 0.6124 - dice\_coef\_enhancing: 0.5489 - dice\_coef\_necrotic: 0.3397 - loss: 0.0276 - mean\_io\_u: 0.4651 - precision: 0.9928 - sensitivity: 0.9876 - specificity: 0.9975

Epoch 27: ReduceLROnPlateau reducing learning rate to 4.0000001899898055e-05.

Epoch 27: val\_loss did not improve from 0.02879

**250/250** ━━━━━━━━━━━━━━━━━━━━ **328s** 1s/step - accuracy: 0.9904 - dice\_coef: 0.4864 - dice\_coef\_edema: 0.6123 - dice\_coef\_enhancing: 0.5488 - dice\_coef\_necrotic: 0.3398 - loss: 0.0276 - mean\_io\_u: 0.4653 - precision: 0.9928 - sensitivity: 0.9876 - specificity: 0.9975 - val\_accuracy: 0.9903 - val\_dice\_coef: 0.4716 - val\_dice\_coef\_edema: 0.5818 - val\_dice\_coef\_enhancing: 0.3627 - val\_dice\_coef\_necrotic: 0.3919 - val\_loss: 0.0296 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9917 - val\_sensitivity: 0.9887 - val\_specificity: 0.9972 - learning\_rate: 2.0000e-04

Epoch 28/50

Epoch 28: val\_loss did not improve from 0.02879

**250/250** ━━━━━━━━━━━━━━━━━━━━ **41s** 164ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9903 - val\_dice\_coef: 0.4716 - val\_dice\_coef\_edema: 0.5818 - val\_dice\_coef\_enhancing: 0.3627 - val\_dice\_coef\_necrotic: 0.3919 - val\_loss: 0.0296 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9917 - val\_sensitivity: 0.9887 - val\_specificity: 0.9972 - learning\_rate: 4.0000e-05

Epoch 29/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 1s/step - accuracy: 0.9913 - dice\_coef: 0.5019 - dice\_coef\_edema: 0.6266 - dice\_coef\_enhancing: 0.5274 - dice\_coef\_necrotic: 0.4061 - loss: 0.0252 - mean\_io\_u: 0.4931 - precision: 0.9930 - sensitivity: 0.9889 - specificity: 0.9976

Epoch 29: val\_loss improved from 0.02879 to 0.02608, saving model to model\_29-0.026081.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **399s** 2s/step - accuracy: 0.9913 - dice\_coef: 0.5019 - dice\_coef\_edema: 0.6267 - dice\_coef\_enhancing: 0.5276 - dice\_coef\_necrotic: 0.4062 - loss: 0.0252 - mean\_io\_u: 0.4931 - precision: 0.9930 - sensitivity: 0.9889 - specificity: 0.9976 - val\_accuracy: 0.9915 - val\_dice\_coef: 0.5156 - val\_dice\_coef\_edema: 0.6237 - val\_dice\_coef\_enhancing: 0.5656 - val\_dice\_coef\_necrotic: 0.3906 - val\_loss: 0.0261 - val\_mean\_io\_u: 0.4940 - val\_precision: 0.9929 - val\_sensitivity: 0.9896 - val\_specificity: 0.9976 - learning\_rate: 4.0000e-05

Epoch 30/50

Epoch 30: val\_loss did not improve from 0.02608

**250/250** ━━━━━━━━━━━━━━━━━━━━ **43s** 172ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9915 - val\_dice\_coef: 0.5156 - val\_dice\_coef\_edema: 0.6237 - val\_dice\_coef\_enhancing: 0.5656 - val\_dice\_coef\_necrotic: 0.3906 - val\_loss: 0.0261 - val\_mean\_io\_u: 0.4940 - val\_precision: 0.9929 - val\_sensitivity: 0.9896 - val\_specificity: 0.9976 - learning\_rate: 4.0000e-05

Epoch 31/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 915ms/step - accuracy: 0.9920 - dice\_coef: 0.5234 - dice\_coef\_edema: 0.6547 - dice\_coef\_enhancing: 0.6187 - dice\_coef\_necrotic: 0.3969 - loss: 0.0236 - mean\_io\_u: 0.4695 - precision: 0.9937 - sensitivity: 0.9896 - specificity: 0.9978

