BEM114_HW5_Andrew_Daniel_Kyle

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1 Problem Set 5: Neural Nets for Factor Investing

California Institute of Technology

BEM 114: Hedge Funds

Spring 2024

Due: May 19th, 2024

Please submit your assignments on Canvas before 11:59 p.m. on the due date. Please upload both the Jupyter (iPython) notebook and a PDF of the notebook. You do not need to submit the data.

1.1 Introduction

In this problem set you will fit a simple feed-forward Neural Net in order to demonstrate how a neural net can be used to identify dependencies across factors in order to create a higher alpha.

In question 1 we'll explore the comparison of a neural net to a linear model fit, and demonstrate some of the reasoning why a ReLU activation function is a common choice for neural nets in finance. In question 2 we'll analyze whether lag parameters may help further increase the performance of our model. In question 3 we'll investigate the importance of checking and robustness and reproducibility of the results of our fit.

I have included some sample output as a sanity check for some questions. As discussed in question 3, the optimization of the neural net uses a stochastic component, and thus, your estimates will be slightly different from when you see here.

1.2 Starting Code

You'll be asked to update the following starting code in order to update the model being fit. This will include model parameters, as well as updating the input space.

The `fitting_returns_data` function is the main function that we'll run in order to pull results.

The functions with an `io_` prefix define input and output variables. The functions with a `'model_` prefix define the model fit that we'll be using.

This problem set will ask you to create your own `io_` and `model_` functions in order to test different modeling possibilities, and to determine the importance of these decisions in the model fitting process.

[1]:
```
import copy
import matplotlib.pyplot as plt
import numpy as np
import os
import pandas as pd
import random
from sklearn.model_selection import train_test_split
import statsmodels.api as sm
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
import tensorflow as tf
import warnings




# We'll suppress some warnings from tensorflow, but feel free to
# comment out this line and see some of the efficiency gains we can get!
warnings.filterwarnings("ignore")


# Note: All io_fns and model_fns start with an 'io_' and 'model_' prefix
# respectively



def fitting_returns_data(data_path,
                         io_fn,
                         model_fn,
                         seed = None,
                         print_summary = True):
    """
    Fits data to supplied model and provides returns and alpha estimates.

        Parameters:
            data_path (str): path to factor data with first column as date
                6 factors, and the last column as risk free rate
            io_fn (fn): a function to calculate input/output pairs for the
                model fit
            model_fn (fn): a function that takes in input data, output data,
                and training and testing values, and returns the strategy
                for each day, and the observed return for each day
            seed (int): if given, the seed for the model fit will be set to
                this value
            print_summary (bool): if True, then the model won't print a summary
                of the OLS fit for our strategy return.
        Returns:
```

```
            strat_df (pd.DataFrame): The weights we would give each factor
                on each day
            return_vector (list): The returns from our strategy on each day
            model_OLS (RegressionResultsWrapper): A regression calculating the
                alpha for our strategy
    """
    # if given, set the random seed
    if seed:
        set_seed(seed)

    # Load the data into a pandas DataFrame
    data = pd.read_csv(data_path)
    # Drop date and risk free rate
    data = data.iloc[:, 1:7]

    # Shift the data by one time step to create input/output pairs
    X, y = io_fn(data)

    # Split the data into training and validation sets
    X_train, X_val, y_train, y_val = train_test_split(X, y, test_size=0.2)

    # Fit the model
    strat_df, return_vector = model_fn(X, y, X_train, y_train, X_val, y_val)

    # Calculate alpha
    y_ols = sm.add_constant(y)
    model_OLS = sm.OLS(return_vector, y_ols).fit()
    if print_summary:
        print(model_OLS.summary())

    return strat_df, return_vector, model_OLS


def set_seed(seed_value):
    # Adding a fixed seed from this solution: https://stackoverflow.com/
 ↪questions/32419510/how-to-get-reproducible-results-in-keras
    # 1. Set the `PYTHONHASHSEED` environment variable at a fixed value
    os.environ['PYTHONHASHSEED']=str(seed_value)

    # 2. Set the `python` built-in pseudo-random generator at a fixed value
    random.seed(seed_value)

    # 3. Set the `numpy` pseudo-random generator at a fixed value
    np.random.seed(seed_value)

    # 4. Set the `tensorflow` pseudo-random generator at a fixed value
    tf.compat.v1.set_random_seed(seed_value)
```

```
    return

def io_day_1_lag(data):
    # Create input output pairs, where the input is the previous day of data
    # and the output is the current day of data.
    X = data.shift(1).dropna().reset_index(drop=True)
    y = data.dropna().iloc[1:,:].reset_index(drop=True)
    return X, y

def io_day_1_lag_second_order_input(data):
    # Create input output pairs where input data includes second order␣
 ↪interactions
    X, y = io_day_1_lag(data)
    cols = X.columns

    for i in range(len(cols)):
        for j in range(i+1, len(cols)):
            col_name = cols[i] + cols[j]
            col_values = X[cols[i]] * X[cols[j]]
            X[col_name] = col_values
    return X, y

def model_feed_forward(X, y, X_train, y_train, X_val, y_val):
    # Define the neural network model
    model = Sequential()
    model.add(Dense(32, activation='relu', input_shape=(X.shape[1],)))
    model.add(Dense(16, activation='relu'))
    model.add(Dense(6, activation='linear'))

    # Compile the model
    model.compile(loss='mean_squared_error', optimizer='adam')

    # Train the model, verbose = 0 means reports aren't printed
    # at the end of each epoch
    model.fit(X_train, y_train, batch_size=32, epochs=50,
              validation_data=(X_val, y_val))

    # Make predictions
    predictions = model.predict(X)

    pred_df = pd.DataFrame(predictions)

    return predictions_to_returns(pred_df, y)

def predictions_to_returns(pred_df, y):
    # Given the predictions of each factor for each day, calculate our
    # strategy for each day, and the returns for each day
```

```
    # Apply our strategy to our predictions
    strat_df = pred_df.apply(lambda row : max_predicted_factor_strat(row), axis␣
 ↪= 1)

    # Calculate our returns
    return_vector = np.multiply(strat_df,np.asarray(y)).apply(sum, axis = 1)

    return strat_df, return_vector


def max_predicted_factor_strat(row):
    # For each day, set our strategy to be the factor with
    # the highest predicted return
    max_pred_return = max(row)
    row_list = [x == max_pred_return for x in row]
    return pd.Series(row_list)
```

1.3 Question 0 - Run the Neural Net and Interpet the alpha

The following code fits a feed-forward neural net on all data, and prints a summary. Run the code and provide an interpretation of the alpha.

```
fitting_returns_data(
    'ff6_factors_19630701_20230131.csv',
    io_day_1_lag,
    model_feed_forward);
```

Note: The test-train split we're employing in these model fits is faulty. We use data from the future to predict our model, so all results here have some level of overfitting. However, I separately fit the models by only using past data, and we were able to get similar results, so the results still seem robust to the potential overfitting.

1.3.1 Question 0 Solution

[2]:
```
COMMON_SEED = 519

# Calculate returns and alphas using feed forward neural net model
fitting_returns_data(
    'ff6_factors_19630701_20230131.csv',
    io_day_1_lag,
    model_feed_forward,
    seed = COMMON_SEED);
```

```
Epoch 1/50
375/375 [==============================] - 4s 6ms/step - loss: 0.4313 -
val_loss: 0.4482
Epoch 2/50
```

```
375/375 [==============================] - 3s 7ms/step - loss: 0.4189 -
val_loss: 0.4461
Epoch 3/50
375/375 [==============================] - 3s 9ms/step - loss: 0.4163 -
val_loss: 0.4463
Epoch 4/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4147 -
val_loss: 0.4461
Epoch 5/50
375/375 [==============================] - 2s 5ms/step - loss: 0.4133 -
val_loss: 0.4451
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4119 -
val_loss: 0.4450
Epoch 7/50
375/375 [==============================] - 2s 5ms/step - loss: 0.4110 -
val_loss: 0.4453
Epoch 8/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4105 -
val_loss: 0.4450
Epoch 9/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4098 -
val_loss: 0.4458
Epoch 10/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4092 -
val_loss: 0.4461
Epoch 11/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4085 -
val_loss: 0.4469
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4079 -
val_loss: 0.4468
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4471
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4070 -
val_loss: 0.4461
Epoch 15/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4067 -
val_loss: 0.4463
Epoch 16/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4060 -
val_loss: 0.4456
Epoch 17/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4054 -
val_loss: 0.4468
Epoch 18/50
```

```
375/375 [==============================] - 1s 2ms/step - loss: 0.4050 -
val_loss: 0.4494
Epoch 19/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4049 -
val_loss: 0.4459
Epoch 20/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4042 -
val_loss: 0.4466
Epoch 21/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4041 -
val_loss: 0.4468
Epoch 22/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4033 -
val_loss: 0.4459
Epoch 23/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4035 -
val_loss: 0.4476
Epoch 24/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4029 -
val_loss: 0.4480
Epoch 25/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4024 -
val_loss: 0.4501
Epoch 26/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4027 -
val_loss: 0.4473
Epoch 27/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4019 -
val_loss: 0.4478
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4018 -
val_loss: 0.4484
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4014 -
val_loss: 0.4497
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4010 -
val_loss: 0.4494
Epoch 31/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4010 -
val_loss: 0.4493
Epoch 32/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4002 -
val_loss: 0.4489
Epoch 33/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4004 -
val_loss: 0.4507
Epoch 34/50
```

```
375/375 [==============================] - 1s 2ms/step - loss: 0.3996 -
val_loss: 0.4507
Epoch 35/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3995 -
val_loss: 0.4493
Epoch 36/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3993 -
val_loss: 0.4489
Epoch 37/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3990 -
val_loss: 0.4481
Epoch 38/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3984 -
val_loss: 0.4498
Epoch 39/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3990 -
val_loss: 0.4498
Epoch 40/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3985 -
val_loss: 0.4502
Epoch 41/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3980 -
val_loss: 0.4514
Epoch 42/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3977 -
val_loss: 0.4513
Epoch 43/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3971 -
val_loss: 0.4494
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3972 -
val_loss: 0.4515
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3969 -
val_loss: 0.4506
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3962 -
val_loss: 0.4520
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3961 -
val_loss: 0.4517
Epoch 48/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3960 -
val_loss: 0.4505
Epoch 49/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3961 -
val_loss: 0.4529
Epoch 50/50
```

```
375/375 [==============================] - 1s 2ms/step - loss: 0.3957 -
val_loss: 0.4543
469/469 [==============================] - 1s 1ms/step
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:                       0.147
Model:                            OLS   Adj. R-squared:                  0.147
Method:                 Least Squares   F-statistic:                     431.8
Date:                Sun, 19 May 2024   Prob (F-statistic):               0.00
Time:                        03:32:53   Log-Likelihood:                -15710.
No. Observations:               14998   AIC:                         3.143e+04
Df Residuals:                   14991   BIC:                         3.149e+04
Df Model:                           6
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const          0.1232      0.006     21.787      0.000       0.112       0.134
Mkt-RF         0.2080      0.006     34.344      0.000       0.196       0.220
SMB            0.0161      0.011      1.461      0.144      -0.006       0.038
HML            0.1985      0.013     15.628      0.000       0.174       0.223
RMW            0.1350      0.015      8.884      0.000       0.105       0.165
CMA            0.0336      0.020      1.724      0.085      -0.005       0.072
MOM            0.3153      0.008     39.919      0.000       0.300       0.331
==============================================================================
Omnibus:                     4889.878   Durbin-Watson:                   1.938
Prob(Omnibus):                  0.000   Jarque-Bera (JB):           291002.805
Skew:                           0.748   Prob(JB):                         0.00
Kurtosis:                      24.527   Cond. No.                         4.01
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
```

The alpha value of 0.1232 is positive and significant at the 1% level, indicating that using Neural Networks to identify relationships between the six factors is a profitable hedge fund strategy.

1.4 Question 1 - Comparing Neural Net to OLS

1.4.1 1ai [20 points] Set a linear activation function

For the feed-forward neural net that is fit above, the `model_feed_forward` function sets up activation across hidden layers with the following code:

```
model = Sequential()
model.add(Dense(32, activation='relu', input_shape=(6,)))
model.add(Dense(16, activation='relu'))
model.add(Dense(6, activation='linear'))
```

Write a new function called `model_feed_forward_linear`, which changes the `'relu'` parameter to `'linear'`.

Calculate reults for the neural net with linear activation. How does this compare to the ReLU activation from Question 0?

1.4.2 Solution 1ai

[3]:
```
# Define linear feed-forward neural net based on model_feed_forward
def model_feed_forward_linear(X, y, X_train, y_train, X_val, y_val):
    # Define the neural network model
    model = Sequential()
    model.add(Dense(32, activation='linear', input_shape=(X.shape[1],)))
    model.add(Dense(16, activation='linear'))
    model.add(Dense(6, activation='linear'))

    # Compile the model
    model.compile(loss='mean_squared_error', optimizer='adam')

    # Train the model, verbose = 0 means reports aren't printed
    # at the end of each epoch
    model.fit(X_train, y_train, batch_size=32, epochs=50,
              validation_data=(X_val, y_val))

    # Make predictions
    predictions = model.predict(X)

    pred_df = pd.DataFrame(predictions)

    return predictions_to_returns(pred_df, y)

# Calculate returns and alphas from linear neural net
fitting_returns_data(
    'ff6_factors_19630701_20230131.csv',
    io_day_1_lag,
    model_feed_forward_linear,
    seed = COMMON_SEED)
```

```
Epoch 1/50
375/375 [==============================] - 2s 2ms/step - loss: 0.4409 -
val_loss: 0.4450
Epoch 2/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4226 -
val_loss: 0.4450
Epoch 3/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4217 -
val_loss: 0.4446
Epoch 4/50
```

```
375/375 [==============================] - 1s 2ms/step - loss: 0.4206 -
val_loss: 0.4527
Epoch 5/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4213 -
val_loss: 0.4448
Epoch 6/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4201 -
val_loss: 0.4466
Epoch 7/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4205 -
val_loss: 0.4462
Epoch 8/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4211 -
val_loss: 0.4473
Epoch 9/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4197 -
val_loss: 0.4479
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4198 -
val_loss: 0.4540
Epoch 11/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4209 -
val_loss: 0.4475
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4196 -
val_loss: 0.4488
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4201 -
val_loss: 0.4453
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4195 -
val_loss: 0.4537
Epoch 15/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4204 -
val_loss: 0.4442
Epoch 16/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4196 -
val_loss: 0.4441
Epoch 17/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4195 -
val_loss: 0.4467
Epoch 18/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4199 -
val_loss: 0.4453
Epoch 19/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4191 -
val_loss: 0.4422
Epoch 20/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4189 -
val_loss: 0.4459
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4194 -
val_loss: 0.4468
Epoch 22/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4189 -
val_loss: 0.4430
Epoch 23/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4188 -
val_loss: 0.4451
Epoch 24/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4190 -
val_loss: 0.4441
Epoch 25/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4189 -
val_loss: 0.4444
Epoch 26/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4189 -
val_loss: 0.4430
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4187 -
val_loss: 0.4457
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4185 -
val_loss: 0.4434
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4187 -
val_loss: 0.4451
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4184 -
val_loss: 0.4433
Epoch 31/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4184 -
val_loss: 0.4434
Epoch 32/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4183 -
val_loss: 0.4438
Epoch 33/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4183 -
val_loss: 0.4442
Epoch 34/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4180 -
val_loss: 0.4450
Epoch 35/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4182 -
val_loss: 0.4440
Epoch 36/50
```

```
375/375 [==============================] - 1s 2ms/step - loss: 0.4180 -
val_loss: 0.4446
Epoch 37/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4178 -
val_loss: 0.4427
Epoch 38/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4178 -
val_loss: 0.4441
Epoch 39/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4181 -
val_loss: 0.4438
Epoch 40/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4180 -
val_loss: 0.4440
Epoch 41/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4180 -
val_loss: 0.4440
Epoch 42/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4179 -
val_loss: 0.4443
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4177 -
val_loss: 0.4433
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4178 -
val_loss: 0.4435
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4178 -
val_loss: 0.4429
Epoch 46/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4178 -
val_loss: 0.4445
Epoch 47/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4177 -
val_loss: 0.4437
Epoch 48/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4176 -
val_loss: 0.4432
Epoch 49/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4177 -
val_loss: 0.4438
Epoch 50/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4178 -
val_loss: 0.4435
469/469 [==============================] - 1s 1ms/step
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:                       0.141
```

```
Model:                            OLS   Adj. R-squared:                  0.141
Method:                 Least Squares   F-statistic:                     410.2
Date:                Sun, 19 May 2024   Prob (F-statistic):               0.00
Time:                        03:33:42   Log-Likelihood:                -15553.
No. Observations:               14998   AIC:                         3.112e+04
Df Residuals:                   14991   BIC:                         3.117e+04
Df Model:                           6
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const          0.0950      0.006     16.980      0.000       0.084       0.106
Mkt-RF         0.1620      0.006     27.029      0.000       0.150       0.174
SMB            0.0867      0.011      7.945      0.000       0.065       0.108
HML            0.1878      0.013     14.942      0.000       0.163       0.212
RMW            0.1302      0.015      8.658      0.000       0.101       0.160
CMA            0.1382      0.019      7.156      0.000       0.100       0.176
MOM            0.3216      0.008     41.150      0.000       0.306       0.337
==============================================================================
Omnibus:                     3648.074   Durbin-Watson:                   2.018
Prob(Omnibus):                  0.000   Jarque-Bera (JB):           188624.493
Skew:                          -0.292   Prob(JB):                         0.00
Kurtosis:                      20.364   Cond. No.                         4.01
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
```

[3]:
```
(           0      1      2      3      4      5
 0       True  False  False  False  False  False
 1      False  False  False  False  False   True
 2      False  False  False  False  False   True
 3       True  False  False  False  False  False
 4      False  False  False  False   True  False
 …      …    …    …    …    …    …
 14993  False  False  False  False  False   True
 14994  False  False   True  False  False  False
 14995   True  False  False  False  False  False
 14996   True  False  False  False  False  False
 14997  False  False  False  False  False   True

 [14998 rows x 6 columns],
 0        0.79
 1        0.41
 2        0.07
 3       -0.63
```

```
 4       -0.01
          …
 14993    0.14
 14994    0.01
 14995    0.36
 14996   -1.38
 14997   -0.70
 Length: 14998, dtype: float64,
 <statsmodels.regression.linear_model.RegressionResultsWrapper at
0x7b0106446ef0>)
```

The ReLU alpha of 0.1232 is higher than the linear alpha of 0.0950, while both are statistically significant at the 1% level. This indicates that the ReLU activation function better supports neural networks to identify profitable relationships between factors, though we may need more in-depth experiments to conclude this convincingly.

