

```
import tensorflow as tf
from tensorflow.keras import layers, Model
import numpy as np
import matplotlib.pyplot as plt
```

```
(x_train, _), (x_test, _) = tf.keras.datasets.cifar10.load_data()

print("Train shape:", x_train.shape)
print("Test shape:", x_test.shape)
```

Downloading data from <https://www.cs.toronto.edu/~kriz/cifar-10-python.tar.gz>
170498071/170498071 ————— **4s** 0us/step
 Train shape: (50000, 32, 32, 3)
 Test shape: (10000, 32, 32, 3)

```
x_train = (x_train.astype('float32') / 127.5) - 1
x_test = (x_test.astype('float32') / 127.5) - 1
```

```
def build_encoder():

    inputs = layers.Input(shape=(32,32,3))

    x = layers.Conv2D(64, 3, strides=2, padding="same")(inputs)
    x = layers.ReLU()(x)

    x = layers.Conv2D(128, 3, strides=2, padding="same")(x)
    x = layers.ReLU()(x)

    x = layers.Conv2D(256, 3, strides=2, padding="same")(x)
    x = layers.ReLU()(x)

    return Model(inputs, x, name="Encoder")
```

```
def build_decoder():

    inputs = layers.Input(shape=(4,4,256))

    x = layers.Conv2DTranspose(128, 3, strides=2, padding="same")(inputs)
    x = layers.ReLU()(x)

    x = layers.Conv2DTranspose(64, 3, strides=2, padding="same")(x)
    x = layers.ReLU()(x)

    x = layers.Conv2DTranspose(3, 3, strides=2, padding="same")(x)

    outputs = layers.Activation("tanh")(x)

    return Model(inputs, outputs, name="Decoder")
```

```
encoder = build_encoder()
decoder = build_decoder()

inputs = layers.Input(shape=(32,32,3))
encoded = encoder(inputs)
decoded = decoder(encoded)

model = Model(inputs, decoded)

model.summary()
```

Model: "functional"

| Layer (type) | Output Shape | Param # |
|----------------------------|-------------------|---------|
| input_layer_2 (InputLayer) | (None, 32, 32, 3) | 0 |
| Encoder (Functional) | (None, 4, 4, 256) | 370,816 |
| Decoder (Functional) | (None, 32, 32, 3) | 370,563 |

Total params: 741,379 (2.83 MB)
 Trainable params: 741,379 (2.83 MB)
 Non-trainable params: 0 (0.00 B)

```
model.compile(
    optimizer="adam",
    loss="mse"
)
```

```
loss="mae"
```

```
history = model.fit(
    x_train,
    x_train,
    epochs=20,
    batch_size=128,
    validation_data=(x_test, x_test)
)
```

```
Epoch 1/20
391/391 ————— 13s 22ms/step - loss: 0.0679 - val_loss: 0.0125
Epoch 2/20
391/391 ————— 4s 10ms/step - loss: 0.0111 - val_loss: 0.0073
Epoch 3/20
391/391 ————— 4s 10ms/step - loss: 0.0075 - val_loss: 0.0057
Epoch 4/20
391/391 ————— 4s 11ms/step - loss: 0.0061 - val_loss: 0.0067
Epoch 5/20
391/391 ————— 4s 10ms/step - loss: 0.0049 - val_loss: 0.0067
Epoch 6/20
391/391 ————— 4s 10ms/step - loss: 0.0045 - val_loss: 0.0042
Epoch 7/20
391/391 ————— 4s 11ms/step - loss: 0.0040 - val_loss: 0.0036
Epoch 8/20
391/391 ————— 4s 10ms/step - loss: 0.0035 - val_loss: 0.0031
Epoch 9/20
391/391 ————— 4s 10ms/step - loss: 0.0030 - val_loss: 0.0027
Epoch 10/20
391/391 ————— 4s 11ms/step - loss: 0.0028 - val_loss: 0.0030
Epoch 11/20
391/391 ————— 4s 10ms/step - loss: 0.0032 - val_loss: 0.0022
Epoch 12/20
391/391 ————— 4s 10ms/step - loss: 0.0025 - val_loss: 0.0020
Epoch 13/20
391/391 ————— 4s 11ms/step - loss: 0.0024 - val_loss: 0.0019
Epoch 14/20
391/391 ————— 4s 11ms/step - loss: 0.0024 - val_loss: 0.0018
Epoch 15/20
391/391 ————— 4s 11ms/step - loss: 0.0022 - val_loss: 0.0020
Epoch 16/20
391/391 ————— 5s 12ms/step - loss: 0.0022 - val_loss: 0.0017
Epoch 17/20
391/391 ————— 4s 11ms/step - loss: 0.0018 - val_loss: 0.0015
Epoch 18/20
391/391 ————— 4s 11ms/step - loss: 0.0017 - val_loss: 0.0033
Epoch 19/20
391/391 ————— 4s 11ms/step - loss: 0.0019 - val_loss: 0.0014
Epoch 20/20
391/391 ————— 4s 11ms/step - loss: 0.0017 - val_loss: 0.0015
```

```
decoded_images = model.predict(x_test[:5])

plt.figure(figsize=(10,4))

for i in range(5):

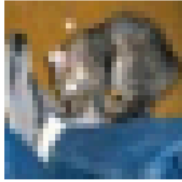
    # original
    plt.subplot(2,5,i+1)
    plt.imshow((x_test[i]+1)/2)
    plt.title("Original")
    plt.axis("off")

    # reconstructed
    plt.subplot(2,5,i+6)
    plt.imshow((decoded_images[i]+1)/2)
    plt.title("Reconstructed")
    plt.axis("off")

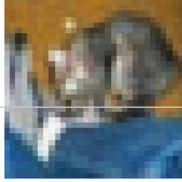
plt.show()
```

1/1 — 1s 607ms/step

Original



Reconstructed



Original



Reconstructed



Original



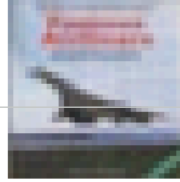
Reconstructed



Original



Reconstructed



Original



Reconstructed