Epoch 31: val\_loss improved from 0.02608 to 0.02530, saving model to model\_31-0.025297.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **436s** 1s/step - accuracy: 0.9920 - dice\_coef: 0.5234 - dice\_coef\_edema: 0.6547 - dice\_coef\_enhancing: 0.6187 - dice\_coef\_necrotic: 0.3970 - loss: 0.0236 - mean\_io\_u: 0.4697 - precision: 0.9937 - sensitivity: 0.9896 - specificity: 0.9978 - val\_accuracy: 0.9916 - val\_dice\_coef: 0.5171 - val\_dice\_coef\_edema: 0.6184 - val\_dice\_coef\_enhancing: 0.5812 - val\_dice\_coef\_necrotic: 0.3958 - val\_loss: 0.0253 - val\_mean\_io\_u: 0.4893 - val\_precision: 0.9931 - val\_sensitivity: 0.9896 - val\_specificity: 0.9977 - learning\_rate: 4.0000e-05

Epoch 32/50

Epoch 32: val\_loss did not improve from 0.02530

**250/250** ━━━━━━━━━━━━━━━━━━━━ **45s** 181ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9916 - val\_dice\_coef: 0.5171 - val\_dice\_coef\_edema: 0.6184 - val\_dice\_coef\_enhancing: 0.5812 - val\_dice\_coef\_necrotic: 0.3958 - val\_loss: 0.0253 - val\_mean\_io\_u: 0.4893 - val\_precision: 0.9931 - val\_sensitivity: 0.9896 - val\_specificity: 0.9977 - learning\_rate: 4.0000e-05

Epoch 33/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 968ms/step - accuracy: 0.9906 - dice\_coef: 0.5319 - dice\_coef\_edema: 0.6729 - dice\_coef\_enhancing: 0.6013 - dice\_coef\_necrotic: 0.4227 - loss: 0.0257 - mean\_io\_u: 0.4726 - precision: 0.9925 - sensitivity: 0.9880 - specificity: 0.9974

Epoch 33: val\_loss improved from 0.02530 to 0.02495, saving model to model\_33-0.024946.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **363s** 1s/step - accuracy: 0.9906 - dice\_coef: 0.5318 - dice\_coef\_edema: 0.6729 - dice\_coef\_enhancing: 0.6013 - dice\_coef\_necrotic: 0.4227 - loss: 0.0257 - mean\_io\_u: 0.4727 - precision: 0.9925 - sensitivity: 0.9880 - specificity: 0.9974 - val\_accuracy: 0.9916 - val\_dice\_coef: 0.5231 - val\_dice\_coef\_edema: 0.6407 - val\_dice\_coef\_enhancing: 0.5741 - val\_dice\_coef\_necrotic: 0.3817 - val\_loss: 0.0249 - val\_mean\_io\_u: 0.4820 - val\_precision: 0.9928 - val\_sensitivity: 0.9900 - val\_specificity: 0.9976 - learning\_rate: 4.0000e-05

Epoch 34/50

Epoch 34: val\_loss did not improve from 0.02495

**250/250** ━━━━━━━━━━━━━━━━━━━━ **47s** 187ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9916 - val\_dice\_coef: 0.5231 - val\_dice\_coef\_edema: 0.6407 - val\_dice\_coef\_enhancing: 0.5741 - val\_dice\_coef\_necrotic: 0.3817 - val\_loss: 0.0249 - val\_mean\_io\_u: 0.4820 - val\_precision: 0.9928 - val\_sensitivity: 0.9900 - val\_specificity: 0.9976 - learning\_rate: 4.0000e-05

Epoch 35/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 1s/step - accuracy: 0.9921 - dice\_coef: 0.5379 - dice\_coef\_edema: 0.6756 - dice\_coef\_enhancing: 0.6069 - dice\_coef\_necrotic: 0.4390 - loss: 0.0224 - mean\_io\_u: 0.4783 - precision: 0.9935 - sensitivity: 0.9898 - specificity: 0.9978