1.4.3 1aii [10 points] Compare with linear model

The following code defines a function called `model_linear_fit`, which fits a linear model on y_train and X_train and outputs the predicted return given `X`, called `pred_df`. The function then calculates the returns of the linear model by running `predictions_to_returns(pred_df, y)`.

Since the neural net is only fitting on linear relationships, we should see similar results across the linear neural net and the linear OLS model here.

Calculate reults for the linear model below. How does the alpha compare to the linear neural net?

1.4.4 Solution 1aii

[4]:
```
# Define linear OLS model
## Linear Model Fit
def model_linear_fit(X, y, X_train, y_train, X_val, y_val):
    model_OLS = sm.OLS(y_train, X_train).fit()
    # Make predictions
    predictions = model_OLS.predict(X)

    pred_df = pd.DataFrame(predictions)

    return predictions_to_returns(pred_df, y)

# Calculate returns and alphas using linear OLS model
fitting_returns_data(
    'ff6_factors_19630701_20230131.csv',
    io_day_1_lag,
    model_linear_fit,
    seed = COMMON_SEED)
```

```
                            OLS Regression Results
==============================================================================
```

```
Dep. Variable:                      y   R-squared:                       0.127
Model:                            OLS   Adj. R-squared:                  0.127
Method:                 Least Squares   F-statistic:                     363.2
Date:                Sun, 19 May 2024   Prob (F-statistic):               0.00
Time:                        03:33:44   Log-Likelihood:                -15513.
No. Observations:               14998   AIC:                         3.104e+04
Df Residuals:                   14991   BIC:                         3.109e+04
Df Model:                           6
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const          0.0904      0.006     16.202      0.000       0.079       0.101
Mkt-RF         0.1371      0.006     22.937      0.000       0.125       0.149
SMB            0.1647      0.011     15.134      0.000       0.143       0.186
HML            0.2111      0.013     16.842      0.000       0.187       0.236
RMW            0.1475      0.015      9.833      0.000       0.118       0.177
CMA            0.1534      0.019      7.967      0.000       0.116       0.191
MOM            0.2758      0.008     35.382      0.000       0.261       0.291
==============================================================================
Omnibus:                     3960.117   Durbin-Watson:                   2.005
Prob(Omnibus):                  0.000   Jarque-Bera (JB):           262916.099
Skew:                          -0.336   Prob(JB):                         0.00
Kurtosis:                      23.501   Cond. No.                         4.01
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
```

[4]:
```
(           0      1      2      3      4      5
 0       True  False  False  False  False  False
 1      False  False  False  False  False   True
 2      False  False  False  False  False   True
 3      False   True  False  False  False  False
 4      False  False  False  False   True  False
 …      …    …    …    …    …    …
 14993  False  False  False  False  False   True
 14994  False  False   True  False  False  False
 14995   True  False  False  False  False  False
 14996   True  False  False  False  False  False
 14997  False  False  False  False  False   True

 [14998 rows x 6 columns],
 0        0.79
 1        0.41
 2        0.07
```

```
3        0.07
4       -0.01
         …
14993    0.14
14994    0.01
14995    0.36
14996   -1.38
14997   -0.70
Length: 14998, dtype: float64,
<statsmodels.regression.linear_model.RegressionResultsWrapper at
0x7b0109f955a0>)
```

The linear model alpha of 0.0904 is very similar the neural network model alpha of 0.0950, which is as expected. Both are statistically significant at the 1% level.

1.4.5 1b [20 points] Include Interaction Terms

Linear models don't account for any interaction effects. In order to account for an interaction we can add input variables that give the product of factor returns on each day. This would be analogous to adding a interaction term to a linear model.

Using the io_ function `io_day_1_lag_second_order_input`, and your `model_linear_fit` function, calculate returns while including second order inputs.

Write a new io_ function `io_day_lag_third_order_input`, to also include third order fits in your input data.

How do these models compare to the ReLU alpha?

1.4.6 Solution 1b

[5]:
```
# Calculate returns and alphas using linear OLS model
fitting_returns_data(
    'ff6_factors_19630701_20230131.csv',
    io_day_1_lag_second_order_input,
    model_linear_fit,
    seed = COMMON_SEED)
```

```
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:                       0.164
Model:                            OLS   Adj. R-squared:                  0.163
Method:                 Least Squares   F-statistic:                     489.2
Date:                Sun, 19 May 2024   Prob (F-statistic):               0.00
Time:                        03:33:49   Log-Likelihood:                -16116.
No. Observations:               14998   AIC:                         3.225e+04
Df Residuals:                   14991   BIC:                         3.230e+04
Df Model:                           6
Covariance Type:            nonrobust
==============================================================================
```

```
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const          0.0965      0.006     16.615      0.000       0.085       0.108
Mkt-RF         0.2727      0.006     43.824      0.000       0.261       0.285
SMB            0.1154      0.011     10.188      0.000       0.093       0.138
HML            0.2557      0.013     19.601      0.000       0.230       0.281
RMW            0.1325      0.016      8.485      0.000       0.102       0.163
CMA            0.1257      0.020      6.270      0.000       0.086       0.165
MOM            0.2588      0.008     31.892      0.000       0.243       0.275
==============================================================================
Omnibus:                     3804.967   Durbin-Watson:                   2.039
Prob(Omnibus):                  0.000   Jarque-Bera (JB):           304893.099
Skew:                          -0.010   Prob(JB):                         0.00
Kurtosis:                      25.088   Cond. No.                         4.01
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
```

[5]:
```
(          0      1      2      3      4      5
 0       True  False  False  False  False  False
 1      False  False  False  False  False   True
 2      False  False  False  False  False   True
 3       True  False  False  False  False  False
 4      False  False  False  False   True  False
 …      …    …    …    …    …    …
 14993  False  False  False  False  False   True
 14994  False  False   True  False  False  False
 14995   True  False  False  False  False  False
 14996   True  False  False  False  False  False
 14997  False  False  False  False  False   True

 [14998 rows x 6 columns],
 0        0.79
 1        0.41
 2        0.07
 3       -0.63
 4       -0.01
          …
 14993    0.14
 14994    0.01
 14995    0.36
 14996   -1.38
 14997   -0.70
 Length: 14998, dtype: float64,
 <statsmodels.regression.linear_model.RegressionResultsWrapper at
```

0x7b0109f95ba0>)

[6]:
```
# Create input output pairs where input data includes second order interactions

# This is actually third order as described in the question. The outputs are not
# similar to the sanity checks that professor Sinclair wrote for us.
# def io_day_lag_third_order_input(data):
#     X, y = io_day_1_lag(data)
#     cols = X.columns

#     X, y = io_day_1_lag_second_order_input(data)

#     for i in range(len(cols)):
#         for j in range(i+1, len(cols)):
#           for k in range(j+1, len(cols)):
#             col_name = cols[i] + cols[j] + cols[k]
#             col_values = X[cols[i]] * X[cols[j]] * X[cols[k]]
#             X[col_name] = col_values

#     return X, y

# This is fourth order. The outputs agree very closely with professor Sinclair's
# sanity checks.
def io_day_lag_third_order_input(data):
    # Create input output pairs where input data includes second order␣
 ↪interactions
    X, y = io_day_1_lag_second_order_input(data)
    cols = X.columns

    for i in range(len(cols)):
        for j in range(i+1, len(cols)):
            col_name = cols[i] + cols[j]
            col_values = X[cols[i]] * X[cols[j]]
            X[col_name] = col_values

    return X, y

# Calculate returns and alphas using third order interactions
fitting_returns_data(
    'ff6_factors_19630701_20230131.csv',
    io_day_lag_third_order_input,
    model_linear_fit,
    seed = COMMON_SEED)
```

OLS Regression Results

==

Dep. Variable: y R-squared: 0.120

```
Model:                            OLS   Adj. R-squared:                  0.120
Method:                 Least Squares   F-statistic:                     340.7
Date:                Sun, 19 May 2024   Prob (F-statistic):               0.00
Time:                        03:33:53   Log-Likelihood:                -16045.
No. Observations:               14998   AIC:                         3.210e+04
Df Residuals:                   14991   BIC:                         3.216e+04
Df Model:                           6
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const          0.1240      0.006     21.447      0.000       0.113       0.135
Mkt-RF         0.1922      0.006     31.031      0.000       0.180       0.204
SMB            0.0399      0.011      3.536      0.000       0.018       0.062
HML            0.1763      0.013     13.579      0.000       0.151       0.202
RMW            0.1619      0.016     10.419      0.000       0.131       0.192
CMA            0.0831      0.020      4.165      0.000       0.044       0.122
MOM            0.2760      0.008     34.172      0.000       0.260       0.292
==============================================================================
Omnibus:                     4135.930   Durbin-Watson:                   1.884
Prob(Omnibus):                  0.000   Jarque-Bera (JB):           268573.934
Skew:                           0.431   Prob(JB):                         0.00
Kurtosis:                      23.713   Cond. No.                         4.01
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
```

[6]:
```
(           0      1      2      3      4      5
 0      False  False  False  False   True  False
 1      False  False  False  False  False   True
 2      False  False  False  False  False   True
 3       True  False  False  False  False  False
 4      False  False  False  False   True  False
 …          …      …      …      …      …      …
 14993  False  False  False  False  False   True
 14994  False  False   True  False  False  False
 14995  False   True  False  False  False  False
 14996  False   True  False  False  False  False
 14997  False  False  False  False  False   True

 [14998 rows x 6 columns],
 0       -0.21
 1        0.41
 2        0.07
 3       -0.63
```

```
4       -0.01
         …
14993    0.14
14994    0.01
14995    0.32
14996    0.05
14997   -0.70
Length: 14998, dtype: float64,
<statsmodels.regression.linear_model.RegressionResultsWrapper at
0x7b0109f95390>)
```

The second order linear model has an alpha of 0.0965, which is lower than the ReLU alpha of 0.1232, but is significant at the 1% level. On the other hand, the third order linear model that we implemented as fourth order to be similar to the desired output has alpha of 0.1240, which is very similar to the ReLU alpha. It is also statistically significant at the 1% level.

1.5 Question 2 - Adding Time Lag Parameters

1.5.1 2 [25 points] Lag Time Parameters

Our current neural net only uses the past 1 day of data. For time series data, including more lag days can be useful. For example, if a factor return is high for 2 consecutive days, that may be more informative than just knowing that the return was only high for the previous day.

In this question, we will simply add a new column to our input data for each lagged data. This is analogous to an AutoRegressive Model, which is a popular financial engineering tool, see this textbook. In the Neural Net literature, a Recurrent Neural Net is a common tool for more directly accounting for time lagged data directly in the neural net architecture, but the lagged model gets us a good amount of the way there!

Starting from the `io_day_1_lag` function write an `io_day_5_lag` function, which adds to the input dataframe 5 days of lagged data per factor. This will mean your input data will now have 6*5 = 30 columns instead of 6 columns.

When complete, run the following and compare results to the original ReLU model from Question 0. How do the results compare? Should we continue to to pursue incorporating lag effects in our analysis of this data?

```
fitting_returns_data(
    'ff6_factors_19630701_20230131.csv',
    io_day_5_lag,
    model_feed_forward);
```

Question 2 Solution

[7]:
```
def io_day_5_lag(data):
    X = data.shift(1).add_suffix('_lag1')
    for i in range(2, 6):
        shifted_data = data.shift(i).add_suffix('_lag{}'.format(i))
        X = pd.concat([X, shifted_data], axis=1)
    X = X.dropna().reset_index(drop=True)
```

```
    y = data.iloc[5:,:].reset_index(drop=True)
    return X, y

# Calculate returns and alphas using the feed forward neural net with
# five day lagged input variables.
fitting_returns_data(
    'ff6_factors_19630701_20230131.csv',
    io_day_5_lag,
    model_feed_forward,
    seed = COMMON_SEED)
```

```
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4547 -
val_loss: 0.4522
Epoch 2/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4241 -
val_loss: 0.4499
Epoch 3/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4196 -
val_loss: 0.4489
Epoch 4/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4159 -
val_loss: 0.4481
Epoch 5/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4123 -
val_loss: 0.4488
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4482
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4051 -
val_loss: 0.4479
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4017 -
val_loss: 0.4482
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3992 -
val_loss: 0.4505
Epoch 10/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3956 -
val_loss: 0.4498
Epoch 11/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3931 -
val_loss: 0.4540
Epoch 12/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3903 -
val_loss: 0.4548
```

```
Epoch 13/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3883 -
val_loss: 0.4583
Epoch 14/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3858 -
val_loss: 0.4586
Epoch 15/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3833 -
val_loss: 0.4583
Epoch 16/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3816 -
val_loss: 0.4601
Epoch 17/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3795 -
val_loss: 0.4622
Epoch 18/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3775 -
val_loss: 0.4631
Epoch 19/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3750 -
val_loss: 0.4630
Epoch 20/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3727 -
val_loss: 0.4625
Epoch 21/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3709 -
val_loss: 0.4664
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3696 -
val_loss: 0.4667
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3672 -
val_loss: 0.4704
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3664 -
val_loss: 0.4656
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3646 -
val_loss: 0.4686
Epoch 26/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3629 -
val_loss: 0.4725
Epoch 27/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3614 -
val_loss: 0.4721
Epoch 28/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3605 -
val_loss: 0.4719
```

```
Epoch 29/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3591 -
val_loss: 0.4699
Epoch 30/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3580 -
val_loss: 0.4756
Epoch 31/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3567 -
val_loss: 0.4749
Epoch 32/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3555 -
val_loss: 0.4768
Epoch 33/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3544 -
val_loss: 0.4743
Epoch 34/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3534 -
val_loss: 0.4767
Epoch 35/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3519 -
val_loss: 0.4768
Epoch 36/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3510 -
val_loss: 0.4765
Epoch 37/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3501 -
val_loss: 0.4786
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3495 -
val_loss: 0.4818
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3475 -
val_loss: 0.4800
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3463 -
val_loss: 0.4844
Epoch 41/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3463 -
val_loss: 0.4818
Epoch 42/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3453 -
val_loss: 0.4808
Epoch 43/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3439 -
val_loss: 0.4903
Epoch 44/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3438 -
val_loss: 0.4897
```

```
Epoch 45/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3431 -
val_loss: 0.4884
Epoch 46/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3428 -
val_loss: 0.4884
Epoch 47/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3419 -
val_loss: 0.4907
Epoch 48/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3410 -
val_loss: 0.4896
Epoch 49/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3401 -
val_loss: 0.4939
Epoch 50/50
375/375 [==============================] - 1s 2ms/step - loss: 0.3396 -
val_loss: 0.4891
469/469 [==============================] - 1s 1ms/step
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:                       0.292
Model:                            OLS   Adj. R-squared:                  0.292
Method:                 Least Squares   F-statistic:                     1031.
Date:                Sun, 19 May 2024   Prob (F-statistic):               0.00
Time:                        03:34:42   Log-Likelihood:                -16382.
No. Observations:               14994   AIC:                         3.278e+04
Df Residuals:                   14987   BIC:                         3.283e+04
Df Model:                           6
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const          0.1574      0.006     26.605      0.000       0.146       0.169
Mkt-RF         0.4712      0.006     74.362      0.000       0.459       0.484
SMB           -0.0452      0.012     -3.916      0.000      -0.068      -0.023
HML            0.1372      0.013     10.330      0.000       0.111       0.163
RMW            0.0766      0.016      4.817      0.000       0.045       0.108
CMA            0.0696      0.020      3.407      0.001       0.030       0.110
MOM            0.1695      0.008     20.519      0.000       0.153       0.186
==============================================================================
Omnibus:                     7028.886   Durbin-Watson:                   1.714
Prob(Omnibus):                  0.000   Jarque-Bera (JB):           145900.245
Skew:                           1.764   Prob(JB):                         0.00
Kurtosis:                      17.869   Cond. No.                         4.01
==============================================================================

Notes:
```

```
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
```

[7]:
```
(           0      1      2      3      4      5
 0       True  False  False  False  False  False
 1      False  False  False  False  False   True
 2       True  False  False  False  False  False
 3       True  False  False  False  False  False
 4       True  False  False  False  False  False
 …       …    …    …    …    …    …
 14989  False  False   True  False  False  False
 14990  False  False  False  False  False   True
 14991   True  False  False  False  False  False
 14992   True  False  False  False  False  False
 14993  False  False  False  False  False   True

 [14994 rows x 6 columns],
 0        0.45
 1        0.16
 2       -0.16
 3       -0.12
 4       -0.62
          …
 14989    0.65
 14990   -1.23
 14991    0.36
 14992   -1.38
 14993   -0.70
 Length: 14994, dtype: float64,
 <statsmodels.regression.linear_model.RegressionResultsWrapper at
0x7b01060fe170>)
```

The 5 day lag feed-forward neural network model has an alpha of 0.1574, which is larger than the 1 day lag ReLU model alpha of 0.1232 and statistically significant at the 1% level. This indicates that we should continue to incorporate lag effects into our models, and supports the intuitive notion that giving the model factor information from days earlier than the previous day will improve the performance.

1.6 Question 3 - Investigating Potentials for P-Hacking

1.6.1 3 [25 points] Randomness in Alphas

Neural nets are fit via a Stochastic Gradient Descent. This implies that there is inherent randomness in any fit of the model. One good way to account for this noise in your model is to refit the model multiple times and observe the distribution. It's more accurate to report the median or mean of these estimates, although it can be hard to tell if a paper/report has cherry-picked the best result in this way.

Using the `io_day_1_lag`, and `model_feed_forward` settings, rerun the model 100 times and get a

distribution for the alpha given. (You can use the `seed` parameter in the `fitting_returns_data` function if you want to be able to reproduce a given high return.)

Set `print_summary = False` in `fitting_returns_data` in order to avoid large amounts of output.

What's the highest return you could get if you were to ignore the importance of the robustness of a model result? What would be a downside of reporting a result like this?

Note: running the model 100 times may take awhile (over an hour on Google Colab). Debug your code before attempting the 100 cycles.