Epoch 35: val\_loss improved from 0.02495 to 0.02440, saving model to model\_35-0.024398.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **453s** 2s/step - accuracy: 0.9921 - dice\_coef: 0.5379 - dice\_coef\_edema: 0.6756 - dice\_coef\_enhancing: 0.6069 - dice\_coef\_necrotic: 0.4390 - loss: 0.0224 - mean\_io\_u: 0.4783 - precision: 0.9935 - sensitivity: 0.9898 - specificity: 0.9978 - val\_accuracy: 0.9919 - val\_dice\_coef: 0.5254 - val\_dice\_coef\_edema: 0.6315 - val\_dice\_coef\_enhancing: 0.6152 - val\_dice\_coef\_necrotic: 0.4140 - val\_loss: 0.0244 - val\_mean\_io\_u: 0.4335 - val\_precision: 0.9936 - val\_sensitivity: 0.9896 - val\_specificity: 0.9978 - learning\_rate: 4.0000e-05

Epoch 36/50

Epoch 36: val\_loss improved from 0.02440 to 0.02440, saving model to model\_36-0.024398.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **53s** 214ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9919 - val\_dice\_coef: 0.5254 - val\_dice\_coef\_edema: 0.6315 - val\_dice\_coef\_enhancing: 0.6152 - val\_dice\_coef\_necrotic: 0.4140 - val\_loss: 0.0244 - val\_mean\_io\_u: 0.4335 - val\_precision: 0.9936 - val\_sensitivity: 0.9896 - val\_specificity: 0.9978 - learning\_rate: 4.0000e-05

Epoch 37/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 1s/step - accuracy: 0.9918 - dice\_coef: 0.5348 - dice\_coef\_edema: 0.6688 - dice\_coef\_enhancing: 0.6054 - dice\_coef\_necrotic: 0.4462 - loss: 0.0233 - mean\_io\_u: 0.4605 - precision: 0.9934 - sensitivity: 0.9894 - specificity: 0.9977

Epoch 37: ReduceLROnPlateau reducing learning rate to 8.000000525498762e-06.

Epoch 37: val\_loss did not improve from 0.02440

**250/250** ━━━━━━━━━━━━━━━━━━━━ **492s** 2s/step - accuracy: 0.9918 - dice\_coef: 0.5348 - dice\_coef\_edema: 0.6688 - dice\_coef\_enhancing: 0.6054 - dice\_coef\_necrotic: 0.4462 - loss: 0.0233 - mean\_io\_u: 0.4607 - precision: 0.9934 - sensitivity: 0.9894 - specificity: 0.9977 - val\_accuracy: 0.9918 - val\_dice\_coef: 0.5285 - val\_dice\_coef\_edema: 0.6441 - val\_dice\_coef\_enhancing: 0.5659 - val\_dice\_coef\_necrotic: 0.3968 - val\_loss: 0.0251 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9928 - val\_sensitivity: 0.9902 - val\_specificity: 0.9976 - learning\_rate: 4.0000e-05

Epoch 38/50

Epoch 38: val\_loss did not improve from 0.02440

**250/250** ━━━━━━━━━━━━━━━━━━━━ **52s** 209ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9918 - val\_dice\_coef: 0.5285 - val\_dice\_coef\_edema: 0.6441 - val\_dice\_coef\_enhancing: 0.5659 - val\_dice\_coef\_necrotic: 0.3968 - val\_loss: 0.0251 - val\_mean\_io\_u: 0.5000 - val\_precision: 0.9928 - val\_sensitivity: 0.9902 - val\_specificity: 0.9976 - learning\_rate: 8.0000e-06

Epoch 39/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 1s/step - accuracy: 0.9919 - dice\_coef: 0.5513 - dice\_coef\_edema: 0.6982 - dice\_coef\_enhancing: 0.6261 - dice\_coef\_necrotic: 0.4462 - loss: 0.0229 - mean\_io\_u: 0.4794 - precision: 0.9933 - sensitivity: 0.9897 - specificity: 0.9977