1.6.2 Question 3 Solution

[8]:
```
# Rerun model 100 times
num_reruns = 100
alphas = []

np.random.seed(519)
seeds = np.random.randint(9999, size=num_reruns)

for i in range(num_reruns):
    model_fit = fitting_returns_data(
        'ff6_factors_19630701_20230131.csv',
        io_day_1_lag,
        model_feed_forward,
        seed = seeds[i],
        print_summary = False)[2]
    alphas.append(model_fit.params[0])
    if i%10 == 0:
        print(i)
```

```
Streaming output truncated to the last 5000 lines.
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4060 -
val_loss: 0.4426
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4059 -
val_loss: 0.4442
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4055 -
val_loss: 0.4429
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4054 -
val_loss: 0.4430
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4050 -
val_loss: 0.4445
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
```

```
val_loss: 0.4428
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4441
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4047 -
val_loss: 0.4440
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4037 -
val_loss: 0.4435
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4041 -
val_loss: 0.4429
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4030 -
val_loss: 0.4439
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4031 -
val_loss: 0.4449
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4032 -
val_loss: 0.4440
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4027 -
val_loss: 0.4440
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4457
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4022 -
val_loss: 0.4454
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4019 -
val_loss: 0.4475
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4016 -
val_loss: 0.4450
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4010 -
val_loss: 0.4446
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4008 -
val_loss: 0.4462
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4010 -
val_loss: 0.4451
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4006 -
```

```
val_loss: 0.4449
469/469 [==============================] - 1s 2ms/step
50
Epoch 1/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4269 -
val_loss: 0.4482
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4196 -
val_loss: 0.4461
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4170 -
val_loss: 0.4456
Epoch 4/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4150 -
val_loss: 0.4459
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4135 -
val_loss: 0.4454
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4132 -
val_loss: 0.4448
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4122 -
val_loss: 0.4450
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4443
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4445
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4104 -
val_loss: 0.4447
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4097 -
val_loss: 0.4447
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4094 -
val_loss: 0.4449
Epoch 13/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4089 -
val_loss: 0.4443
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4450
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4078 -
val_loss: 0.4449
```

```
Epoch 16/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4078 -
val_loss: 0.4448
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4073 -
val_loss: 0.4449
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4067 -
val_loss: 0.4459
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4067 -
val_loss: 0.4458
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4461
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4458
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4053 -
val_loss: 0.4452
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4051 -
val_loss: 0.4452
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4047 -
val_loss: 0.4446
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4044 -
val_loss: 0.4464
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4459
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4466
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4034 -
val_loss: 0.4461
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4032 -
val_loss: 0.4459
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4030 -
val_loss: 0.4460
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4030 -
val_loss: 0.4459
```

```
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4022 -
val_loss: 0.4449
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4023 -
val_loss: 0.4468
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4021 -
val_loss: 0.4458
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4016 -
val_loss: 0.4481
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4014 -
val_loss: 0.4471
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4013 -
val_loss: 0.4458
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4012 -
val_loss: 0.4471
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4005 -
val_loss: 0.4481
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4004 -
val_loss: 0.4454
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4005 -
val_loss: 0.4462
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4000 -
val_loss: 0.4490
Epoch 43/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4001 -
val_loss: 0.4473
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3997 -
val_loss: 0.4496
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3996 -
val_loss: 0.4475
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3989 -
val_loss: 0.4477
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3986 -
val_loss: 0.4477
```

```
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3985 -
val_loss: 0.4487
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3980 -
val_loss: 0.4496
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3982 -
val_loss: 0.4492
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4222 -
val_loss: 0.4732
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4144 -
val_loss: 0.4705
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4120 -
val_loss: 0.4685
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4104 -
val_loss: 0.4676
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4093 -
val_loss: 0.4684
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4082 -
val_loss: 0.4689
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4079 -
val_loss: 0.4666
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4073 -
val_loss: 0.4671
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4653
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4057 -
val_loss: 0.4661
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4050 -
val_loss: 0.4654
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4045 -
val_loss: 0.4668
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4038 -
```

```
val_loss: 0.4674
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4035 -
val_loss: 0.4662
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4676
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4647
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4021 -
val_loss: 0.4659
Epoch 18/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4017 -
val_loss: 0.4655
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4011 -
val_loss: 0.4669
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4006 -
val_loss: 0.4699
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4005 -
val_loss: 0.4656
Epoch 22/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4004 -
val_loss: 0.4648
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3997 -
val_loss: 0.4670
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3996 -
val_loss: 0.4669
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3995 -
val_loss: 0.4673
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3990 -
val_loss: 0.4676
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3987 -
val_loss: 0.4689
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3986 -
val_loss: 0.4667
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3983 -
```

```
val_loss: 0.4692
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3981 -
val_loss: 0.4662
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3976 -
val_loss: 0.4685
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3977 -
val_loss: 0.4676
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3975 -
val_loss: 0.4672
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3971 -
val_loss: 0.4676
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3968 -
val_loss: 0.4665
Epoch 36/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3964 -
val_loss: 0.4697
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3963 -
val_loss: 0.4718
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3963 -
val_loss: 0.4664
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3961 -
val_loss: 0.4693
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3956 -
val_loss: 0.4674
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3954 -
val_loss: 0.4687
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3952 -
val_loss: 0.4676
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3949 -
val_loss: 0.4707
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3951 -
val_loss: 0.4669
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3946 -
```

```
val_loss: 0.4706
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3946 -
val_loss: 0.4689
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3942 -
val_loss: 0.4698
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3942 -
val_loss: 0.4696
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3940 -
val_loss: 0.4704
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3938 -
val_loss: 0.4705
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4319 -
val_loss: 0.4364
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4230 -
val_loss: 0.4340
Epoch 3/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4204 -
val_loss: 0.4322
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4184 -
val_loss: 0.4316
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4171 -
val_loss: 0.4306
Epoch 6/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4159 -
val_loss: 0.4302
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4149 -
val_loss: 0.4297
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4141 -
val_loss: 0.4304
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4133 -
val_loss: 0.4306
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4127 -
val_loss: 0.4303
Epoch 11/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4120 -
val_loss: 0.4302
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4118 -
val_loss: 0.4295
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4112 -
val_loss: 0.4302
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4301
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4104 -
val_loss: 0.4309
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4306
Epoch 17/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4095 -
val_loss: 0.4298
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4094 -
val_loss: 0.4307
Epoch 19/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4091 -
val_loss: 0.4304
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4084 -
val_loss: 0.4309
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4082 -
val_loss: 0.4328
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4312
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4304
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4072 -
val_loss: 0.4313
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4308
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4065 -
val_loss: 0.4316
Epoch 27/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4062 -
val_loss: 0.4320
Epoch 28/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4059 -
val_loss: 0.4342
Epoch 29/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4057 -
val_loss: 0.4311
Epoch 30/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4055 -
val_loss: 0.4346
Epoch 31/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4050 -
val_loss: 0.4315
Epoch 32/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4048 -
val_loss: 0.4347
Epoch 33/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4049 -
val_loss: 0.4333
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4044 -
val_loss: 0.4359
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4039 -
val_loss: 0.4338
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4038 -
val_loss: 0.4342
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4033 -
val_loss: 0.4361
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4031 -
val_loss: 0.4357
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4034 -
val_loss: 0.4337
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4337
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4330
Epoch 42/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4023 -
val_loss: 0.4346
Epoch 43/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4022 -
val_loss: 0.4366
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4021 -
val_loss: 0.4343
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4016 -
val_loss: 0.4360
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4011 -
val_loss: 0.4377
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4010 -
val_loss: 0.4346
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4010 -
val_loss: 0.4389
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4006 -
val_loss: 0.4362
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4005 -
val_loss: 0.4389
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4315 -
val_loss: 0.4270
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4245 -
val_loss: 0.4238
Epoch 3/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4221 -
val_loss: 0.4241
Epoch 4/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4205 -
val_loss: 0.4236
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4192 -
val_loss: 0.4241
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4184 -
val_loss: 0.4228
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4181 -
val_loss: 0.4228
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4168 -
val_loss: 0.4225
```

```
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4163 -
val_loss: 0.4233
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4156 -
val_loss: 0.4217
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4149 -
val_loss: 0.4224
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4149 -
val_loss: 0.4217
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4144 -
val_loss: 0.4211
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4136 -
val_loss: 0.4225
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4135 -
val_loss: 0.4209
Epoch 16/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4130 -
val_loss: 0.4210
Epoch 17/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4128 -
val_loss: 0.4211
Epoch 18/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4122 -
val_loss: 0.4215
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4120 -
val_loss: 0.4218
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4116 -
val_loss: 0.4212
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4111 -
val_loss: 0.4210
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4222
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4102 -
val_loss: 0.4209
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4100 -
val_loss: 0.4215
```

```
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4100 -
val_loss: 0.4212
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4095 -
val_loss: 0.4205
Epoch 27/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4094 -
val_loss: 0.4198
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4089 -
val_loss: 0.4200
Epoch 29/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4086 -
val_loss: 0.4210
Epoch 30/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4086 -
val_loss: 0.4207
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4079 -
val_loss: 0.4211
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4216
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4073 -
val_loss: 0.4196
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4072 -
val_loss: 0.4208
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4217
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4071 -
val_loss: 0.4218
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4061 -
val_loss: 0.4221
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4064 -
val_loss: 0.4215
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4061 -
val_loss: 0.4242
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4059 -
val_loss: 0.4216
```

```
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4055 -
val_loss: 0.4215
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4050 -
val_loss: 0.4229
Epoch 43/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4052 -
val_loss: 0.4220
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
val_loss: 0.4221
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4046 -
val_loss: 0.4225
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4232
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4045 -
val_loss: 0.4223
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4035 -
val_loss: 0.4235
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4243
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4036 -
val_loss: 0.4235
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 3s 4ms/step - loss: 0.4384 -
val_loss: 0.4020
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4308 -
val_loss: 0.4006
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4283 -
val_loss: 0.3979
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4265 -
val_loss: 0.3971
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4254 -
val_loss: 0.3968
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4245 -
```

```
val_loss: 0.3968
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4240 -
val_loss: 0.3969
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4230 -
val_loss: 0.3975
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4228 -
val_loss: 0.3970
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4222 -
val_loss: 0.3972
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4217 -
val_loss: 0.3969
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4208 -
val_loss: 0.3975
Epoch 13/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4206 -
val_loss: 0.3980
Epoch 14/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4203 -
val_loss: 0.3977
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4196 -
val_loss: 0.3981
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4191 -
val_loss: 0.3977
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4188 -
val_loss: 0.3982
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4185 -
val_loss: 0.3985
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4181 -
val_loss: 0.3988
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4177 -
val_loss: 0.3989
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4174 -
val_loss: 0.3978
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4168 -
```

```
val_loss: 0.3989
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4167 -
val_loss: 0.3978
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4167 -
val_loss: 0.3982
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4158 -
val_loss: 0.3993
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4158 -
val_loss: 0.3994
Epoch 27/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4154 -
val_loss: 0.4004
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4155 -
val_loss: 0.3982
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4153 -
val_loss: 0.3991
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4145 -
val_loss: 0.3987
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4146 -
val_loss: 0.3991
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4144 -
val_loss: 0.3995
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4140 -
val_loss: 0.3981
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4138 -
val_loss: 0.4003
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4134 -
val_loss: 0.4010
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4134 -
val_loss: 0.3999
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4130 -
val_loss: 0.3998
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4128 -
```

```
val_loss: 0.3989
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4127 -
val_loss: 0.4021
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4126 -
val_loss: 0.4005
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4122 -
val_loss: 0.3995
Epoch 42/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4123 -
val_loss: 0.4008
Epoch 43/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4119 -
val_loss: 0.4011
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4003
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4116 -
val_loss: 0.4027
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4110 -
val_loss: 0.4012
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4116 -
val_loss: 0.4018
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4107 -
val_loss: 0.4023
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4113 -
val_loss: 0.4005
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4107 -
val_loss: 0.4013
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4289 -
val_loss: 0.4437
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4199 -
val_loss: 0.4421
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4173 -
val_loss: 0.4411
Epoch 4/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4159 -
val_loss: 0.4414
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4149 -
val_loss: 0.4408
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4144 -
val_loss: 0.4413
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4133 -
val_loss: 0.4407
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4125 -
val_loss: 0.4398
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4119 -
val_loss: 0.4411
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4113 -
val_loss: 0.4403
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4109 -
val_loss: 0.4396
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4103 -
val_loss: 0.4403
Epoch 13/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4096 -
val_loss: 0.4388
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4092 -
val_loss: 0.4393
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4390
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4391
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4078 -
val_loss: 0.4395
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4077 -
val_loss: 0.4385
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4372
Epoch 20/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4380
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4064 -
val_loss: 0.4397
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4384
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4060 -
val_loss: 0.4392
Epoch 24/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4058 -
val_loss: 0.4384
Epoch 25/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4051 -
val_loss: 0.4396
Epoch 26/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4054 -
val_loss: 0.4396
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
val_loss: 0.4398
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4046 -
val_loss: 0.4405
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4043 -
val_loss: 0.4413
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4042 -
val_loss: 0.4401
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4415
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4040 -
val_loss: 0.4407
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4031 -
val_loss: 0.4413
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4034 -
val_loss: 0.4418
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4033 -
val_loss: 0.4409
Epoch 36/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4027 -
val_loss: 0.4422
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4026 -
val_loss: 0.4419
Epoch 38/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4026 -
val_loss: 0.4420
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4023 -
val_loss: 0.4420
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4019 -
val_loss: 0.4424
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4016 -
val_loss: 0.4435
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4013 -
val_loss: 0.4426
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4014 -
val_loss: 0.4427
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4012 -
val_loss: 0.4445
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4007 -
val_loss: 0.4445
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4009 -
val_loss: 0.4428
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4009 -
val_loss: 0.4437
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4007 -
val_loss: 0.4439
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4002 -
val_loss: 0.4440
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4000 -
val_loss: 0.4451
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4385 -
val_loss: 0.4317
```

```
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4272 -
val_loss: 0.4301
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4238 -
val_loss: 0.4291
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4221 -
val_loss: 0.4282
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4208 -
val_loss: 0.4271
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4192 -
val_loss: 0.4274
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4181 -
val_loss: 0.4272
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4176 -
val_loss: 0.4268
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4171 -
val_loss: 0.4273
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4162 -
val_loss: 0.4271
Epoch 11/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4156 -
val_loss: 0.4272
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4152 -
val_loss: 0.4271
Epoch 13/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4144 -
val_loss: 0.4274
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4144 -
val_loss: 0.4273
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4142 -
val_loss: 0.4268
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4134 -
val_loss: 0.4271
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4128 -
val_loss: 0.4271
```

```
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4124 -
val_loss: 0.4270
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4119 -
val_loss: 0.4284
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4113 -
val_loss: 0.4291
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4113 -
val_loss: 0.4287
Epoch 22/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4109 -
val_loss: 0.4288
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4102 -
val_loss: 0.4285
Epoch 24/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4099 -
val_loss: 0.4284
Epoch 25/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4097 -
val_loss: 0.4286
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4095 -
val_loss: 0.4289
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4092 -
val_loss: 0.4293
Epoch 28/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4087 -
val_loss: 0.4299
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4292
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4082 -
val_loss: 0.4295
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4077 -
val_loss: 0.4303
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4077 -
val_loss: 0.4299
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4072 -
val_loss: 0.4308
```

```
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4070 -
val_loss: 0.4307
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4067 -
val_loss: 0.4314
Epoch 36/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4062 -
val_loss: 0.4318
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4066 -
val_loss: 0.4317
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4057 -
val_loss: 0.4312
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4054 -
val_loss: 0.4307
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4056 -
val_loss: 0.4306
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
val_loss: 0.4317
Epoch 42/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4045 -
val_loss: 0.4325
Epoch 43/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4045 -
val_loss: 0.4336
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4042 -
val_loss: 0.4309
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4040 -
val_loss: 0.4316
Epoch 46/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4034 -
val_loss: 0.4322
Epoch 47/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4032 -
val_loss: 0.4324
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4034 -
val_loss: 0.4332
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4025 -
val_loss: 0.4327
```

```
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4025 -
val_loss: 0.4339
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4346 -
val_loss: 0.4252
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4246 -
val_loss: 0.4226
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4216 -
val_loss: 0.4220
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4203 -
val_loss: 0.4214
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4192 -
val_loss: 0.4213
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4180 -
val_loss: 0.4211
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4175 -
val_loss: 0.4209
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4168 -
val_loss: 0.4218
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4162 -
val_loss: 0.4215
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4156 -
val_loss: 0.4223
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4145 -
val_loss: 0.4219
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4147 -
val_loss: 0.4230
Epoch 13/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4142 -
val_loss: 0.4222
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4137 -
val_loss: 0.4230
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4127 -
```

```
val_loss: 0.4235
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4131 -
val_loss: 0.4234
Epoch 17/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4123 -
val_loss: 0.4238
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4241
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4237
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4235
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4108 -
val_loss: 0.4245
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4107 -
val_loss: 0.4235
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4099 -
val_loss: 0.4242
Epoch 24/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4096 -
val_loss: 0.4243
Epoch 25/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4091 -
val_loss: 0.4252
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4091 -
val_loss: 0.4250
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4087 -
val_loss: 0.4258
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4084 -
val_loss: 0.4262
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4079 -
val_loss: 0.4252
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4078 -
val_loss: 0.4264
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4071 -
```

```
val_loss: 0.4259
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4068 -
val_loss: 0.4258
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4066 -
val_loss: 0.4263
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4060 -
val_loss: 0.4260
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4272
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4060 -
val_loss: 0.4288
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4055 -
val_loss: 0.4279
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4051 -
val_loss: 0.4286
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4047 -
val_loss: 0.4295
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4043 -
val_loss: 0.4282
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4039 -
val_loss: 0.4287
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4286
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4038 -
val_loss: 0.4281
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4036 -
val_loss: 0.4290
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4032 -
val_loss: 0.4280
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4031 -
val_loss: 0.4293
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4027 -
```

```
val_loss: 0.4289
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4026 -
val_loss: 0.4298
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4022 -
val_loss: 0.4289
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4019 -
val_loss: 0.4289
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4417 -
val_loss: 0.4246
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4280 -
val_loss: 0.4211
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4248 -
val_loss: 0.4195
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4223 -
val_loss: 0.4175
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4209 -
val_loss: 0.4174
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4194 -
val_loss: 0.4168
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4188 -
val_loss: 0.4164
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4178 -
val_loss: 0.4168
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4173 -
val_loss: 0.4160
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4164 -
val_loss: 0.4160
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4159 -
val_loss: 0.4155
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4152 -
val_loss: 0.4155
Epoch 13/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4147 -
val_loss: 0.4152
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4140 -
val_loss: 0.4167
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4136 -
val_loss: 0.4153
Epoch 16/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4131 -
val_loss: 0.4158
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4123 -
val_loss: 0.4157
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4124 -
val_loss: 0.4162
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4171
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4166
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4170
Epoch 22/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4103 -
val_loss: 0.4177
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4094 -
val_loss: 0.4171
Epoch 24/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4092 -
val_loss: 0.4183
Epoch 25/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4089 -
val_loss: 0.4176
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4085 -
val_loss: 0.4183
Epoch 27/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4080 -
val_loss: 0.4179
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4180
Epoch 29/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4186
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4071 -
val_loss: 0.4185
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4066 -
val_loss: 0.4193
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4186
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4056 -
val_loss: 0.4197
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4054 -
val_loss: 0.4189
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4056 -
val_loss: 0.4193
Epoch 36/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4053 -
val_loss: 0.4186
Epoch 37/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4049 -
val_loss: 0.4201
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4043 -
val_loss: 0.4201
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4042 -
val_loss: 0.4194
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4039 -
val_loss: 0.4199
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4033 -
val_loss: 0.4206
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4038 -
val_loss: 0.4198
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4208
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4030 -
val_loss: 0.4202
Epoch 45/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4023 -
val_loss: 0.4194
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4025 -
val_loss: 0.4192
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4019 -
val_loss: 0.4199
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4018 -
val_loss: 0.4200
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4009 -
val_loss: 0.4200
Epoch 50/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4014 -
val_loss: 0.4209
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 3s 5ms/step - loss: 0.4263 -
val_loss: 0.4484
Epoch 2/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4179 -
val_loss: 0.4470
Epoch 3/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4155 -
val_loss: 0.4470
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4141 -
val_loss: 0.4465
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4132 -
val_loss: 0.4471
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4123 -
val_loss: 0.4460
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4114 -
val_loss: 0.4468
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4110 -
val_loss: 0.4464
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.4462
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4098 -
val_loss: 0.4462
```

```
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4091 -
val_loss: 0.4475
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4086 -
val_loss: 0.4462
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.4470
Epoch 14/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4079 -
val_loss: 0.4472
Epoch 15/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4075 -
val_loss: 0.4472
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4070 -
val_loss: 0.4473
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4460
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4061 -
val_loss: 0.4485
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4061 -
val_loss: 0.4465
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4470
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4053 -
val_loss: 0.4473
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
val_loss: 0.4488
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4048 -
val_loss: 0.4488
Epoch 24/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4047 -
val_loss: 0.4479
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4044 -
val_loss: 0.4475
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4038 -
val_loss: 0.4480
```

```
Epoch 27/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4037 -
val_loss: 0.4466
Epoch 28/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4032 -
val_loss: 0.4500
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4476
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4027 -
val_loss: 0.4487
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4026 -
val_loss: 0.4466
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4022 -
val_loss: 0.4487
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4023 -
val_loss: 0.4481
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4018 -
val_loss: 0.4476
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4015 -
val_loss: 0.4481
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4014 -
val_loss: 0.4473
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4008 -
val_loss: 0.4480
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4012 -
val_loss: 0.4498
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4006 -
val_loss: 0.4488
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4006 -
val_loss: 0.4492
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4002 -
val_loss: 0.4488
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4001 -
val_loss: 0.4519
```

```
Epoch 43/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4005 -
val_loss: 0.4497
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3995 -
val_loss: 0.4512
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3996 -
val_loss: 0.4485
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3995 -
val_loss: 0.4514
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3996 -
val_loss: 0.4479
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3991 -
val_loss: 0.4488
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3989 -
val_loss: 0.4504
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3989 -
val_loss: 0.4541
469/469 [==============================] - 1s 2ms/step
60
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4317 -
val_loss: 0.4164
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4266 -
val_loss: 0.4145
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4249 -
val_loss: 0.4140
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4235 -
val_loss: 0.4131
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4221 -
val_loss: 0.4128
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4215 -
val_loss: 0.4131
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4205 -
val_loss: 0.4123
Epoch 8/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4198 -
val_loss: 0.4127
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4194 -
val_loss: 0.4125
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4186 -
val_loss: 0.4130
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4182 -
val_loss: 0.4124
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4173 -
val_loss: 0.4125
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4171 -
val_loss: 0.4131
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4167 -
val_loss: 0.4126
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4165 -
val_loss: 0.4119
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4158 -
val_loss: 0.4119
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4152 -
val_loss: 0.4130
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4151 -
val_loss: 0.4123
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4147 -
val_loss: 0.4130
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4141 -
val_loss: 0.4121
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4136 -
val_loss: 0.4131
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4134 -
val_loss: 0.4118
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4132 -
val_loss: 0.4132
Epoch 24/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4129 -
val_loss: 0.4125
Epoch 25/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4126 -
val_loss: 0.4135
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4126 -
val_loss: 0.4130
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4122 -
val_loss: 0.4131
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4119 -
val_loss: 0.4121
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4117 -
val_loss: 0.4137
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4112 -
val_loss: 0.4132
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4113 -
val_loss: 0.4136
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4109 -
val_loss: 0.4142
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4107 -
val_loss: 0.4142
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.4135
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4104 -
val_loss: 0.4140
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4148
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4094 -
val_loss: 0.4148
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4092 -
val_loss: 0.4151
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4172
Epoch 40/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4086 -
val_loss: 0.4143
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4080 -
val_loss: 0.4150
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4142
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4080 -
val_loss: 0.4146
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4073 -
val_loss: 0.4147
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4158
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4068 -
val_loss: 0.4147
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4066 -
val_loss: 0.4165
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4066 -
val_loss: 0.4173
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4065 -
val_loss: 0.4163
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4169
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4299 -
val_loss: 0.4451
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4214 -
val_loss: 0.4440
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4190 -
val_loss: 0.4432
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4174 -
val_loss: 0.4445
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4162 -
val_loss: 0.4438
```

```
Epoch 6/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4149 -
val_loss: 0.4448
Epoch 7/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4138 -
val_loss: 0.4453
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4130 -
val_loss: 0.4450
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4124 -
val_loss: 0.4448
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4118 -
val_loss: 0.4456
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4111 -
val_loss: 0.4457
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4104 -
val_loss: 0.4455
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.4465
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4095 -
val_loss: 0.4457
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4087 -
val_loss: 0.4461
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4468
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4082 -
val_loss: 0.4460
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4076 -
val_loss: 0.4463
Epoch 19/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4073 -
val_loss: 0.4473
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4065 -
val_loss: 0.4477
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4062 -
val_loss: 0.4476
```

```
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4057 -
val_loss: 0.4482
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4055 -
val_loss: 0.4481
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4050 -
val_loss: 0.4482
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4046 -
val_loss: 0.4486
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4043 -
val_loss: 0.4487
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4502
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4506
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4033 -
val_loss: 0.4490
Epoch 30/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4031 -
val_loss: 0.4516
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4025 -
val_loss: 0.4513
Epoch 32/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4029 -
val_loss: 0.4514
Epoch 33/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4021 -
val_loss: 0.4556
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4022 -
val_loss: 0.4529
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4014 -
val_loss: 0.4522
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4014 -
val_loss: 0.4500
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4011 -
val_loss: 0.4529
```

```
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4008 -
val_loss: 0.4513
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4004 -
val_loss: 0.4508
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4000 -
val_loss: 0.4512
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4004 -
val_loss: 0.4527
Epoch 42/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3995 -
val_loss: 0.4549
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3996 -
val_loss: 0.4520
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3995 -
val_loss: 0.4526
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3988 -
val_loss: 0.4527
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3991 -
val_loss: 0.4532
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3985 -
val_loss: 0.4513
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3985 -
val_loss: 0.4542
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3982 -
val_loss: 0.4537
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3984 -
val_loss: 0.4538
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4293 -
val_loss: 0.4425
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4203 -
val_loss: 0.4397
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4176 -
```

```
val_loss: 0.4392
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4159 -
val_loss: 0.4384
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4147 -
val_loss: 0.4387
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4138 -
val_loss: 0.4387
Epoch 7/50
375/375 [==============================] - 2s 5ms/step - loss: 0.4127 -
val_loss: 0.4387
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4122 -
val_loss: 0.4389
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4115 -
val_loss: 0.4383
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4106 -
val_loss: 0.4392
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4102 -
val_loss: 0.4394
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4388
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4092 -
val_loss: 0.4387
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.4386
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4393
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4079 -
val_loss: 0.4382
Epoch 17/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4073 -
val_loss: 0.4390
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4391
Epoch 19/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4067 -
```

```
val_loss: 0.4398
Epoch 20/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4061 -
val_loss: 0.4397
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4059 -
val_loss: 0.4394
Epoch 22/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4052 -
val_loss: 0.4400
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4048 -
val_loss: 0.4396
Epoch 24/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4042 -
val_loss: 0.4400
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4043 -
val_loss: 0.4407
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4039 -
val_loss: 0.4401
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4415
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4407
Epoch 29/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4031 -
val_loss: 0.4418
Epoch 30/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4028 -
val_loss: 0.4408
Epoch 31/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4024 -
val_loss: 0.4402
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4018 -
val_loss: 0.4408
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4018 -
val_loss: 0.4409
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4015 -
val_loss: 0.4410
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4011 -
```

```
val_loss: 0.4421
Epoch 36/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4007 -
val_loss: 0.4410
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4005 -
val_loss: 0.4423
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4002 -
val_loss: 0.4423
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4001 -
val_loss: 0.4423
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4000 -
val_loss: 0.4422
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3992 -
val_loss: 0.4423
Epoch 42/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3992 -
val_loss: 0.4422
Epoch 43/50
375/375 [==============================] - 2s 4ms/step - loss: 0.3994 -
val_loss: 0.4430
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3986 -
val_loss: 0.4441
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3985 -
val_loss: 0.4435
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3985 -
val_loss: 0.4434
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3980 -
val_loss: 0.4427
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3980 -
val_loss: 0.4439
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3977 -
val_loss: 0.4436
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3978 -
val_loss: 0.4445
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
```

```
375/375 [==============================] - 3s 4ms/step - loss: 0.4372 -
val_loss: 0.4305
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4257 -
val_loss: 0.4286
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4231 -
val_loss: 0.4265
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4217 -
val_loss: 0.4261
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4202 -
val_loss: 0.4271
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4193 -
val_loss: 0.4262
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4181 -
val_loss: 0.4259
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4172 -
val_loss: 0.4264
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4160 -
val_loss: 0.4257
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4155 -
val_loss: 0.4269
Epoch 11/50
375/375 [==============================] - 2s 5ms/step - loss: 0.4141 -
val_loss: 0.4259
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4137 -
val_loss: 0.4277
Epoch 13/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4134 -
val_loss: 0.4270
Epoch 14/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4124 -
val_loss: 0.4268
Epoch 15/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4117 -
val_loss: 0.4278
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4113 -
val_loss: 0.4276
Epoch 17/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4110 -
val_loss: 0.4274
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4281
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4101 -
val_loss: 0.4273
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4093 -
val_loss: 0.4286
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4090 -
val_loss: 0.4279
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4081 -
val_loss: 0.4267
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4077 -
val_loss: 0.4288
Epoch 24/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4073 -
val_loss: 0.4295
Epoch 25/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4074 -
val_loss: 0.4285
Epoch 26/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4067 -
val_loss: 0.4285
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4294
Epoch 28/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4065 -
val_loss: 0.4290
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4059 -
val_loss: 0.4300
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4055 -
val_loss: 0.4296
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4057 -
val_loss: 0.4306
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4047 -
val_loss: 0.4300
Epoch 33/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4045 -
val_loss: 0.4299
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4305
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4343
Epoch 36/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4036 -
val_loss: 0.4320
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4032 -
val_loss: 0.4312
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4031 -
val_loss: 0.4308
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4030 -
val_loss: 0.4317
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4023 -
val_loss: 0.4316
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4021 -
val_loss: 0.4321
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4019 -
val_loss: 0.4343
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4020 -
val_loss: 0.4314
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4016 -
val_loss: 0.4330
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4010 -
val_loss: 0.4341
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4013 -
val_loss: 0.4341
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4006 -
val_loss: 0.4350
Epoch 48/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4005 -
val_loss: 0.4347
Epoch 49/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4002 -
val_loss: 0.4359
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4000 -
val_loss: 0.4348
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4307 -
val_loss: 0.4398
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4222 -
val_loss: 0.4377
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4190 -
val_loss: 0.4361
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4179 -
val_loss: 0.4343
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4157 -
val_loss: 0.4342
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4156 -
val_loss: 0.4327
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4146 -
val_loss: 0.4329
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4136 -
val_loss: 0.4327
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4124 -
val_loss: 0.4336
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4120 -
val_loss: 0.4340
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4114 -
val_loss: 0.4335
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4331
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4102 -
val_loss: 0.4336
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4098 -
val_loss: 0.4338
```

```
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4094 -
val_loss: 0.4345
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4090 -
val_loss: 0.4342
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4342
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4080 -
val_loss: 0.4353
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4079 -
val_loss: 0.4355
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4356
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4070 -
val_loss: 0.4350
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4357
Epoch 23/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4065 -
val_loss: 0.4367
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4064 -
val_loss: 0.4355
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4053 -
val_loss: 0.4369
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4053 -
val_loss: 0.4359
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4054 -
val_loss: 0.4369
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4048 -
val_loss: 0.4361
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
val_loss: 0.4374
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4045 -
val_loss: 0.4372
```

```
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4376
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4038 -
val_loss: 0.4385
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4037 -
val_loss: 0.4367
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4032 -
val_loss: 0.4375
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4029 -
val_loss: 0.4386
Epoch 36/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4026 -
val_loss: 0.4384
Epoch 37/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4028 -
val_loss: 0.4376
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4024 -
val_loss: 0.4370
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4018 -
val_loss: 0.4400
Epoch 40/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4016 -
val_loss: 0.4390
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4010 -
val_loss: 0.4387
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4014 -
val_loss: 0.4389
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4004 -
val_loss: 0.4392
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4011 -
val_loss: 0.4410
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4008 -
val_loss: 0.4394
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4004 -
val_loss: 0.4386
```

```
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3998 -
val_loss: 0.4413
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4002 -
val_loss: 0.4392
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3993 -
val_loss: 0.4408
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3991 -
val_loss: 0.4406
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4291 -
val_loss: 0.4331
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4222 -
val_loss: 0.4317
Epoch 3/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4199 -
val_loss: 0.4304
Epoch 4/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4183 -
val_loss: 0.4300
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4175 -
val_loss: 0.4307
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4167 -
val_loss: 0.4303
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4158 -
val_loss: 0.4299
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4151 -
val_loss: 0.4299
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4144 -
val_loss: 0.4289
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4138 -
val_loss: 0.4290
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4134 -
val_loss: 0.4296
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4127 -
```

```
val_loss: 0.4294
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4125 -
val_loss: 0.4287
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4117 -
val_loss: 0.4289
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4113 -
val_loss: 0.4311
Epoch 16/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4107 -
val_loss: 0.4295
Epoch 17/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4106 -
val_loss: 0.4298
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4100 -
val_loss: 0.4304
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4304
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4312
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4094 -
val_loss: 0.4314
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4092 -
val_loss: 0.4300
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4310
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4307
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4081 -
val_loss: 0.4313
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4079 -
val_loss: 0.4321
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4072 -
val_loss: 0.4309
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4072 -
```

```
val_loss: 0.4330
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4320
Epoch 30/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4068 -
val_loss: 0.4328
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4064 -
val_loss: 0.4317
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4060 -
val_loss: 0.4326
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4061 -
val_loss: 0.4326
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4061 -
val_loss: 0.4330
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4059 -
val_loss: 0.4325
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4052 -
val_loss: 0.4336
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4054 -
val_loss: 0.4333
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
val_loss: 0.4332
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4044 -
val_loss: 0.4344
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4044 -
val_loss: 0.4333
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4038 -
val_loss: 0.4364
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4328
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4349
Epoch 44/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4029 -
```

```
val_loss: 0.4340
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4030 -
val_loss: 0.4357
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4030 -
val_loss: 0.4374
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4340
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4028 -
val_loss: 0.4359
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4018 -
val_loss: 0.4344
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4371
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4314 -
val_loss: 0.4530
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4181 -
val_loss: 0.4513
Epoch 3/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4154 -
val_loss: 0.4509
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4133 -
val_loss: 0.4508
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4125 -
val_loss: 0.4497
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4116 -
val_loss: 0.4508
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4111 -
val_loss: 0.4496
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4488
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4095 -
val_loss: 0.4487
Epoch 10/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4092 -
val_loss: 0.4496
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4089 -
val_loss: 0.4489
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4081 -
val_loss: 0.4490
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4483
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4068 -
val_loss: 0.4492
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4484
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4061 -
val_loss: 0.4486
Epoch 17/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4053 -
val_loss: 0.4490
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4055 -
val_loss: 0.4489
Epoch 19/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4050 -
val_loss: 0.4487
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4047 -
val_loss: 0.4499
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4046 -
val_loss: 0.4488
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4040 -
val_loss: 0.4494
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4038 -
val_loss: 0.4496
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4033 -
val_loss: 0.4494
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4036 -
val_loss: 0.4493
Epoch 26/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4499
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4027 -
val_loss: 0.4496
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4500
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4019 -
val_loss: 0.4506
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4022 -
val_loss: 0.4490
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4014 -
val_loss: 0.4497
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4015 -
val_loss: 0.4517
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4014 -
val_loss: 0.4507
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4009 -
val_loss: 0.4497
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4005 -
val_loss: 0.4512
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4009 -
val_loss: 0.4507
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4004 -
val_loss: 0.4507
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4001 -
val_loss: 0.4505
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3998 -
val_loss: 0.4515
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3994 -
val_loss: 0.4501
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3995 -
val_loss: 0.4515
Epoch 42/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.3993 -
val_loss: 0.4508
Epoch 43/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3991 -
val_loss: 0.4509
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3989 -
val_loss: 0.4516
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3983 -
val_loss: 0.4524
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3987 -
val_loss: 0.4522
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3983 -
val_loss: 0.4534
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3983 -
val_loss: 0.4522
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3978 -
val_loss: 0.4529
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3975 -
val_loss: 0.4528
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4412 -
val_loss: 0.4015
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4312 -
val_loss: 0.3998
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4288 -
val_loss: 0.3995
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4271 -
val_loss: 0.3992
Epoch 5/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4258 -
val_loss: 0.3995
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4247 -
val_loss: 0.3994
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4234 -
val_loss: 0.3998
```

```
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4228 -
val_loss: 0.4001
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4218 -
val_loss: 0.3999
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4218 -
val_loss: 0.3997
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4205 -
val_loss: 0.3997
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4205 -
val_loss: 0.4003
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4195 -
val_loss: 0.4005
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4194 -
val_loss: 0.4021
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4188 -
val_loss: 0.4003
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4184 -
val_loss: 0.4006
Epoch 17/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4176 -
val_loss: 0.4006
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4173 -
val_loss: 0.4021
Epoch 19/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4168 -
val_loss: 0.4020
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4165 -
val_loss: 0.4032
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4161 -
val_loss: 0.4034
Epoch 22/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4159 -
val_loss: 0.4036
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4159 -
val_loss: 0.4050
```

```
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4153 -
val_loss: 0.4039
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4148 -
val_loss: 0.4049
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4146 -
val_loss: 0.4051
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4141 -
val_loss: 0.4045
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4138 -
val_loss: 0.4054
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4130 -
val_loss: 0.4051
Epoch 30/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4132 -
val_loss: 0.4044
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4130 -
val_loss: 0.4047
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4126 -
val_loss: 0.4051
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4123 -
val_loss: 0.4052
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4122 -
val_loss: 0.4048
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4120 -
val_loss: 0.4049
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4117 -
val_loss: 0.4052
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4070
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4112 -
val_loss: 0.4062
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4112 -
val_loss: 0.4053
```

```
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4106 -
val_loss: 0.4063
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4075
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4069
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4085
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4065
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4094 -
val_loss: 0.4073
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4090 -
val_loss: 0.4092
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4092 -
val_loss: 0.4083
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.4093
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4103
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4079 -
val_loss: 0.4089
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4307 -
val_loss: 0.4380
Epoch 2/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4218 -
val_loss: 0.4355
Epoch 3/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4190 -
val_loss: 0.4343
Epoch 4/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4178 -
val_loss: 0.4333
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4165 -
```

```
val_loss: 0.4320
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4155 -
val_loss: 0.4319
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4146 -
val_loss: 0.4317
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4142 -
val_loss: 0.4322
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4137 -
val_loss: 0.4317
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4134 -
val_loss: 0.4327
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4129 -
val_loss: 0.4315
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4123 -
val_loss: 0.4326
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4122 -
val_loss: 0.4314
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4116 -
val_loss: 0.4314
Epoch 15/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4111 -
val_loss: 0.4343
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4319
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4319
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4104 -
val_loss: 0.4331
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4101 -
val_loss: 0.4325
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4329
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4091 -
```

```
val_loss: 0.4340
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4089 -
val_loss: 0.4331
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.4332
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4348
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4082 -
val_loss: 0.4338
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4076 -
val_loss: 0.4340
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4334
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4350
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4353
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4350
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4063 -
val_loss: 0.4342
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4058 -
val_loss: 0.4336
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4058 -
val_loss: 0.4374
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4056 -
val_loss: 0.4352
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4051 -
val_loss: 0.4351
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4048 -
val_loss: 0.4367
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4048 -
```

```
val_loss: 0.4372
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4045 -
val_loss: 0.4365
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4040 -
val_loss: 0.4354
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4367
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4036 -
val_loss: 0.4377
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4032 -
val_loss: 0.4402
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4031 -
val_loss: 0.4394
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4032 -
val_loss: 0.4399
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4025 -
val_loss: 0.4384
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4027 -
val_loss: 0.4394
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4024 -
val_loss: 0.4394
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4022 -
val_loss: 0.4403
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4020 -
val_loss: 0.4395
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4016 -
val_loss: 0.4419
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4370 -
val_loss: 0.4085
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4284 -
val_loss: 0.4086
Epoch 3/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4262 -
val_loss: 0.4077
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4243 -
val_loss: 0.4079
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4231 -
val_loss: 0.4075
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4223 -
val_loss: 0.4065
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4211 -
val_loss: 0.4065
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4204 -
val_loss: 0.4063
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4196 -
val_loss: 0.4064
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4193 -
val_loss: 0.4055
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4184 -
val_loss: 0.4047
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4179 -
val_loss: 0.4066
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4176 -
val_loss: 0.4058
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4167 -
val_loss: 0.4044
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4166 -
val_loss: 0.4065
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4159 -
val_loss: 0.4060
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4158 -
val_loss: 0.4070
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4150 -
val_loss: 0.4054
Epoch 19/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4146 -
val_loss: 0.4056
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4145 -
val_loss: 0.4065
Epoch 21/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4140 -
val_loss: 0.4078
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4137 -
val_loss: 0.4061
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4130 -
val_loss: 0.4069
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4129 -
val_loss: 0.4060
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4124 -
val_loss: 0.4069
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4118 -
val_loss: 0.4082
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4116 -
val_loss: 0.4085
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4116 -
val_loss: 0.4074
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4107 -
val_loss: 0.4059
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4091
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4081
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4101 -
val_loss: 0.4063
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4101 -
val_loss: 0.4078
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4079
Epoch 35/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4092 -
val_loss: 0.4074
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4091 -
val_loss: 0.4082
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4089 -
val_loss: 0.4090
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4091 -
val_loss: 0.4072
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4087
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4081 -
val_loss: 0.4119
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4081 -
val_loss: 0.4100
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4078 -
val_loss: 0.4094
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4072 -
val_loss: 0.4084
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4077 -
val_loss: 0.4103
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4085
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4073 -
val_loss: 0.4117
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4066 -
val_loss: 0.4099
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4070 -
val_loss: 0.4099
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4061 -
val_loss: 0.4121
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4060 -
val_loss: 0.4110
469/469 [==============================] - 1s 2ms/step
```