Epoch 39: val\_loss improved from 0.02440 to 0.02410, saving model to model\_39-0.024096.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **497s** 2s/step - accuracy: 0.9919 - dice\_coef: 0.5512 - dice\_coef\_edema: 0.6982 - dice\_coef\_enhancing: 0.6261 - dice\_coef\_necrotic: 0.4462 - loss: 0.0229 - mean\_io\_u: 0.4795 - precision: 0.9933 - sensitivity: 0.9897 - specificity: 0.9977 - val\_accuracy: 0.9921 - val\_dice\_coef: 0.5360 - val\_dice\_coef\_edema: 0.6387 - val\_dice\_coef\_enhancing: 0.6051 - val\_dice\_coef\_necrotic: 0.4290 - val\_loss: 0.0241 - val\_mean\_io\_u: 0.4907 - val\_precision: 0.9933 - val\_sensitivity: 0.9902 - val\_specificity: 0.9977 - learning\_rate: 8.0000e-06

Epoch 40/50

Epoch 40: val\_loss improved from 0.02410 to 0.02410, saving model to model\_40-0.024096.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **63s** 254ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9921 - val\_dice\_coef: 0.5360 - val\_dice\_coef\_edema: 0.6387 - val\_dice\_coef\_enhancing: 0.6051 - val\_dice\_coef\_necrotic: 0.4290 - val\_loss: 0.0241 - val\_mean\_io\_u: 0.4907 - val\_precision: 0.9933 - val\_sensitivity: 0.9902 - val\_specificity: 0.9977 - learning\_rate: 8.0000e-06

Epoch 41/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 2s/step - accuracy: 0.9922 - dice\_coef: 0.5502 - dice\_coef\_edema: 0.6853 - dice\_coef\_enhancing: 0.6181 - dice\_coef\_necrotic: 0.4704 - loss: 0.0219 - mean\_io\_u: 0.4785 - precision: 0.9937 - sensitivity: 0.9898 - specificity: 0.9978

Epoch 41: val\_loss improved from 0.02410 to 0.02355, saving model to model\_41-0.023550.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **580s** 2s/step - accuracy: 0.9922 - dice\_coef: 0.5502 - dice\_coef\_edema: 0.6853 - dice\_coef\_enhancing: 0.6182 - dice\_coef\_necrotic: 0.4703 - loss: 0.0219 - mean\_io\_u: 0.4785 - precision: 0.9937 - sensitivity: 0.9898 - specificity: 0.9978 - val\_accuracy: 0.9922 - val\_dice\_coef: 0.5384 - val\_dice\_coef\_edema: 0.6466 - val\_dice\_coef\_enhancing: 0.6137 - val\_dice\_coef\_necrotic: 0.4477 - val\_loss: 0.0235 - val\_mean\_io\_u: 0.4730 - val\_precision: 0.9935 - val\_sensitivity: 0.9902 - val\_specificity: 0.9978 - learning\_rate: 8.0000e-06

Epoch 42/50

Epoch 42: val\_loss improved from 0.02355 to 0.02355, saving model to model\_42-0.023550.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **63s** 253ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9922 - val\_dice\_coef: 0.5384 - val\_dice\_coef\_edema: 0.6466 - val\_dice\_coef\_enhancing: 0.6137 - val\_dice\_coef\_necrotic: 0.4477 - val\_loss: 0.0235 - val\_mean\_io\_u: 0.4730 - val\_precision: 0.9935 - val\_sensitivity: 0.9902 - val\_specificity: 0.9978 - learning\_rate: 8.0000e-06

Epoch 43/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 2s/step - accuracy: 0.9926 - dice\_coef: 0.5466 - dice\_coef\_edema: 0.6782 - dice\_coef\_enhancing: 0.6544 - dice\_coef\_necrotic: 0.4347 - loss: 0.0213 - mean\_io\_u: 0.4683 - precision: 0.9940 - sensitivity: 0.9904 - specificity: 0.9979

Epoch 43: ReduceLROnPlateau reducing learning rate to 1.6000001778593287e-06.

Epoch 43: val\_loss did not improve from 0.02355

**250/250** ━━━━━━━━━━━━━━━━━━━━ **536s** 2s/step - accuracy: 0.9926 - dice\_coef: 0.5466 - dice\_coef\_edema: 0.6782 - dice\_coef\_enhancing: 0.6543 - dice\_coef\_necrotic: 0.4348 - loss: 0.0213 - mean\_io\_u: 0.4684 - precision: 0.9940 - sensitivity: 0.9904 - specificity: 0.9979 - val\_accuracy: 0.9921 - val\_dice\_coef: 0.5387 - val\_dice\_coef\_edema: 0.6475 - val\_dice\_coef\_enhancing: 0.5982 - val\_dice\_coef\_necrotic: 0.4271 - val\_loss: 0.0239 - val\_mean\_io\_u: 0.4869 - val\_precision: 0.9932 - val\_sensitivity: 0.9903 - val\_specificity: 0.9977 - learning\_rate: 8.0000e-06

Epoch 44/50

Epoch 44: val\_loss did not improve from 0.02355

**250/250** ━━━━━━━━━━━━━━━━━━━━ **41s** 164ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9921 - val\_dice\_coef: 0.5387 - val\_dice\_coef\_edema: 0.6475 - val\_dice\_coef\_enhancing: 0.5982 - val\_dice\_coef\_necrotic: 0.4271 - val\_loss: 0.0239 - val\_mean\_io\_u: 0.4869 - val\_precision: 0.9932 - val\_sensitivity: 0.9903 - val\_specificity: 0.9977 - learning\_rate: 1.6000e-06

Epoch 45/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 1s/step - accuracy: 0.9924 - dice\_coef: 0.5431 - dice\_coef\_edema: 0.6698 - dice\_coef\_enhancing: 0.6079 - dice\_coef\_necrotic: 0.4504 - loss: 0.0217 - mean\_io\_u: 0.4754 - precision: 0.9937 - sensitivity: 0.9904 - specificity: 0.9979

Epoch 45: ReduceLROnPlateau reducing learning rate to 1e-06.

Epoch 45: val\_loss did not improve from 0.02355

**250/250** ━━━━━━━━━━━━━━━━━━━━ **364s** 1s/step - accuracy: 0.9924 - dice\_coef: 0.5432 - dice\_coef\_edema: 0.6699 - dice\_coef\_enhancing: 0.6080 - dice\_coef\_necrotic: 0.4504 - loss: 0.0217 - mean\_io\_u: 0.4755 - precision: 0.9937 - sensitivity: 0.9904 - specificity: 0.9979 - val\_accuracy: 0.9921 - val\_dice\_coef: 0.5400 - val\_dice\_coef\_edema: 0.6522 - val\_dice\_coef\_enhancing: 0.6066 - val\_dice\_coef\_necrotic: 0.4358 - val\_loss: 0.0236 - val\_mean\_io\_u: 0.4805 - val\_precision: 0.9934 - val\_sensitivity: 0.9903 - val\_specificity: 0.9977 - learning\_rate: 1.6000e-06

Epoch 46/50

Epoch 46: val\_loss did not improve from 0.02355

**250/250** ━━━━━━━━━━━━━━━━━━━━ **45s** 181ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9921 - val\_dice\_coef: 0.5400 - val\_dice\_coef\_edema: 0.6522 - val\_dice\_coef\_enhancing: 0.6066 - val\_dice\_coef\_necrotic: 0.4358 - val\_loss: 0.0236 - val\_mean\_io\_u: 0.4805 - val\_precision: 0.9934 - val\_sensitivity: 0.9903 - val\_specificity: 0.9977 - learning\_rate: 1.0000e-06

Epoch 47/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 1s/step - accuracy: 0.9927 - dice\_coef: 0.5514 - dice\_coef\_edema: 0.6833 - dice\_coef\_enhancing: 0.6384 - dice\_coef\_necrotic: 0.4663 - loss: 0.0202 - mean\_io\_u: 0.4668 - precision: 0.9941 - sensitivity: 0.9906 - specificity: 0.9980