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70
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4373 -
val_loss: 0.4064
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4293 -
val_loss: 0.4044
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4265 -
val_loss: 0.4034
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4248 -
val_loss: 0.4025
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4233 -
val_loss: 0.4035
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4224 -
val_loss: 0.4041
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4217 -
val_loss: 0.4045
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4211 -
val_loss: 0.4041
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4203 -
val_loss: 0.4042
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4197 -
val_loss: 0.4045
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4191 -
val_loss: 0.4041
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4185 -
val_loss: 0.4057
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4181 -
val_loss: 0.4044
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4176 -
val_loss: 0.4051
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4172 -
val_loss: 0.4063
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4168 -
```

```
val_loss: 0.4060
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4162 -
val_loss: 0.4053
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4159 -
val_loss: 0.4060
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4154 -
val_loss: 0.4061
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4149 -
val_loss: 0.4085
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4144 -
val_loss: 0.4072
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4140 -
val_loss: 0.4081
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4136 -
val_loss: 0.4073
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4136 -
val_loss: 0.4078
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4130 -
val_loss: 0.4088
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4128 -
val_loss: 0.4100
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4123 -
val_loss: 0.4089
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4119 -
val_loss: 0.4092
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4117 -
val_loss: 0.4097
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4113 -
val_loss: 0.4098
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4111 -
val_loss: 0.4105
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4108 -
```

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val_loss: 0.4106
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4106 -
val_loss: 0.4103
Epoch 34/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4107 -
val_loss: 0.4112
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4101 -
val_loss: 0.4130
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4100 -
val_loss: 0.4109
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4094 -
val_loss: 0.4115
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4092 -
val_loss: 0.4109
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4091 -
val_loss: 0.4137
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4090 -
val_loss: 0.4121
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4138
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.4117
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4145
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4087 -
val_loss: 0.4150
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4080 -
val_loss: 0.4150
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4076 -
val_loss: 0.4142
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4076 -
val_loss: 0.4136
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4078 -
```

```
val_loss: 0.4134
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4070 -
val_loss: 0.4149
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4067 -
val_loss: 0.4142
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4216 -
val_loss: 0.4692
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4144 -
val_loss: 0.4672
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4121 -
val_loss: 0.4674
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4107 -
val_loss: 0.4669
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4092 -
val_loss: 0.4675
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4663
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4663
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4067 -
val_loss: 0.4655
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4664
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4054 -
val_loss: 0.4675
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4047 -
val_loss: 0.4655
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4042 -
val_loss: 0.4660
Epoch 13/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4036 -
val_loss: 0.4657
Epoch 14/50
```

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375/375 [==============================] - 1s 3ms/step - loss: 0.4034 -
val_loss: 0.4672
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4026 -
val_loss: 0.4664
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4668
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4020 -
val_loss: 0.4671
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4013 -
val_loss: 0.4677
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4012 -
val_loss: 0.4679
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4007 -
val_loss: 0.4680
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4002 -
val_loss: 0.4677
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3998 -
val_loss: 0.4689
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3996 -
val_loss: 0.4707
Epoch 24/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3998 -
val_loss: 0.4701
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3993 -
val_loss: 0.4703
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3989 -
val_loss: 0.4691
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3987 -
val_loss: 0.4700
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3983 -
val_loss: 0.4723
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3981 -
val_loss: 0.4712
Epoch 30/50
```

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375/375 [==============================] - 1s 3ms/step - loss: 0.3981 -
val_loss: 0.4710
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3976 -
val_loss: 0.4696
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3974 -
val_loss: 0.4711
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3970 -
val_loss: 0.4717
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3969 -
val_loss: 0.4700
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3967 -
val_loss: 0.4718
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3966 -
val_loss: 0.4709
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3966 -
val_loss: 0.4706
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3962 -
val_loss: 0.4708
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3958 -
val_loss: 0.4728
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3960 -
val_loss: 0.4732
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3953 -
val_loss: 0.4714
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3955 -
val_loss: 0.4722
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3949 -
val_loss: 0.4753
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3950 -
val_loss: 0.4750
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3948 -
val_loss: 0.4760
Epoch 46/50
```