Epoch 47: val\_loss improved from 0.02355 to 0.02350, saving model to model\_47-0.023498.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **401s** 2s/step - accuracy: 0.9927 - dice\_coef: 0.5514 - dice\_coef\_edema: 0.6833 - dice\_coef\_enhancing: 0.6384 - dice\_coef\_necrotic: 0.4663 - loss: 0.0202 - mean\_io\_u: 0.4669 - precision: 0.9941 - sensitivity: 0.9906 - specificity: 0.9980 - val\_accuracy: 0.9922 - val\_dice\_coef: 0.5404 - val\_dice\_coef\_edema: 0.6545 - val\_dice\_coef\_enhancing: 0.6077 - val\_dice\_coef\_necrotic: 0.4386 - val\_loss: 0.0235 - val\_mean\_io\_u: 0.4784 - val\_precision: 0.9934 - val\_sensitivity: 0.9903 - val\_specificity: 0.9977 - learning\_rate: 1.0000e-06

Epoch 48/50

Epoch 48: val\_loss improved from 0.02350 to 0.02350, saving model to model\_48-0.023498.weights.h5

**250/250** ━━━━━━━━━━━━━━━━━━━━ **61s** 243ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9922 - val\_dice\_coef: 0.5404 - val\_dice\_coef\_edema: 0.6545 - val\_dice\_coef\_enhancing: 0.6077 - val\_dice\_coef\_necrotic: 0.4386 - val\_loss: 0.0235 - val\_mean\_io\_u: 0.4784 - val\_precision: 0.9934 - val\_sensitivity: 0.9903 - val\_specificity: 0.9977 - learning\_rate: 1.0000e-06

Epoch 49/50

**250/250** ━━━━━━━━━━━━━━━━━━━━ **0s** 1s/step - accuracy: 0.9926 - dice\_coef: 0.5540 - dice\_coef\_edema: 0.7131 - dice\_coef\_enhancing: 0.6317 - dice\_coef\_necrotic: 0.4536 - loss: 0.0213 - mean\_io\_u: 0.4738 - precision: 0.9939 - sensitivity: 0.9903 - specificity: 0.9979

Epoch 49: val\_loss did not improve from 0.02350

**250/250** ━━━━━━━━━━━━━━━━━━━━ **416s** 2s/step - accuracy: 0.9926 - dice\_coef: 0.5540 - dice\_coef\_edema: 0.7130 - dice\_coef\_enhancing: 0.6317 - dice\_coef\_necrotic: 0.4537 - loss: 0.0213 - mean\_io\_u: 0.4739 - precision: 0.9939 - sensitivity: 0.9903 - specificity: 0.9979 - val\_accuracy: 0.9922 - val\_dice\_coef: 0.5407 - val\_dice\_coef\_edema: 0.6532 - val\_dice\_coef\_enhancing: 0.6063 - val\_dice\_coef\_necrotic: 0.4385 - val\_loss: 0.0236 - val\_mean\_io\_u: 0.4830 - val\_precision: 0.9934 - val\_sensitivity: 0.9903 - val\_specificity: 0.9977 - learning\_rate: 1.0000e-06

Epoch 50/50

Epoch 50: val\_loss did not improve from 0.02350

**250/250** ━━━━━━━━━━━━━━━━━━━━ **48s** 192ms/step - accuracy: 0.0000e+00 - dice\_coef: 0.0000e+00 - dice\_coef\_edema: 0.0000e+00 - dice\_coef\_enhancing: 0.0000e+00 - dice\_coef\_necrotic: 0.0000e+00 - loss: 0.0000e+00 - mean\_io\_u: 0.0000e+00 - precision: 0.0000e+00 - sensitivity: 0.0000e+00 - specificity: 0.0000e+00 - val\_accuracy: 0.9922 - val\_dice\_coef: 0.5407 - val\_dice\_coef\_edema: 0.6532 - val\_dice\_coef\_enhancing: 0.6063 - val\_dice\_coef\_necrotic: 0.4385 - val\_loss: 0.0236 - val\_mean\_io\_u: 0.4830 - val\_precision: 0.9934 - val\_sensitivity: 0.9903 - val\_specificity: 0.9977 - learning\_rate: 1.0000e-06