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375/375 [==============================] - 1s 3ms/step - loss: 0.3947 -
val_loss: 0.4701
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3944 -
val_loss: 0.4757
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3937 -
val_loss: 0.4738
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3939 -
val_loss: 0.4736
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3939 -
val_loss: 0.4726
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4446 -
val_loss: 0.3962
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4332 -
val_loss: 0.3937
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4297 -
val_loss: 0.3929
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4279 -
val_loss: 0.3929
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4264 -
val_loss: 0.3925
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4253 -
val_loss: 0.3926
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4247 -
val_loss: 0.3917
Epoch 8/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4236 -
val_loss: 0.3914
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4229 -
val_loss: 0.3920
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4225 -
val_loss: 0.3910
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4216 -
val_loss: 0.3919
```

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Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4213 -
val_loss: 0.3910
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4204 -
val_loss: 0.3932
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4204 -
val_loss: 0.3918
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4197 -
val_loss: 0.3931
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4194 -
val_loss: 0.3925
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4188 -
val_loss: 0.3932
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4184 -
val_loss: 0.3932
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4181 -
val_loss: 0.3932
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4177 -
val_loss: 0.3938
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4175 -
val_loss: 0.3937
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4169 -
val_loss: 0.3939
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4164 -
val_loss: 0.3943
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4163 -
val_loss: 0.3949
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4157 -
val_loss: 0.3940
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4153 -
val_loss: 0.3942
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4150 -
val_loss: 0.3943
```

```
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4148 -
val_loss: 0.3946
Epoch 29/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4146 -
val_loss: 0.3952
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4143 -
val_loss: 0.3962
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4138 -
val_loss: 0.3942
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4133 -
val_loss: 0.3958
Epoch 33/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4129 -
val_loss: 0.3953
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4129 -
val_loss: 0.3963
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4123 -
val_loss: 0.3961
Epoch 36/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4119 -
val_loss: 0.3974
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4121 -
val_loss: 0.3961
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4113 -
val_loss: 0.3978
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4114 -
val_loss: 0.3992
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4110 -
val_loss: 0.3974
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.3983
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4102 -
val_loss: 0.3987
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.3984
```

```
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4100 -
val_loss: 0.3982
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.3997
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4092 -
val_loss: 0.3996
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4089 -
val_loss: 0.3998
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4087 -
val_loss: 0.4013
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4084 -
val_loss: 0.4000
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4086 -
val_loss: 0.4003
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4377 -
val_loss: 0.4209
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4289 -
val_loss: 0.4196
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4263 -
val_loss: 0.4173
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4239 -
val_loss: 0.4167
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4219 -
val_loss: 0.4152
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4211 -
val_loss: 0.4157
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4201 -
val_loss: 0.4151
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4191 -
val_loss: 0.4149
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4183 -
```

```
val_loss: 0.4146
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4176 -
val_loss: 0.4155
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4170 -
val_loss: 0.4151
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4164 -
val_loss: 0.4140
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4158 -
val_loss: 0.4138
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4154 -
val_loss: 0.4140
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4148 -
val_loss: 0.4132
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4143 -
val_loss: 0.4145
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4137 -
val_loss: 0.4136
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4132 -
val_loss: 0.4166
Epoch 19/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4135 -
val_loss: 0.4141
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4126 -
val_loss: 0.4163
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4120 -
val_loss: 0.4148
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4123 -
val_loss: 0.4141
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4138
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4112 -
val_loss: 0.4143
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
```

```
val_loss: 0.4144
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.4172
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4101 -
val_loss: 0.4144
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4097 -
val_loss: 0.4159
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4100 -
val_loss: 0.4160
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4092 -
val_loss: 0.4164
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4095 -
val_loss: 0.4159
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4189
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4087 -
val_loss: 0.4168
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4080 -
val_loss: 0.4152
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4084 -
val_loss: 0.4176
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4080 -
val_loss: 0.4171
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4196
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4188
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4066 -
val_loss: 0.4168
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4066 -
val_loss: 0.4164
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4062 -
```

```
val_loss: 0.4163
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4060 -
val_loss: 0.4207
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4057 -
val_loss: 0.4174
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4056 -
val_loss: 0.4182
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4053 -
val_loss: 0.4213
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4047 -
val_loss: 0.4188
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4050 -
val_loss: 0.4181
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4045 -
val_loss: 0.4155
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4044 -
val_loss: 0.4187
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4041 -
val_loss: 0.4180
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4364 -
val_loss: 0.4128
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4285 -
val_loss: 0.4096
Epoch 3/50
375/375 [==============================] - 1s 2ms/step - loss: 0.4261 -
val_loss: 0.4086
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4246 -
val_loss: 0.4075
Epoch 5/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4236 -
val_loss: 0.4080
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4228 -
val_loss: 0.4084
Epoch 7/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4222 -
val_loss: 0.4073
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4214 -
val_loss: 0.4066
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4212 -
val_loss: 0.4064
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4205 -
val_loss: 0.4061
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4201 -
val_loss: 0.4064
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4198 -
val_loss: 0.4063
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4194 -
val_loss: 0.4055
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4187 -
val_loss: 0.4082
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4182 -
val_loss: 0.4068
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4176 -
val_loss: 0.4072
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4176 -
val_loss: 0.4069
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4171 -
val_loss: 0.4069
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4164 -
val_loss: 0.4058
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4162 -
val_loss: 0.4062
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4157 -
val_loss: 0.4066
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4153 -
val_loss: 0.4064
Epoch 23/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4151 -
val_loss: 0.4067
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4146 -
val_loss: 0.4057
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4142 -
val_loss: 0.4069
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4141 -
val_loss: 0.4057
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4141 -
val_loss: 0.4068
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4137 -
val_loss: 0.4063
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4131 -
val_loss: 0.4064
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4133 -
val_loss: 0.4073
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4125 -
val_loss: 0.4074
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4125 -
val_loss: 0.4062
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4123 -
val_loss: 0.4062
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4119 -
val_loss: 0.4069
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4119 -
val_loss: 0.4078
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4074
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4081
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4108 -
val_loss: 0.4076
Epoch 39/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4106 -
val_loss: 0.4080
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4106 -
val_loss: 0.4085
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4104 -
val_loss: 0.4079
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4102 -
val_loss: 0.4080
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4101 -
val_loss: 0.4076
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4095 -
val_loss: 0.4075
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4095 -
val_loss: 0.4078
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4095 -
val_loss: 0.4084
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4094 -
val_loss: 0.4064
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4086
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4079
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4089 -
val_loss: 0.4082
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 3s 4ms/step - loss: 0.4360 -
val_loss: 0.4163
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4271 -
val_loss: 0.4136
Epoch 3/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4247 -
val_loss: 0.4111
Epoch 4/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4234 -
val_loss: 0.4125
```

```
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4225 -
val_loss: 0.4106
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4217 -
val_loss: 0.4108
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4210 -
val_loss: 0.4103
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4204 -
val_loss: 0.4092
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4198 -
val_loss: 0.4087
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4191 -
val_loss: 0.4097
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4182 -
val_loss: 0.4098
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4177 -
val_loss: 0.4094
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4173 -
val_loss: 0.4086
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4168 -
val_loss: 0.4099
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4160 -
val_loss: 0.4087
Epoch 16/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4160 -
val_loss: 0.4087
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4151 -
val_loss: 0.4111
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4149 -
val_loss: 0.4090
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4145 -
val_loss: 0.4096
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4143 -
val_loss: 0.4091
```

```
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4136 -
val_loss: 0.4105
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4135 -
val_loss: 0.4098
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4131 -
val_loss: 0.4112
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4127 -
val_loss: 0.4087
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4121 -
val_loss: 0.4090
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4120 -
val_loss: 0.4093
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4117 -
val_loss: 0.4094
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4114 -
val_loss: 0.4090
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4110 -
val_loss: 0.4111
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4107 -
val_loss: 0.4102
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4098
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4099 -
val_loss: 0.4102
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4102 -
val_loss: 0.4100
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4129
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4093 -
val_loss: 0.4105
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4091 -
val_loss: 0.4097
```

```
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4103
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4080 -
val_loss: 0.4117
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4078 -
val_loss: 0.4118
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4080 -
val_loss: 0.4118
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4079 -
val_loss: 0.4096
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4072 -
val_loss: 0.4122
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4066 -
val_loss: 0.4105
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4067 -
val_loss: 0.4112
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4059 -
val_loss: 0.4126
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4060 -
val_loss: 0.4116
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4056 -
val_loss: 0.4117
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4059 -
val_loss: 0.4130
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4052 -
val_loss: 0.4109
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4046 -
val_loss: 0.4123
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4368 -
val_loss: 0.4266
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4240 -
```

```
val_loss: 0.4247
Epoch 3/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4215 -
val_loss: 0.4228
Epoch 4/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4204 -
val_loss: 0.4229
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4196 -
val_loss: 0.4233
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4190 -
val_loss: 0.4226
Epoch 7/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4183 -
val_loss: 0.4227
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4175 -
val_loss: 0.4219
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4173 -
val_loss: 0.4226
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4165 -
val_loss: 0.4231
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4162 -
val_loss: 0.4224
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4157 -
val_loss: 0.4218
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4154 -
val_loss: 0.4214
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4150 -
val_loss: 0.4220
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4145 -
val_loss: 0.4220
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4140 -
val_loss: 0.4217
Epoch 17/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4132 -
val_loss: 0.4232
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4129 -
```

```
val_loss: 0.4230
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4125 -
val_loss: 0.4211
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4120 -
val_loss: 0.4207
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4116 -
val_loss: 0.4219
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4227
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4218
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4221
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.4227
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4098 -
val_loss: 0.4224
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4218
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4091 -
val_loss: 0.4223
Epoch 29/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4087 -
val_loss: 0.4216
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4077 -
val_loss: 0.4241
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4081 -
val_loss: 0.4233
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4077 -
val_loss: 0.4230
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4073 -
val_loss: 0.4225
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4070 -
```

```
val_loss: 0.4227
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4244
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4068 -
val_loss: 0.4227
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4229
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4060 -
val_loss: 0.4232
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4055 -
val_loss: 0.4235
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4059 -
val_loss: 0.4243
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4055 -
val_loss: 0.4247
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4235
Epoch 43/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4049 -
val_loss: 0.4255
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4049 -
val_loss: 0.4271
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4043 -
val_loss: 0.4264
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4046 -
val_loss: 0.4267
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4039 -
val_loss: 0.4267
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4040 -
val_loss: 0.4261
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4263
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4033 -
```

```
val_loss: 0.4257
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4356 -
val_loss: 0.4244
Epoch 2/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4253 -
val_loss: 0.4220
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4225 -
val_loss: 0.4218
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4208 -
val_loss: 0.4213
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4201 -
val_loss: 0.4209
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4187 -
val_loss: 0.4201
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4182 -
val_loss: 0.4205
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4176 -
val_loss: 0.4205
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4172 -
val_loss: 0.4201
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4165 -
val_loss: 0.4211
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4162 -
val_loss: 0.4202
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4156 -
val_loss: 0.4205
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4153 -
val_loss: 0.4199
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4150 -
val_loss: 0.4205
Epoch 15/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4140 -
val_loss: 0.4199
Epoch 16/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4136 -
val_loss: 0.4208
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4134 -
val_loss: 0.4209
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4132 -
val_loss: 0.4209
Epoch 19/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4125 -
val_loss: 0.4214
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4121 -
val_loss: 0.4212
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4118 -
val_loss: 0.4208
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4113 -
val_loss: 0.4212
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4230
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.4235
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4102 -
val_loss: 0.4226
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4231
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4092 -
val_loss: 0.4225
Epoch 28/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4090 -
val_loss: 0.4229
Epoch 29/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4089 -
val_loss: 0.4235
Epoch 30/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4079 -
val_loss: 0.4234
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4079 -
val_loss: 0.4237
Epoch 32/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4075 -
val_loss: 0.4255
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4068 -
val_loss: 0.4257
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4072 -
val_loss: 0.4258
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4066 -
val_loss: 0.4263
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4066 -
val_loss: 0.4262
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4266
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4056 -
val_loss: 0.4284
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4053 -
val_loss: 0.4289
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4050 -
val_loss: 0.4267
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4046 -
val_loss: 0.4297
Epoch 42/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4044 -
val_loss: 0.4292
Epoch 43/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4036 -
val_loss: 0.4291
Epoch 44/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4038 -
val_loss: 0.4318
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4031 -
val_loss: 0.4297
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4293
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4026 -
val_loss: 0.4319
Epoch 48/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4348
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4021 -
val_loss: 0.4336
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4021 -
val_loss: 0.4344
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4341 -
val_loss: 0.4221
Epoch 2/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4245 -
val_loss: 0.4200
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4223 -
val_loss: 0.4197
Epoch 4/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4209 -
val_loss: 0.4199
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4198 -
val_loss: 0.4194
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4187 -
val_loss: 0.4217
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4179 -
val_loss: 0.4215
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4171 -
val_loss: 0.4221
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4167 -
val_loss: 0.4208
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4160 -
val_loss: 0.4197
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4154 -
val_loss: 0.4206
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4149 -
val_loss: 0.4209
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4144 -
val_loss: 0.4211
```

```
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4137 -
val_loss: 0.4232
Epoch 15/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4134 -
val_loss: 0.4200
Epoch 16/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4130 -
val_loss: 0.4204
Epoch 17/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4124 -
val_loss: 0.4201
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4122 -
val_loss: 0.4210
Epoch 19/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4117 -
val_loss: 0.4203
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4112 -
val_loss: 0.4202
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4107 -
val_loss: 0.4216
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4107 -
val_loss: 0.4215
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.4204
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4098 -
val_loss: 0.4221
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4215
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4090 -
val_loss: 0.4201
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4089 -
val_loss: 0.4216
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4226
Epoch 29/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4081 -
val_loss: 0.4209
```

```
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4081 -
val_loss: 0.4208
Epoch 31/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4074 -
val_loss: 0.4234
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4076 -
val_loss: 0.4226
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4070 -
val_loss: 0.4206
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4068 -
val_loss: 0.4213
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4229
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4067 -
val_loss: 0.4218
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4062 -
val_loss: 0.4217
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4060 -
val_loss: 0.4204
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4059 -
val_loss: 0.4204
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4054 -
val_loss: 0.4216
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4053 -
val_loss: 0.4228
Epoch 42/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4053 -
val_loss: 0.4207
Epoch 43/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4050 -
val_loss: 0.4221
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4048 -
val_loss: 0.4211
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4049 -
val_loss: 0.4229
```

```
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4042 -
val_loss: 0.4200
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4042 -
val_loss: 0.4213
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4040 -
val_loss: 0.4196
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4244
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4232
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 3s 5ms/step - loss: 0.4270 -
val_loss: 0.4393
Epoch 2/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4206 -
val_loss: 0.4384
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4186 -
val_loss: 0.4367
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4170 -
val_loss: 0.4359
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4163 -
val_loss: 0.4351
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4153 -
val_loss: 0.4350
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4147 -
val_loss: 0.4341
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4141 -
val_loss: 0.4346
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4136 -
val_loss: 0.4341
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4129 -
val_loss: 0.4344
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4124 -
```

```
val_loss: 0.4347
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4120 -
val_loss: 0.4343
Epoch 13/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4113 -
val_loss: 0.4345
Epoch 14/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4105 -
val_loss: 0.4362
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4358
Epoch 16/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4101 -
val_loss: 0.4353
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4358
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4356
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4355
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4079 -
val_loss: 0.4357
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4077 -
val_loss: 0.4369
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4070 -
val_loss: 0.4375
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4068 -
val_loss: 0.4373
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4380
Epoch 25/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4057 -
val_loss: 0.4382
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4056 -
val_loss: 0.4376
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
```

```
val_loss: 0.4380
Epoch 28/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4047 -
val_loss: 0.4384
Epoch 29/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4042 -
val_loss: 0.4381
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4394
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4036 -
val_loss: 0.4394
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4032 -
val_loss: 0.4396
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4023 -
val_loss: 0.4404
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4409
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4019 -
val_loss: 0.4412
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4018 -
val_loss: 0.4412
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4016 -
val_loss: 0.4418
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4006 -
val_loss: 0.4423
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4007 -
val_loss: 0.4429
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4007 -
val_loss: 0.4428
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4001 -
val_loss: 0.4426
Epoch 42/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3999 -
val_loss: 0.4420
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3990 -
```

```
val_loss: 0.4458
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3992 -
val_loss: 0.4433
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3986 -
val_loss: 0.4455
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3984 -
val_loss: 0.4482
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3985 -
val_loss: 0.4455
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3980 -
val_loss: 0.4442
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3972 -
val_loss: 0.4462
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3978 -
val_loss: 0.4460
469/469 [==============================] - 1s 2ms/step
80
Epoch 1/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4195 -
val_loss: 0.4641
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4131 -
val_loss: 0.4641
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4110 -
val_loss: 0.4636
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4098 -
val_loss: 0.4641
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.4633
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4640
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4071 -
val_loss: 0.4658
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4062 -
val_loss: 0.4639
```

```
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4056 -
val_loss: 0.4656
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4050 -
val_loss: 0.4645
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4044 -
val_loss: 0.4650
Epoch 12/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4042 -
val_loss: 0.4654
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4034 -
val_loss: 0.4652
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4028 -
val_loss: 0.4665
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4026 -
val_loss: 0.4664
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4021 -
val_loss: 0.4664
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4020 -
val_loss: 0.4662
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4012 -
val_loss: 0.4673
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4012 -
val_loss: 0.4676
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4008 -
val_loss: 0.4677
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4002 -
val_loss: 0.4688
Epoch 22/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4003 -
val_loss: 0.4678
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3997 -
val_loss: 0.4695
Epoch 24/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3993 -
val_loss: 0.4694
```

```
Epoch 25/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3988 -
val_loss: 0.4699
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3988 -
val_loss: 0.4708
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3984 -
val_loss: 0.4693
Epoch 28/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3986 -
val_loss: 0.4692
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3980 -
val_loss: 0.4699
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3979 -
val_loss: 0.4711
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3974 -
val_loss: 0.4708
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3974 -
val_loss: 0.4706
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3973 -
val_loss: 0.4722
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3969 -
val_loss: 0.4718
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3966 -
val_loss: 0.4727
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3961 -
val_loss: 0.4724
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3961 -
val_loss: 0.4740
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3960 -
val_loss: 0.4723
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3956 -
val_loss: 0.4727
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3957 -
val_loss: 0.4739
```

```
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3957 -
val_loss: 0.4742
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3951 -
val_loss: 0.4734
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3952 -
val_loss: 0.4740
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3946 -
val_loss: 0.4750
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3947 -
val_loss: 0.4751
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3945 -
val_loss: 0.4766
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3946 -
val_loss: 0.4763
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3942 -
val_loss: 0.4747
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3935 -
val_loss: 0.4755
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3936 -
val_loss: 0.4748
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4367 -
val_loss: 0.4257
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4250 -
val_loss: 0.4232
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4223 -
val_loss: 0.4226
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4203 -
val_loss: 0.4227
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4194 -
val_loss: 0.4217
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4189 -
```

```
val_loss: 0.4221
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4182 -
val_loss: 0.4216
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4176 -
val_loss: 0.4217
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4171 -
val_loss: 0.4224
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4167 -
val_loss: 0.4218
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4161 -
val_loss: 0.4220
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4158 -
val_loss: 0.4222
Epoch 13/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4153 -
val_loss: 0.4223
Epoch 14/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4150 -
val_loss: 0.4230
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4141 -
val_loss: 0.4228
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4139 -
val_loss: 0.4229
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4134 -
val_loss: 0.4224
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4130 -
val_loss: 0.4218
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4124 -
val_loss: 0.4208
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4122 -
val_loss: 0.4210
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4117 -
val_loss: 0.4213
Epoch 22/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4112 -
```

```
val_loss: 0.4244
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4109 -
val_loss: 0.4218
Epoch 24/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4104 -
val_loss: 0.4235
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4097 -
val_loss: 0.4241
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4095 -
val_loss: 0.4234
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4089 -
val_loss: 0.4243
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4232
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4082 -
val_loss: 0.4229
Epoch 30/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4081 -
val_loss: 0.4223
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4261
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4238
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4071 -
val_loss: 0.4226
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4065 -
val_loss: 0.4259
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4069 -
val_loss: 0.4249
Epoch 36/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4063 -
val_loss: 0.4253
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4058 -
val_loss: 0.4243
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4061 -
```

```
val_loss: 0.4256
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4057 -
val_loss: 0.4249
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4051 -
val_loss: 0.4251
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4053 -
val_loss: 0.4274
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4050 -
val_loss: 0.4265
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4050 -
val_loss: 0.4264
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4043 -
val_loss: 0.4254
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4262
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4283
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4036 -
val_loss: 0.4258
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4039 -
val_loss: 0.4270
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4032 -
val_loss: 0.4269
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4030 -
val_loss: 0.4273
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4394 -
val_loss: 0.4210
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4256 -
val_loss: 0.4175
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4235 -
val_loss: 0.4166
Epoch 4/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4221 -
val_loss: 0.4165
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4211 -
val_loss: 0.4159
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4201 -
val_loss: 0.4161
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4192 -
val_loss: 0.4155
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4187 -
val_loss: 0.4157
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4180 -
val_loss: 0.4161
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4175 -
val_loss: 0.4160
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4169 -
val_loss: 0.4162
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4164 -
val_loss: 0.4157
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4162 -
val_loss: 0.4154
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4153 -
val_loss: 0.4174
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4149 -
val_loss: 0.4169
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4144 -
val_loss: 0.4181
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4142 -
val_loss: 0.4167
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4135 -
val_loss: 0.4175
Epoch 19/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4131 -
val_loss: 0.4179
Epoch 20/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4127 -
val_loss: 0.4178
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4122 -
val_loss: 0.4170
Epoch 22/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4124 -
val_loss: 0.4188
Epoch 23/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4118 -
val_loss: 0.4168
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4111 -
val_loss: 0.4182
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4106 -
val_loss: 0.4181
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4103 -
val_loss: 0.4179
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4104 -
val_loss: 0.4204
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4200
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4186
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4094 -
val_loss: 0.4187
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4184
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4090 -
val_loss: 0.4176
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4182
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.4187
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4081 -
val_loss: 0.4198
Epoch 36/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4082 -
val_loss: 0.4202
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4078 -
val_loss: 0.4192
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4073 -
val_loss: 0.4202
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4070 -
val_loss: 0.4202
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4073 -
val_loss: 0.4188
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4068 -
val_loss: 0.4189
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4068 -
val_loss: 0.4193
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4067 -
val_loss: 0.4210
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4063 -
val_loss: 0.4213
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4063 -
val_loss: 0.4191
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4056 -
val_loss: 0.4208
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4057 -
val_loss: 0.4213
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4054 -
val_loss: 0.4208
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4047 -
val_loss: 0.4202
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4047 -
val_loss: 0.4223
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4252 -
val_loss: 0.4492
```

```
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4175 -
val_loss: 0.4483
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4157 -
val_loss: 0.4483
Epoch 4/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4143 -
val_loss: 0.4471
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4131 -
val_loss: 0.4469
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4119 -
val_loss: 0.4469
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4114 -
val_loss: 0.4455
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4107 -
val_loss: 0.4454
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4100 -
val_loss: 0.4473
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4094 -
val_loss: 0.4466
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.4460
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4078 -
val_loss: 0.4449
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4458
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4070 -
val_loss: 0.4467
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4067 -
val_loss: 0.4467
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4062 -
val_loss: 0.4459
Epoch 17/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4057 -
val_loss: 0.4468
```

```
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4052 -
val_loss: 0.4481
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4048 -
val_loss: 0.4472
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4045 -
val_loss: 0.4485
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4038 -
val_loss: 0.4484
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4033 -
val_loss: 0.4500
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4032 -
val_loss: 0.4482
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4496
Epoch 25/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4022 -
val_loss: 0.4484
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4017 -
val_loss: 0.4503
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4011 -
val_loss: 0.4516
Epoch 28/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4008 -
val_loss: 0.4497
Epoch 29/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4008 -
val_loss: 0.4497
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4003 -
val_loss: 0.4521
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3999 -
val_loss: 0.4509
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3997 -
val_loss: 0.4514
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3998 -
val_loss: 0.4504
```

```
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3990 -
val_loss: 0.4536
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3989 -
val_loss: 0.4524
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3989 -
val_loss: 0.4530
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3984 -
val_loss: 0.4530
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3980 -
val_loss: 0.4524
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3977 -
val_loss: 0.4524
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3972 -
val_loss: 0.4527
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3969 -
val_loss: 0.4536
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3973 -
val_loss: 0.4542
Epoch 43/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3969 -
val_loss: 0.4525
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3967 -
val_loss: 0.4562
Epoch 45/50
375/375 [==============================] - 2s 4ms/step - loss: 0.3962 -
val_loss: 0.4516
Epoch 46/50
375/375 [==============================] - 2s 4ms/step - loss: 0.3963 -
val_loss: 0.4586
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3957 -
val_loss: 0.4548
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3956 -
val_loss: 0.4547
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3953 -
val_loss: 0.4574
```

```
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3949 -
val_loss: 0.4555
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4292 -
val_loss: 0.4338
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4215 -
val_loss: 0.4324
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4202 -
val_loss: 0.4314
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4192 -
val_loss: 0.4311
Epoch 5/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4183 -
val_loss: 0.4313
Epoch 6/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4173 -
val_loss: 0.4319
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4167 -
val_loss: 0.4310
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4159 -
val_loss: 0.4314
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4155 -
val_loss: 0.4307
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4151 -
val_loss: 0.4301
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4143 -
val_loss: 0.4317
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4141 -
val_loss: 0.4327
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4138 -
val_loss: 0.4321
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4133 -
val_loss: 0.4315
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4129 -
```

```
val_loss: 0.4335
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4126 -
val_loss: 0.4334
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4122 -
val_loss: 0.4334
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4119 -
val_loss: 0.4343
Epoch 19/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4114 -
val_loss: 0.4349
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4112 -
val_loss: 0.4351
Epoch 21/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4109 -
val_loss: 0.4350
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4104 -
val_loss: 0.4364
Epoch 23/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4102 -
val_loss: 0.4369
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4383
Epoch 25/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4092 -
val_loss: 0.4375
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4093 -
val_loss: 0.4393
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4089 -
val_loss: 0.4384
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4388
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4084 -
val_loss: 0.4412
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4078 -
val_loss: 0.4398
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4078 -
```

```
val_loss: 0.4437
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4078 -
val_loss: 0.4428
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4074 -
val_loss: 0.4444
Epoch 34/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4068 -
val_loss: 0.4425
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4073 -
val_loss: 0.4447
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4067 -
val_loss: 0.4450
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4065 -
val_loss: 0.4446
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4063 -
val_loss: 0.4483
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4474
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4060 -
val_loss: 0.4466
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4056 -
val_loss: 0.4461
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4055 -
val_loss: 0.4483
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4047 -
val_loss: 0.4477
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4048 -
val_loss: 0.4491
Epoch 45/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4050 -
val_loss: 0.4482
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4044 -
val_loss: 0.4504
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4043 -
```

```
val_loss: 0.4512
Epoch 48/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4038 -
val_loss: 0.4492
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4038 -
val_loss: 0.4537
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4033 -
val_loss: 0.4503
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4379 -
val_loss: 0.4046
Epoch 2/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4287 -
val_loss: 0.4042
Epoch 3/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4264 -
val_loss: 0.4048
Epoch 4/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4249 -
val_loss: 0.4036
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4243 -
val_loss: 0.4032
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4230 -
val_loss: 0.4024
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4224 -
val_loss: 0.4040
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4212 -
val_loss: 0.4021
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4209 -
val_loss: 0.4013
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4204 -
val_loss: 0.4062
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4198 -
val_loss: 0.4065
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4193 -
val_loss: 0.4031
Epoch 13/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4190 -
val_loss: 0.4050
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4183 -
val_loss: 0.4029
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4177 -
val_loss: 0.4037
Epoch 16/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4177 -
val_loss: 0.4028
Epoch 17/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4170 -
val_loss: 0.4026
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4168 -
val_loss: 0.4046
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4162 -
val_loss: 0.4062
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4160 -
val_loss: 0.4053
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4155 -
val_loss: 0.4058
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4151 -
val_loss: 0.4049
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4149 -
val_loss: 0.4081
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4143 -
val_loss: 0.4099
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4142 -
val_loss: 0.4076
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4137 -
val_loss: 0.4079
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4135 -
val_loss: 0.4066
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4133 -
val_loss: 0.4064
Epoch 29/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4130 -
val_loss: 0.4065
Epoch 30/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4125 -
val_loss: 0.4077
Epoch 31/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4123 -
val_loss: 0.4077
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4119 -
val_loss: 0.4091
Epoch 33/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4116 -
val_loss: 0.4066
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4113 -
val_loss: 0.4068
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4114 -
val_loss: 0.4100
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4110 -
val_loss: 0.4072
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4104 -
val_loss: 0.4131
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4111
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4101 -
val_loss: 0.4110
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4100 -
val_loss: 0.4108
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4098 -
val_loss: 0.4142
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4097 -
val_loss: 0.4102
Epoch 43/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4098 -
val_loss: 0.4116
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4112
Epoch 45/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4090 -
val_loss: 0.4109
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4090 -
val_loss: 0.4152
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4213
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4084 -
val_loss: 0.4156
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4084 -
val_loss: 0.4136
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4076 -
val_loss: 0.4115
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4288 -
val_loss: 0.4629
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4169 -
val_loss: 0.4599
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4128 -
val_loss: 0.4608
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4584
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4096 -
val_loss: 0.4609
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4087 -
val_loss: 0.4599
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4078 -
val_loss: 0.4597
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4072 -
val_loss: 0.4603
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4068 -
val_loss: 0.4596
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4055 -
val_loss: 0.4610
```

```
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4054 -
val_loss: 0.4613
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4051 -
val_loss: 0.4610
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4046 -
val_loss: 0.4620
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4040 -
val_loss: 0.4639
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4039 -
val_loss: 0.4616
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4613
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4623
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4023 -
val_loss: 0.4639
Epoch 19/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4023 -
val_loss: 0.4619
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4021 -
val_loss: 0.4630
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4018 -
val_loss: 0.4637
Epoch 22/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4015 -
val_loss: 0.4634
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4012 -
val_loss: 0.4631
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4010 -
val_loss: 0.4635
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4008 -
val_loss: 0.4635
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4007 -
val_loss: 0.4617
```

```
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3999 -
val_loss: 0.4635
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3998 -
val_loss: 0.4627
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3994 -
val_loss: 0.4632
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3999 -
val_loss: 0.4635
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3991 -
val_loss: 0.4619
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3987 -
val_loss: 0.4643
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3986 -
val_loss: 0.4629
Epoch 34/50
375/375 [==============================] - 2s 4ms/step - loss: 0.3985 -
val_loss: 0.4638
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3982 -
val_loss: 0.4630
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3980 -
val_loss: 0.4639
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3970 -
val_loss: 0.4653
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3974 -
val_loss: 0.4659
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3976 -
val_loss: 0.4655
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3972 -
val_loss: 0.4640
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3971 -
val_loss: 0.4647
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3969 -
val_loss: 0.4648
```

```
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3963 -
val_loss: 0.4660
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3963 -
val_loss: 0.4673
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3958 -
val_loss: 0.4673
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3960 -
val_loss: 0.4648
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3955 -
val_loss: 0.4659
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3955 -
val_loss: 0.4650
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3950 -
val_loss: 0.4701
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3951 -
val_loss: 0.4638
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4352 -
val_loss: 0.4159
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4265 -
val_loss: 0.4148
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4240 -
val_loss: 0.4130
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4229 -
val_loss: 0.4140
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4218 -
val_loss: 0.4120
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4210 -
val_loss: 0.4137
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4202 -
val_loss: 0.4136
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4194 -
```

```
val_loss: 0.4131
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4187 -
val_loss: 0.4124
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4179 -
val_loss: 0.4137
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4172 -
val_loss: 0.4126
Epoch 12/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4167 -
val_loss: 0.4134
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4161 -
val_loss: 0.4138
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4158 -
val_loss: 0.4125
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4151 -
val_loss: 0.4121
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4144 -
val_loss: 0.4148
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4142 -
val_loss: 0.4150
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4136 -
val_loss: 0.4154
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4134 -
val_loss: 0.4162
Epoch 20/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4124 -
val_loss: 0.4145
Epoch 21/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4129 -
val_loss: 0.4159
Epoch 22/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4120 -
val_loss: 0.4156
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4118 -
val_loss: 0.4168
Epoch 24/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4112 -
```

```
val_loss: 0.4161
Epoch 25/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4109 -
val_loss: 0.4161
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4104 -
val_loss: 0.4175
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.4177
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.4181
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4097 -
val_loss: 0.4188
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4091 -
val_loss: 0.4181
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4088 -
val_loss: 0.4197
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4087 -
val_loss: 0.4202
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4080 -
val_loss: 0.4198
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4079 -
val_loss: 0.4207
Epoch 35/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4077 -
val_loss: 0.4215
Epoch 36/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4071 -
val_loss: 0.4199
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4235
Epoch 38/50
375/375 [==============================] - 2s 5ms/step - loss: 0.4062 -
val_loss: 0.4220
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4062 -
val_loss: 0.4230
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
```

```
val_loss: 0.4234
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4053 -
val_loss: 0.4233
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4052 -
val_loss: 0.4222
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4046 -
val_loss: 0.4274
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4042 -
val_loss: 0.4243
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4043 -
val_loss: 0.4296
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4241
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4037 -
val_loss: 0.4253
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4036 -
val_loss: 0.4325
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4029 -
val_loss: 0.4263
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4028 -
val_loss: 0.4287
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4416 -
val_loss: 0.4301
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4274 -
val_loss: 0.4278
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4249 -
val_loss: 0.4270
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4229 -
val_loss: 0.4274
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4214 -
val_loss: 0.4271
Epoch 6/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4201 -
val_loss: 0.4273
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4192 -
val_loss: 0.4261
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4181 -
val_loss: 0.4262
Epoch 9/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4174 -
val_loss: 0.4269
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4171 -
val_loss: 0.4259
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4163 -
val_loss: 0.4266
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4157 -
val_loss: 0.4275
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4152 -
val_loss: 0.4284
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4144 -
val_loss: 0.4289
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4139 -
val_loss: 0.4286
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4132 -
val_loss: 0.4291
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4129 -
val_loss: 0.4294
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4122 -
val_loss: 0.4297
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4118 -
val_loss: 0.4324
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4113 -
val_loss: 0.4296
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4108 -
val_loss: 0.4296
Epoch 22/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4102 -
val_loss: 0.4303
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4098 -
val_loss: 0.4304
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4089 -
val_loss: 0.4348
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.4304
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4082 -
val_loss: 0.4312
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4356
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4070 -
val_loss: 0.4322
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4067 -
val_loss: 0.4318
Epoch 30/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4063 -
val_loss: 0.4324
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4059 -
val_loss: 0.4326
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4058 -
val_loss: 0.4330
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4052 -
val_loss: 0.4357
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
val_loss: 0.4336
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4043 -
val_loss: 0.4345
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4043 -
val_loss: 0.4336
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4357
Epoch 38/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4036 -
val_loss: 0.4360
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4035 -
val_loss: 0.4346
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4360
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4025 -
val_loss: 0.4371
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4365
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4022 -
val_loss: 0.4344
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4015 -
val_loss: 0.4374
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4018 -
val_loss: 0.4365
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4012 -
val_loss: 0.4365
Epoch 47/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4007 -
val_loss: 0.4350
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4007 -
val_loss: 0.4350
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4002 -
val_loss: 0.4374
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4002 -
val_loss: 0.4370
469/469 [==============================] - 1s 3ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4410 -
val_loss: 0.4364
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4231 -
val_loss: 0.4324
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4204 -
val_loss: 0.4306
```

```
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4181 -
val_loss: 0.4299
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4171 -
val_loss: 0.4298
Epoch 6/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4160 -
val_loss: 0.4308
Epoch 7/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4157 -
val_loss: 0.4307
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4148 -
val_loss: 0.4300
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4144 -
val_loss: 0.4299
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4137 -
val_loss: 0.4304
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4132 -
val_loss: 0.4310
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4128 -
val_loss: 0.4312
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4121 -
val_loss: 0.4318
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4117 -
val_loss: 0.4311
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4309
Epoch 16/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4109 -
val_loss: 0.4323
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4104 -
val_loss: 0.4321
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4100 -
val_loss: 0.4317
Epoch 19/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4097 -
val_loss: 0.4316
```

```
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4090 -
val_loss: 0.4320
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4091 -
val_loss: 0.4316
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4090 -
val_loss: 0.4315
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4325
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4076 -
val_loss: 0.4339
Epoch 25/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4080 -
val_loss: 0.4323
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4339
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4330
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4072 -
val_loss: 0.4338
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4070 -
val_loss: 0.4343
Epoch 30/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4064 -
val_loss: 0.4354
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4064 -
val_loss: 0.4363
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4059 -
val_loss: 0.4347
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4060 -
val_loss: 0.4354
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4056 -
val_loss: 0.4360
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4051 -
val_loss: 0.4356
```

```
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
val_loss: 0.4363
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
val_loss: 0.4371
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4042 -
val_loss: 0.4370
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4046 -
val_loss: 0.4373
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4042 -
val_loss: 0.4382
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4036 -
val_loss: 0.4383
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4366
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4033 -
val_loss: 0.4382
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4031 -
val_loss: 0.4379
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4399
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4026 -
val_loss: 0.4387
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4026 -
val_loss: 0.4385
Epoch 48/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4020 -
val_loss: 0.4391
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4019 -
val_loss: 0.4390
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4020 -
val_loss: 0.4397
469/469 [==============================] - 1s 2ms/step
90
Epoch 1/50
```

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375/375 [==============================] - 2s 4ms/step - loss: 0.4359 -
val_loss: 0.4187
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4273 -
val_loss: 0.4164
Epoch 3/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4248 -
val_loss: 0.4148
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4229 -
val_loss: 0.4147
Epoch 5/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4217 -
val_loss: 0.4133
Epoch 6/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4206 -
val_loss: 0.4136
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4198 -
val_loss: 0.4126
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4191 -
val_loss: 0.4136
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4185 -
val_loss: 0.4127
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4177 -
val_loss: 0.4145
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4172 -
val_loss: 0.4131
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4171 -
val_loss: 0.4135
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4161 -
val_loss: 0.4137
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4159 -
val_loss: 0.4120
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4157 -
val_loss: 0.4117
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4150 -
val_loss: 0.4120
Epoch 17/50
```

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375/375 [==============================] - 1s 3ms/step - loss: 0.4147 -
val_loss: 0.4131
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4145 -
val_loss: 0.4138
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4141 -
val_loss: 0.4133
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4139 -
val_loss: 0.4139
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4134 -
val_loss: 0.4125
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4130 -
val_loss: 0.4130
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4128 -
val_loss: 0.4136
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4125 -
val_loss: 0.4140
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4122 -
val_loss: 0.4140
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4120 -
val_loss: 0.4149
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4118 -
val_loss: 0.4136
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4114 -
val_loss: 0.4149
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4111 -
val_loss: 0.4136
Epoch 30/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4106 -
val_loss: 0.4145
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4105 -
val_loss: 0.4138
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4148
Epoch 33/50
```

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375/375 [==============================] - 1s 4ms/step - loss: 0.4094 -
val_loss: 0.4154
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4093 -
val_loss: 0.4157
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4090 -
val_loss: 0.4164
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4090 -
val_loss: 0.4145
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4149
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4084 -
val_loss: 0.4155
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4081 -
val_loss: 0.4163
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4078 -
val_loss: 0.4169
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4076 -
val_loss: 0.4165
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4073 -
val_loss: 0.4159
Epoch 43/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4069 -
val_loss: 0.4175
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4071 -
val_loss: 0.4170
Epoch 45/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4062 -
val_loss: 0.4174
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4062 -
val_loss: 0.4159
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4064 -
val_loss: 0.4177
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4173
Epoch 49/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4054 -
val_loss: 0.4182
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4055 -
val_loss: 0.4179
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4425 -
val_loss: 0.4209
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4277 -
val_loss: 0.4163
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4252 -
val_loss: 0.4147
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4239 -
val_loss: 0.4137
Epoch 5/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4225 -
val_loss: 0.4127
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4219 -
val_loss: 0.4127
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4211 -
val_loss: 0.4131
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4205 -
val_loss: 0.4135
Epoch 9/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4198 -
val_loss: 0.4126
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4189 -
val_loss: 0.4138
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4181 -
val_loss: 0.4146
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4172 -
val_loss: 0.4137
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4167 -
val_loss: 0.4136
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4160 -
val_loss: 0.4146
```

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Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4150 -
val_loss: 0.4157
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4147 -
val_loss: 0.4157
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4140 -
val_loss: 0.4160
Epoch 18/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4132 -
val_loss: 0.4155
Epoch 19/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4124 -
val_loss: 0.4163
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4120 -
val_loss: 0.4165
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4119 -
val_loss: 0.4144
Epoch 22/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4113 -
val_loss: 0.4154
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4108 -
val_loss: 0.4182
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.4185
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4190
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4094 -
val_loss: 0.4177
Epoch 27/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4089 -
val_loss: 0.4195
Epoch 28/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4090 -
val_loss: 0.4205
Epoch 29/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4081 -
val_loss: 0.4193
Epoch 30/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4078 -
val_loss: 0.4210
```

```
Epoch 31/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4076 -
val_loss: 0.4191
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4070 -
val_loss: 0.4195
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4071 -
val_loss: 0.4198
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4064 -
val_loss: 0.4210
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4062 -
val_loss: 0.4226
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4203
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4055 -
val_loss: 0.4214
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4056 -
val_loss: 0.4212
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4051 -
val_loss: 0.4209
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4047 -
val_loss: 0.4227
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4043 -
val_loss: 0.4229
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4044 -
val_loss: 0.4224
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4041 -
val_loss: 0.4222
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4036 -
val_loss: 0.4218
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4031 -
val_loss: 0.4232
Epoch 46/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4032 -
val_loss: 0.4218
```

```
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4026 -
val_loss: 0.4245
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4024 -
val_loss: 0.4217
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4023 -
val_loss: 0.4246
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4023 -
val_loss: 0.4224
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4438 -
val_loss: 0.3859
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4337 -
val_loss: 0.3844
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4317 -
val_loss: 0.3852
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4304 -
val_loss: 0.3871
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4293 -
val_loss: 0.3843
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4282 -
val_loss: 0.3846
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4275 -
val_loss: 0.3843
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4267 -
val_loss: 0.3840
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4260 -
val_loss: 0.3843
Epoch 10/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4256 -
val_loss: 0.3856
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4252 -
val_loss: 0.3844
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4244 -
```

```
val_loss: 0.3853
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4237 -
val_loss: 0.3850
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4233 -
val_loss: 0.3840
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4228 -
val_loss: 0.3851
Epoch 16/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4220 -
val_loss: 0.3846
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4218 -
val_loss: 0.3844
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4210 -
val_loss: 0.3859
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4211 -
val_loss: 0.3851
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4205 -
val_loss: 0.3848
Epoch 21/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4197 -
val_loss: 0.3868
Epoch 22/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4193 -
val_loss: 0.3865
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4191 -
val_loss: 0.3860
Epoch 24/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4186 -
val_loss: 0.3872
Epoch 25/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4179 -
val_loss: 0.3882
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4172 -
val_loss: 0.3860
Epoch 27/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4171 -
val_loss: 0.3860
Epoch 28/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4165 -
```

```
val_loss: 0.3889
Epoch 29/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4166 -
val_loss: 0.3872
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4158 -
val_loss: 0.3889
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4153 -
val_loss: 0.3878
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4153 -
val_loss: 0.3862
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4150 -
val_loss: 0.3880
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4150 -
val_loss: 0.3895
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4140 -
val_loss: 0.3869
Epoch 36/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4149 -
val_loss: 0.3882
Epoch 37/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4135 -
val_loss: 0.3901
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4133 -
val_loss: 0.3923
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4128 -
val_loss: 0.3907
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4127 -
val_loss: 0.3945
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4124 -
val_loss: 0.3941
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4123 -
val_loss: 0.3947
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4120 -
val_loss: 0.3921
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4118 -
```

```
val_loss: 0.3962
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4118 -
val_loss: 0.3945
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4114 -
val_loss: 0.3954
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4106 -
val_loss: 0.3909
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4107 -
val_loss: 0.3958
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4103 -
val_loss: 0.3954
Epoch 50/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4105 -
val_loss: 0.3990
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4341 -
val_loss: 0.4380
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4229 -
val_loss: 0.4358
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4206 -
val_loss: 0.4342
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4196 -
val_loss: 0.4319
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4186 -
val_loss: 0.4319
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4175 -
val_loss: 0.4314
Epoch 7/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4168 -
val_loss: 0.4298
Epoch 8/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4161 -
val_loss: 0.4304
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4156 -
val_loss: 0.4295
Epoch 10/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4154 -
val_loss: 0.4292
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4149 -
val_loss: 0.4290
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4142 -
val_loss: 0.4292
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4139 -
val_loss: 0.4295
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4136 -
val_loss: 0.4299
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4130 -
val_loss: 0.4278
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4125 -
val_loss: 0.4301
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4125 -
val_loss: 0.4294
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4122 -
val_loss: 0.4280
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4117 -
val_loss: 0.4300
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4111 -
val_loss: 0.4288
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4112 -
val_loss: 0.4293
Epoch 22/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4104 -
val_loss: 0.4303
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4106 -
val_loss: 0.4295
Epoch 24/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4101 -
val_loss: 0.4290
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4095 -
val_loss: 0.4285
Epoch 26/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4090 -
val_loss: 0.4317
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4090 -
val_loss: 0.4296
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4287
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4085 -
val_loss: 0.4297
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4081 -
val_loss: 0.4290
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4081 -
val_loss: 0.4303
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4074 -
val_loss: 0.4295
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4295
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4072 -
val_loss: 0.4295
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4289
Epoch 36/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4062 -
val_loss: 0.4319
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4059 -
val_loss: 0.4300
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4058 -
val_loss: 0.4309
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4051 -
val_loss: 0.4306
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4049 -
val_loss: 0.4325
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4053 -
val_loss: 0.4321
Epoch 42/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4043 -
val_loss: 0.4326
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4044 -
val_loss: 0.4333
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4039 -
val_loss: 0.4323
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4038 -
val_loss: 0.4316
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4038 -
val_loss: 0.4325
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4327
Epoch 48/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4029 -
val_loss: 0.4339
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4030 -
val_loss: 0.4332
Epoch 50/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4023 -
val_loss: 0.4344
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 3s 4ms/step - loss: 0.4275 -
val_loss: 0.4746
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4141 -
val_loss: 0.4734
Epoch 3/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4119 -
val_loss: 0.4721
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4101 -
val_loss: 0.4717
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.4709
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4073 -
val_loss: 0.4706
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4067 -
val_loss: 0.4707
```

```
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4060 -
val_loss: 0.4712
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4052 -
val_loss: 0.4701
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4045 -
val_loss: 0.4701
Epoch 11/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4039 -
val_loss: 0.4706
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4031 -
val_loss: 0.4700
Epoch 13/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4027 -
val_loss: 0.4707
Epoch 14/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4022 -
val_loss: 0.4704
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4016 -
val_loss: 0.4701
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4008 -
val_loss: 0.4709
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4006 -
val_loss: 0.4706
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4000 -
val_loss: 0.4716
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3993 -
val_loss: 0.4703
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3990 -
val_loss: 0.4710
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3985 -
val_loss: 0.4699
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3979 -
val_loss: 0.4710
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3979 -
val_loss: 0.4706
```

```
Epoch 24/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3974 -
val_loss: 0.4700
Epoch 25/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3970 -
val_loss: 0.4705
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3964 -
val_loss: 0.4715
Epoch 27/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3961 -
val_loss: 0.4707
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3957 -
val_loss: 0.4712
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3953 -
val_loss: 0.4715
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3950 -
val_loss: 0.4705
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3945 -
val_loss: 0.4707
Epoch 32/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3942 -
val_loss: 0.4710
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3939 -
val_loss: 0.4708
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3937 -
val_loss: 0.4706
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3934 -
val_loss: 0.4709
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3931 -
val_loss: 0.4716
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3925 -
val_loss: 0.4712
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3925 -
val_loss: 0.4712
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3922 -
val_loss: 0.4710
```

```
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3916 -
val_loss: 0.4723
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3914 -
val_loss: 0.4719
Epoch 42/50
375/375 [==============================] - 1s 4ms/step - loss: 0.3913 -
val_loss: 0.4729
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3907 -
val_loss: 0.4723
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3907 -
val_loss: 0.4742
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3900 -
val_loss: 0.4727
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3901 -
val_loss: 0.4735
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3900 -
val_loss: 0.4737
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3894 -
val_loss: 0.4733
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3894 -
val_loss: 0.4733
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.3890 -
val_loss: 0.4734
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4358 -
val_loss: 0.4162
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4272 -
val_loss: 0.4140
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4247 -
val_loss: 0.4126
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4233 -
val_loss: 0.4125
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4222 -
```

```
val_loss: 0.4117
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4210 -
val_loss: 0.4157
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4204 -
val_loss: 0.4130
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4194 -
val_loss: 0.4123
Epoch 9/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4185 -
val_loss: 0.4115
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4183 -
val_loss: 0.4124
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4172 -
val_loss: 0.4126
Epoch 12/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4170 -
val_loss: 0.4119
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4160 -
val_loss: 0.4129
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4154 -
val_loss: 0.4135
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4155 -
val_loss: 0.4137
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4153 -
val_loss: 0.4127
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4142 -
val_loss: 0.4122
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4138 -
val_loss: 0.4135
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4137 -
val_loss: 0.4142
Epoch 20/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4135 -
val_loss: 0.4129
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4128 -
```

```
val_loss: 0.4145
Epoch 22/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4128 -
val_loss: 0.4148
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4120 -
val_loss: 0.4140
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4123 -
val_loss: 0.4155
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4152
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4116 -
val_loss: 0.4147
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4166
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4109 -
val_loss: 0.4168
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4149
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4149
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4100 -
val_loss: 0.4150
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4098 -
val_loss: 0.4159
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4098 -
val_loss: 0.4150
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4092 -
val_loss: 0.4150
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4172
Epoch 36/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4084 -
val_loss: 0.4210
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4085 -
```

```
val_loss: 0.4164
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4085 -
val_loss: 0.4173
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4082 -
val_loss: 0.4156
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4072 -
val_loss: 0.4171
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4074 -
val_loss: 0.4173
Epoch 42/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4074 -
val_loss: 0.4167
Epoch 43/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4071 -
val_loss: 0.4172
Epoch 44/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4066 -
val_loss: 0.4201
Epoch 45/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4070 -
val_loss: 0.4189
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4059 -
val_loss: 0.4188
Epoch 47/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4063 -
val_loss: 0.4189
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4061 -
val_loss: 0.4187
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4058 -
val_loss: 0.4196
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4054 -
val_loss: 0.4198
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4345 -
val_loss: 0.4373
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4209 -
val_loss: 0.4348
Epoch 3/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4183 -
val_loss: 0.4353
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4171 -
val_loss: 0.4335
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4160 -
val_loss: 0.4335
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4152 -
val_loss: 0.4333
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4145 -
val_loss: 0.4334
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4140 -
val_loss: 0.4332
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4133 -
val_loss: 0.4322
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4134 -
val_loss: 0.4331
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4126 -
val_loss: 0.4335
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4120 -
val_loss: 0.4345
Epoch 13/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4118 -
val_loss: 0.4332
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4336
Epoch 15/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4112 -
val_loss: 0.4344
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4343
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4106 -
val_loss: 0.4348
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4101 -
val_loss: 0.4338
Epoch 19/50
```

```
375/375 [==============================] - 1s 3ms/step - loss: 0.4097 -
val_loss: 0.4365
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4098 -
val_loss: 0.4357
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4095 -
val_loss: 0.4355
Epoch 22/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4089 -
val_loss: 0.4361
Epoch 23/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4081 -
val_loss: 0.4370
Epoch 24/50
375/375 [==============================] - 2s 5ms/step - loss: 0.4082 -
val_loss: 0.4358
Epoch 25/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4076 -
val_loss: 0.4366
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4071 -
val_loss: 0.4369
Epoch 27/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4072 -
val_loss: 0.4367
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4070 -
val_loss: 0.4368
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4386
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4062 -
val_loss: 0.4366
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
val_loss: 0.4356
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4055 -
val_loss: 0.4374
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4051 -
val_loss: 0.4362
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4053 -
val_loss: 0.4374
Epoch 35/50
```

```
375/375 [==============================] - 1s 4ms/step - loss: 0.4050 -
val_loss: 0.4365
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4049 -
val_loss: 0.4365
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4040 -
val_loss: 0.4371
Epoch 38/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4040 -
val_loss: 0.4377
Epoch 39/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4041 -
val_loss: 0.4368
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4037 -
val_loss: 0.4365
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4034 -
val_loss: 0.4402
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4029 -
val_loss: 0.4380
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4030 -
val_loss: 0.4374
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4023 -
val_loss: 0.4366
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4023 -
val_loss: 0.4392
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4019 -
val_loss: 0.4388
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4019 -
val_loss: 0.4356
Epoch 48/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4016 -
val_loss: 0.4393
Epoch 49/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4012 -
val_loss: 0.4420
Epoch 50/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4011 -
val_loss: 0.4413
469/469 [==============================] - 1s 2ms/step
```

```
Epoch 1/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4397 -
val_loss: 0.4067
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4299 -
val_loss: 0.4041
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4281 -
val_loss: 0.4023
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4267 -
val_loss: 0.4020
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4254 -
val_loss: 0.4005
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4245 -
val_loss: 0.3999
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4236 -
val_loss: 0.4001
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4230 -
val_loss: 0.4002
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4223 -
val_loss: 0.3997
Epoch 10/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4218 -
val_loss: 0.3992
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4211 -
val_loss: 0.3999
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4207 -
val_loss: 0.3994
Epoch 13/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4200 -
val_loss: 0.3995
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4193 -
val_loss: 0.3995
Epoch 15/50
375/375 [==============================] - 2s 4ms/step - loss: 0.4192 -
val_loss: 0.3996
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4182 -
val_loss: 0.4011
```

```
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4183 -
val_loss: 0.4005
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4175 -
val_loss: 0.4005
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4169 -
val_loss: 0.3994
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4161 -
val_loss: 0.3995
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4159 -
val_loss: 0.4014
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4156 -
val_loss: 0.4009
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4152 -
val_loss: 0.4004
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4142 -
val_loss: 0.4025
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4140 -
val_loss: 0.4017
Epoch 26/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4141 -
val_loss: 0.4029
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4132 -
val_loss: 0.4038
Epoch 28/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4132 -
val_loss: 0.4027
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4126 -
val_loss: 0.4034
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4126 -
val_loss: 0.4027
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4122 -
val_loss: 0.4028
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4115 -
val_loss: 0.4030
```

```
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4110 -
val_loss: 0.4048
Epoch 34/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4108 -
val_loss: 0.4057
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4031
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4103 -
val_loss: 0.4047
Epoch 37/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4102 -
val_loss: 0.4033
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4095 -
val_loss: 0.4043
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4094 -
val_loss: 0.4050
Epoch 40/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4092 -
val_loss: 0.4041
Epoch 41/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4086 -
val_loss: 0.4050
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4084 -
val_loss: 0.4046
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4087 -
val_loss: 0.4056
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4081 -
val_loss: 0.4064
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4075 -
val_loss: 0.4061
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4069 -
val_loss: 0.4064
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4072 -
val_loss: 0.4064
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4067 -
val_loss: 0.4072
```

```
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4068 -
val_loss: 0.4059
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4064 -
val_loss: 0.4057
469/469 [==============================] - 1s 2ms/step
Epoch 1/50
375/375 [==============================] - 2s 3ms/step - loss: 0.4358 -
val_loss: 0.4179
Epoch 2/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4279 -
val_loss: 0.4158
Epoch 3/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4253 -
val_loss: 0.4141
Epoch 4/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4237 -
val_loss: 0.4145
Epoch 5/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4224 -
val_loss: 0.4144
Epoch 6/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4213 -
val_loss: 0.4134
Epoch 7/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4208 -
val_loss: 0.4141
Epoch 8/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4201 -
val_loss: 0.4137
Epoch 9/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4192 -
val_loss: 0.4151
Epoch 10/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4191 -
val_loss: 0.4141
Epoch 11/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4184 -
val_loss: 0.4147
Epoch 12/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4178 -
val_loss: 0.4147
Epoch 13/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4173 -
val_loss: 0.4143
Epoch 14/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4168 -
```

```
val_loss: 0.4146
Epoch 15/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4160 -
val_loss: 0.4149
Epoch 16/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4158 -
val_loss: 0.4139
Epoch 17/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4158 -
val_loss: 0.4143
Epoch 18/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4150 -
val_loss: 0.4144
Epoch 19/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4146 -
val_loss: 0.4141
Epoch 20/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4142 -
val_loss: 0.4154
Epoch 21/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4138 -
val_loss: 0.4151
Epoch 22/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4135 -
val_loss: 0.4145
Epoch 23/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4129 -
val_loss: 0.4146
Epoch 24/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4125 -
val_loss: 0.4160
Epoch 25/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4124 -
val_loss: 0.4153
Epoch 26/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4121 -
val_loss: 0.4144
Epoch 27/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4114 -
val_loss: 0.4159
Epoch 28/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4111 -
val_loss: 0.4162
Epoch 29/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4105 -
val_loss: 0.4158
Epoch 30/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4104 -
```

```
val_loss: 0.4158
Epoch 31/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4099 -
val_loss: 0.4155
Epoch 32/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4093 -
val_loss: 0.4169
Epoch 33/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4095 -
val_loss: 0.4165
Epoch 34/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4086 -
val_loss: 0.4189
Epoch 35/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4088 -
val_loss: 0.4175
Epoch 36/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4087 -
val_loss: 0.4164
Epoch 37/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4083 -
val_loss: 0.4173
Epoch 38/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4075 -
val_loss: 0.4172
Epoch 39/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4081 -
val_loss: 0.4174
Epoch 40/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4073 -
val_loss: 0.4175
Epoch 41/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4067 -
val_loss: 0.4172
Epoch 42/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4068 -
val_loss: 0.4195
Epoch 43/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4065 -
val_loss: 0.4182
Epoch 44/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4063 -
val_loss: 0.4201
Epoch 45/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4061 -
val_loss: 0.4182
Epoch 46/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4058 -
```

```
val_loss: 0.4183
Epoch 47/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4055 -
val_loss: 0.4197
Epoch 48/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4048 -
val_loss: 0.4195
Epoch 49/50
375/375 [==============================] - 1s 3ms/step - loss: 0.4046 -
val_loss: 0.4190
Epoch 50/50
375/375 [==============================] - 1s 4ms/step - loss: 0.4047 -
val_loss: 0.4190
469/469 [==============================] - 1s 2ms/step
```

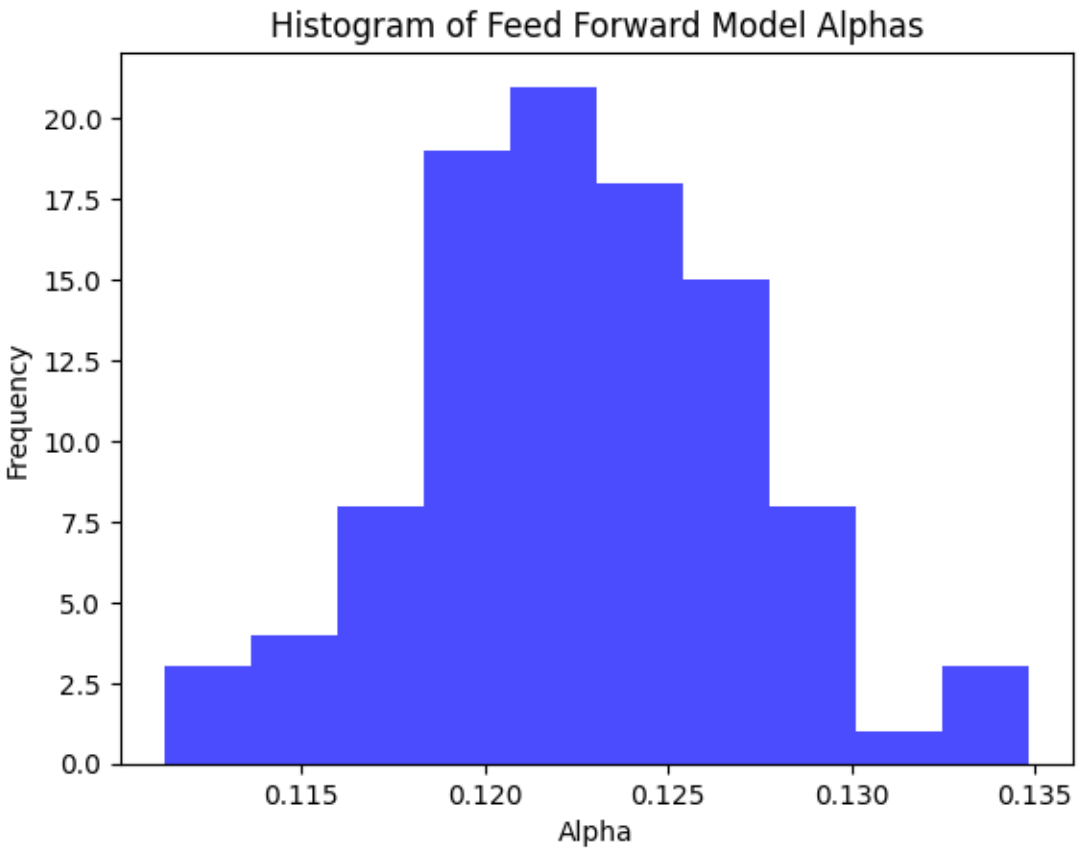
[9]:
```
print(f'Highest return if we ignore robustness: {max(alphas)}')

# Create the histogram
plt.hist(alphas, bins=10, alpha=0.7, color='blue')

# Add title and labels
plt.title('Histogram of Feed Forward Model Alphas')
plt.xlabel('Alpha')
plt.ylabel('Frequency')

# Show the plot
plt.show()
```

```
Highest return if we ignore robustness: 0.13485969142097237
```



The highest alpha we could get if we ignore robustness is 0.135. Simply taking the highest alpha from a bunch of random trials would cause us to falsely believe our model is better than it is. This will lead to the model's average-case performance with real money on the market being far worse than our backtest expectations, which were based on a favorable random condition.

[9]: