In [ ]:
```
#Base Imports
import string
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
#Pre Processing Imports
import re
import nltk
from nltk.corpus import stopwords
nltk.download('stopwords')
nltk.download('wordnet')
from nltk.stem import WordNetLemmatizer
stop_words = set(stopwords.words("english"))
lemmatizer= WordNetLemmatizer()
from sklearn.model_selection import train_test_split
from tensorflow.keras.utils import to_categorical
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
#Model Building Imports
from scikeras.wrappers import KerasClassifier
from sklearn.model_selection import RandomizedSearchCV,GridSearchCV
from tensorflow.keras.optimizers import Adam , SGD ,RMSprop , Adagrad
from tensorflow.keras.models import Sequential
from tensorflow.keras.callbacks import EarlyStopping
from tensorflow.keras.layers import Dense,Embedding, Dropout, GRU
#Model Evaluation imports
from sklearn import metrics
from sklearn.metrics import (classification_report,confusion_matrix ,
                             precision_recall_curve ,precision_score,recall_score , accu
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package wordnet to /root/nltk_data...
[nltk_data]   Package wordnet is already up-to-date!
```

In [ ]:
```
!pip install scikeras
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/publ
ic/simple/
Collecting scikeras
  Downloading scikeras-0.10.0-py3-none-any.whl (27 kB)
Requirement already satisfied: scikit-learn>=1.0.0 in /usr/local/lib/python3.9/dist-pack
ages (from scikeras) (1.2.2)
Requirement already satisfied: packaging>=0.21 in /usr/local/lib/python3.9/dist-packages
(from scikeras) (23.1)
Requirement already satisfied: threadpoolctl>=2.0.0 in /usr/local/lib/python3.9/dist-pac
kages (from scikit-learn>=1.0.0->scikeras) (3.1.0)
Requirement already satisfied: joblib>=1.1.1 in /usr/local/lib/python3.9/dist-packages
(from scikit-learn>=1.0.0->scikeras) (1.2.0)
Requirement already satisfied: numpy>=1.17.3 in /usr/local/lib/python3.9/dist-packages
(from scikit-learn>=1.0.0->scikeras) (1.22.4)
Requirement already satisfied: scipy>=1.3.2 in /usr/local/lib/python3.9/dist-packages (f
rom scikit-learn>=1.0.0->scikeras) (1.10.1)
Installing collected packages: scikeras
Successfully installed scikeras-0.10.0
```

In [ ]:
```
df = pd.read_csv('emotions_preprocessed.csv')
```

In [ ]:
```
def lemmatization(text):
    lemmatizer= WordNetLemmatizer()

    text = text.split()

    text=[lemmatizer.lemmatize(y) for y in text]

    return " " .join(text)

def remove_stop_words(text):

    Text=[i for i in str(text).split() if i not in stop_words]
    return " ".join(Text)

def remove_numbers(text):
    text=''.join([i for i in text if not i.isdigit()])
    return text

def lower_case(text):

    text = text.split()

    text=[y.lower() for y in text]

    return " " .join(text)

def remove_punctuations(text):
    ## Remove punctuations
    text = re.sub('[%s]' % re.escape("""!"#$%&'()*+,،-./:;<=>؟?@[\]^_`{|}~"""), ' ', tex
    text = text.replace('؛',"", )

    ## remove extra whitespace
    text = re.sub('\s+', ' ', text)
    text =  " ".join(text.split())
    return text.strip()

def remove_urls(text):
    url = re.compile(r'https?://\S+|www\.\S+')
    return url.sub(r'', text)

def clean(df):

    df.text=df.text.apply(lambda text : remove_stop_words(text))
    df.text=df.text.apply(lambda text : remove_numbers(text))
    df.text=df.text.apply(lambda text : remove_punctuations(text))
    df.text=df.text.apply(lambda text : remove_urls(text))
    df.text=df.text.apply(lambda text : lower_case(text))
    df.text=df.text.apply(lambda text : lemmatization(text))
    return df
```

In [ ]:
```
df = clean(df)
df
```

Out[ ]:

	text	labels
0	my favourite food anything i cook myself	1
1	now himself everyone think he laugh screwing p...	1
2	why the fuck is bayless isoing	12

3	to make feel threatened	7
4	dirty southern wanker	12
...	...	...
53989	it s pretty dangerous state decides fictional ...	7
53990	i filed divorce morning hoping move next day so	11
53991	the last time happened i said no closed door	13
53992	i can’t stand arrogant prick he’s better thenf...	12
53993	but i like baby bang tiny voice	14

53994 rows × 2 columns

In [ ]:
```
X= df.text
y= df.labels
X_train, X_other, y_train, y_other = train_test_split(X, y, test_size=0.1, random_state=
X_val,X_test,y_val,y_test= train_test_split(X_other,y_other,test_size=0.5,random_state=7
#90/5/5 split used
```

In [ ]:
```
X_train.head()
```

Out[ ]:
```
41908                                my new favorite phrase
37046    in comment accuses account fake prof identity ...
3620                      ah yes good old “glass elevator”
3504                      what hell poor name poor you wow
36509    yeah dare i want green arrow material green ar...
Name: text, dtype: object
```

In [ ]:
```
le = LabelEncoder()
y_train = le.fit_transform(y_train)
y_test = le.transform(y_test)
y_val = le.transform(y_val)

y_train = to_categorical(y_train)
y_test = to_categorical(y_test)
y_val = to_categorical(y_val)
```

In [ ]:
```
# Tokenize words
tokenizer = Tokenizer(oov_token='UNK')
tokenizer.fit_on_texts(pd.concat([X_train], axis=0))
```

In [ ]:
```
X_train
```

Out[ ]:
```
41908                                my new favorite phrase
37046    in comment accuses account fake prof identity ...
3620                      ah yes good old “glass elevator”
3504                      what hell poor name poor you wow
36509    yeah dare i want green arrow material green ar...
                               ...
21563    how supposed get link first place site trustwo...
25916                                          ooo i go far
44824              at job i can do get laid lot second one
21618                                what word i m confused
23886               honestly that’s wife material get that
Name: text, Length: 48594, dtype: object
```

In [ ]:
```
sequences_train = tokenizer.texts_to_sequences(X_train)
sequences_test = tokenizer.texts_to_sequences(X_test)
sequences_val = tokenizer.texts_to_sequences(X_val)
```

In [ ]:
```
max_len = max([len(t) for t in X_train])
```

In [ ]:
```
X_train = pad_sequences(sequences_train, maxlen=max_len, truncating='pre')
X_test = pad_sequences(sequences_test, maxlen=max_len, truncating='pre')
X_val = pad_sequences(sequences_val, maxlen=max_len, truncating='pre')

vocabSize = len(tokenizer.index_word) + 1
print(f"Vocabulary size = {vocabSize}")
```

```
Vocabulary size = 25336
```

Text Representation Using Glove Embedding

In [ ]:
```
#Text Representation Using Glove Embedding
path_to_glove_file = 'glove.6B.300d.txt'
num_tokens = vocabSize
embedding_dim = 300
embeddings_index = {}
misses=0
hits=0


with open(path_to_glove_file) as f:
    for line in f:
        word, coefs = line.split(maxsplit=1)
        coefs = np.fromstring(coefs, "f", sep=" ")
        embeddings_index[word] = coefs
print("Found %s word vectors." % len(embeddings_index))


embedding_matrix = np.zeros((num_tokens, embedding_dim))
for word, i in tokenizer.word_index.items():
    embedding_vector = embeddings_index.get(word)
    if embedding_vector is not None:
        embedding_matrix[i] = embedding_vector
        hits += 1
    else:
        misses += 1
print("Converted %d words (%d misses)" % (hits, misses))
```

```
Found 12117 word vectors.
Converted 7264 words (18071 misses)
```

In [ ]:
```
X_train.shape
```

Out[ ]:
```
(48594, 531)
```

In [ ]:
```
y_train.shape
```

Out[ ]:
```
(48594, 14)
```

In [ ]:
```
# Define the function to create the model
def create_model(optimizer='adam'):
    gru_model = Sequential()
    gru_model.add(Embedding(vocabSize, 300, input_length=X_train.shape[1], weights=[embe
    gru_model.add(GRU(units=64, return_sequences=True))
    gru_model.add(Dropout(0.5))
    gru_model.add(GRU(units=32))
    gru_model.add(Dropout(0.5))
    gru_model.add(Dense(14, activation='softmax'))
    gru_model.compile(loss='categorical_crossentropy', optimizer=optimizer, metrics=['ac
    return gru_model
callback = EarlyStopping(
```

```
    monitor="val_loss",
    patience=3,
    restore_best_weights=True,
)

# Define the grid search parameter
param_grid = {
   'optimizer': [Adam(learning_rate=0.001), Adam(learning_rate=0.005), Adam(learning_rat
                 SGD(learning_rate=0.001), SGD(learning_rate=0.005), SGD(lear
                 RMSprop(learning_rate=0.001), RMSprop(learning_rate=0.005),
                 Adagrad(learning_rate=0.001), Adagrad(learning_rate=0.005),
}
```

Hypertuned GRU Model Using Grid Search

In [ ]:
```
grid_model = KerasClassifier(model=create_model)

# Create the GridSearchCV object
grid = GridSearchCV(estimator=grid_model, param_grid=param_grid ,cv=3)

# Fit the GridSearchCV object to the training data
grid_result = grid.fit(X_train,
                    y_train,
                    validation_data=(X_val, y_val),
                    verbose=1,
                    batch_size=256,
                    epochs=15,
                    callbacks=[callback]
                   )

grid_training_time = sum(grid.cv_results_['mean_fit_time'])
print("Total training time For Grid Search: {:.2f} seconds".format(grid_training_time))

# Print the best parameters and the corresponding accuracy score
print("Best Parameters: ", grid_result.best_params_)
print("Best Accuracy: %.2f%%" % (grid_result.best_score_*100))
```

```
Epoch 1/15
127/127 [==============================] - 13s 63ms/step - loss: 2.2644 - accuracy: 0.32
37 - val_loss: 1.9230 - val_accuracy: 0.4341
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9143 - accuracy: 0.434
2 - val_loss: 1.7345 - val_accuracy: 0.4904
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8001 - accuracy: 0.470
5 - val_loss: 1.6727 - val_accuracy: 0.4978
Epoch 4/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7385 - accuracy: 0.485
6 - val_loss: 1.6306 - val_accuracy: 0.5037
Epoch 5/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6954 - accuracy: 0.498
7 - val_loss: 1.5995 - val_accuracy: 0.5200
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6614 - accuracy: 0.507
3 - val_loss: 1.5744 - val_accuracy: 0.5230
Epoch 7/15
127/127 [==============================] - 7s 57ms/step - loss: 1.6354 - accuracy: 0.513
1 - val_loss: 1.5598 - val_accuracy: 0.5233
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6150 - accuracy: 0.516
9 - val_loss: 1.5488 - val_accuracy: 0.5319
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5932 - accuracy: 0.525
9 - val_loss: 1.5370 - val_accuracy: 0.5311
```

```
Epoch 10/15
127/127 [==============================] - 7s 57ms/step - loss: 1.5670 - accuracy: 0.532
3 - val_loss: 1.5290 - val_accuracy: 0.5356
Epoch 11/15
127/127 [==============================] - 7s 57ms/step - loss: 1.5507 - accuracy: 0.537
6 - val_loss: 1.5361 - val_accuracy: 0.5337
Epoch 12/15
127/127 [==============================] - 7s 57ms/step - loss: 1.5321 - accuracy: 0.540
5 - val_loss: 1.5252 - val_accuracy: 0.5400
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5177 - accuracy: 0.544
7 - val_loss: 1.5214 - val_accuracy: 0.5400
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5051 - accuracy: 0.547
6 - val_loss: 1.5251 - val_accuracy: 0.5422
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.4855 - accuracy: 0.552
6 - val_loss: 1.5157 - val_accuracy: 0.5393
507/507 [==============================] - 8s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 63ms/step - loss: 2.2899 - accuracy: 0.31
93 - val_loss: 1.9270 - val_accuracy: 0.4367
Epoch 2/15
127/127 [==============================] - 7s 57ms/step - loss: 1.9285 - accuracy: 0.436
0 - val_loss: 1.7438 - val_accuracy: 0.4930
Epoch 3/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8099 - accuracy: 0.472
2 - val_loss: 1.6683 - val_accuracy: 0.5041
Epoch 4/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7537 - accuracy: 0.486
4 - val_loss: 1.6286 - val_accuracy: 0.5181
Epoch 5/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7086 - accuracy: 0.494
8 - val_loss: 1.6008 - val_accuracy: 0.5200
Epoch 6/15
127/127 [==============================] - 7s 57ms/step - loss: 1.6672 - accuracy: 0.505
1 - val_loss: 1.5720 - val_accuracy: 0.5300
Epoch 7/15
127/127 [==============================] - 7s 57ms/step - loss: 1.6394 - accuracy: 0.514
1 - val_loss: 1.5488 - val_accuracy: 0.5319
Epoch 8/15
127/127 [==============================] - 7s 57ms/step - loss: 1.6181 - accuracy: 0.519
5 - val_loss: 1.5393 - val_accuracy: 0.5378
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6004 - accuracy: 0.524
1 - val_loss: 1.5235 - val_accuracy: 0.5430
Epoch 10/15
127/127 [==============================] - 7s 57ms/step - loss: 1.5738 - accuracy: 0.531
1 - val_loss: 1.5200 - val_accuracy: 0.5370
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5603 - accuracy: 0.534
9 - val_loss: 1.5224 - val_accuracy: 0.5381
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5403 - accuracy: 0.538
0 - val_loss: 1.5197 - val_accuracy: 0.5422
Epoch 13/15
127/127 [==============================] - 7s 57ms/step - loss: 1.5241 - accuracy: 0.541
5 - val_loss: 1.5041 - val_accuracy: 0.5478
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5121 - accuracy: 0.544
4 - val_loss: 1.5165 - val_accuracy: 0.5437
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.4899 - accuracy: 0.550
6 - val_loss: 1.5156 - val_accuracy: 0.5470
507/507 [==============================] - 7s 14ms/step
Epoch 1/15
```

```
127/127 [==============================] - 12s 64ms/step - loss: 2.3070 - accuracy: 0.30
69 - val_loss: 1.9630 - val_accuracy: 0.4233
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9307 - accuracy: 0.433
9 - val_loss: 1.7376 - val_accuracy: 0.4889
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8030 - accuracy: 0.472
6 - val_loss: 1.6648 - val_accuracy: 0.5044
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7419 - accuracy: 0.488
6 - val_loss: 1.6291 - val_accuracy: 0.5115
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6910 - accuracy: 0.500
6 - val_loss: 1.5993 - val_accuracy: 0.5222
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6521 - accuracy: 0.509
4 - val_loss: 1.5670 - val_accuracy: 0.5204
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6257 - accuracy: 0.515
0 - val_loss: 1.5587 - val_accuracy: 0.5307
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6007 - accuracy: 0.523
6 - val_loss: 1.5531 - val_accuracy: 0.5381
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5803 - accuracy: 0.528
1 - val_loss: 1.5295 - val_accuracy: 0.5356
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5551 - accuracy: 0.536
3 - val_loss: 1.5322 - val_accuracy: 0.5411
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5399 - accuracy: 0.539
5 - val_loss: 1.5052 - val_accuracy: 0.5493
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5152 - accuracy: 0.546
7 - val_loss: 1.5103 - val_accuracy: 0.5493
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5031 - accuracy: 0.551
0 - val_loss: 1.5072 - val_accuracy: 0.5493
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4820 - accuracy: 0.555
1 - val_loss: 1.5128 - val_accuracy: 0.5489
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4677 - accuracy: 0.559
7 - val_loss: 1.5049 - val_accuracy: 0.5507
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2839 - accuracy: 0.32
53 - val_loss: 1.9533 - val_accuracy: 0.4241
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9321 - accuracy: 0.435
0 - val_loss: 1.7404 - val_accuracy: 0.4815
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8037 - accuracy: 0.470
7 - val_loss: 1.6700 - val_accuracy: 0.5026
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7355 - accuracy: 0.488
1 - val_loss: 1.6267 - val_accuracy: 0.5148
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6903 - accuracy: 0.498
3 - val_loss: 1.5944 - val_accuracy: 0.5230
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6621 - accuracy: 0.507
1 - val_loss: 1.5715 - val_accuracy: 0.5248
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6329 - accuracy: 0.516
4 - val_loss: 1.5511 - val_accuracy: 0.5326
```

```
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6072 - accuracy: 0.520
8 - val_loss: 1.5422 - val_accuracy: 0.5389
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5835 - accuracy: 0.527
5 - val_loss: 1.5290 - val_accuracy: 0.5367
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5666 - accuracy: 0.532
1 - val_loss: 1.5210 - val_accuracy: 0.5419
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5469 - accuracy: 0.537
4 - val_loss: 1.5216 - val_accuracy: 0.5378
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5364 - accuracy: 0.540
1 - val_loss: 1.5137 - val_accuracy: 0.5422
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5164 - accuracy: 0.545
4 - val_loss: 1.5074 - val_accuracy: 0.5474
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4991 - accuracy: 0.548
4 - val_loss: 1.5254 - val_accuracy: 0.5430
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4857 - accuracy: 0.553
2 - val_loss: 1.5111 - val_accuracy: 0.5441
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2690 - accuracy: 0.31
92 - val_loss: 1.9103 - val_accuracy: 0.4433
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9264 - accuracy: 0.435
7 - val_loss: 1.7219 - val_accuracy: 0.4889
Epoch 3/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8031 - accuracy: 0.470
0 - val_loss: 1.6539 - val_accuracy: 0.5067
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7443 - accuracy: 0.483
3 - val_loss: 1.6176 - val_accuracy: 0.5144
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6991 - accuracy: 0.494
3 - val_loss: 1.5849 - val_accuracy: 0.5248
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6659 - accuracy: 0.503
7 - val_loss: 1.5654 - val_accuracy: 0.5274
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6404 - accuracy: 0.510
3 - val_loss: 1.5452 - val_accuracy: 0.5363
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6188 - accuracy: 0.518
2 - val_loss: 1.5322 - val_accuracy: 0.5378
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5950 - accuracy: 0.523
7 - val_loss: 1.5263 - val_accuracy: 0.5389
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5725 - accuracy: 0.528
9 - val_loss: 1.5154 - val_accuracy: 0.5411
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5566 - accuracy: 0.534
2 - val_loss: 1.5094 - val_accuracy: 0.5456
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5392 - accuracy: 0.537
3 - val_loss: 1.5038 - val_accuracy: 0.5519
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5240 - accuracy: 0.543
7 - val_loss: 1.5127 - val_accuracy: 0.5404
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5065 - accuracy: 0.544
```

```
3 - val_loss: 1.5094 - val_accuracy: 0.5485
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4976 - accuracy: 0.550
1 - val_loss: 1.5119 - val_accuracy: 0.5459
507/507 [==============================] - 8s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 66ms/step - loss: 2.2741 - accuracy: 0.32
38 - val_loss: 1.9373 - val_accuracy: 0.4256
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9288 - accuracy: 0.433
1 - val_loss: 1.7389 - val_accuracy: 0.4826
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8024 - accuracy: 0.472
1 - val_loss: 1.6699 - val_accuracy: 0.5015
Epoch 4/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7353 - accuracy: 0.487
6 - val_loss: 1.6207 - val_accuracy: 0.5178
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6928 - accuracy: 0.499
9 - val_loss: 1.6007 - val_accuracy: 0.5178
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6588 - accuracy: 0.508
1 - val_loss: 1.5735 - val_accuracy: 0.5326
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6235 - accuracy: 0.518
1 - val_loss: 1.5587 - val_accuracy: 0.5315
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6071 - accuracy: 0.523
3 - val_loss: 1.5460 - val_accuracy: 0.5319
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5813 - accuracy: 0.528
3 - val_loss: 1.5289 - val_accuracy: 0.5385
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5663 - accuracy: 0.535
6 - val_loss: 1.5208 - val_accuracy: 0.5396
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5410 - accuracy: 0.541
6 - val_loss: 1.5255 - val_accuracy: 0.5393
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5245 - accuracy: 0.548
1 - val_loss: 1.5264 - val_accuracy: 0.5378
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5137 - accuracy: 0.550
0 - val_loss: 1.5170 - val_accuracy: 0.5422
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5014 - accuracy: 0.552
9 - val_loss: 1.5005 - val_accuracy: 0.5470
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4768 - accuracy: 0.559
8 - val_loss: 1.5068 - val_accuracy: 0.5470
507/507 [==============================] - 8s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 66ms/step - loss: 2.2694 - accuracy: 0.32
24 - val_loss: 1.9222 - val_accuracy: 0.4407
Epoch 2/15
127/127 [==============================] - 7s 58ms/step - loss: 1.9219 - accuracy: 0.437
5 - val_loss: 1.7369 - val_accuracy: 0.4889
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7985 - accuracy: 0.472
6 - val_loss: 1.6633 - val_accuracy: 0.5019
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7434 - accuracy: 0.483
4 - val_loss: 1.6270 - val_accuracy: 0.5081
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6933 - accuracy: 0.499
6 - val_loss: 1.5939 - val_accuracy: 0.5174
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Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6570 - accuracy: 0.508
0 - val_loss: 1.5703 - val_accuracy: 0.5311
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6350 - accuracy: 0.513
8 - val_loss: 1.5587 - val_accuracy: 0.5330
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6101 - accuracy: 0.518
9 - val_loss: 1.5374 - val_accuracy: 0.5385
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5916 - accuracy: 0.524
4 - val_loss: 1.5394 - val_accuracy: 0.5363
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5687 - accuracy: 0.529
9 - val_loss: 1.5216 - val_accuracy: 0.5396
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5500 - accuracy: 0.536
8 - val_loss: 1.5153 - val_accuracy: 0.5493
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5373 - accuracy: 0.538
7 - val_loss: 1.5139 - val_accuracy: 0.5511
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5136 - accuracy: 0.544
7 - val_loss: 1.5116 - val_accuracy: 0.5489
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4998 - accuracy: 0.548
9 - val_loss: 1.5149 - val_accuracy: 0.5481
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.4823 - accuracy: 0.556
5 - val_loss: 1.5066 - val_accuracy: 0.5470
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 13s 65ms/step - loss: 2.2938 - accuracy: 0.31
60 - val_loss: 1.9362 - val_accuracy: 0.4226
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9368 - accuracy: 0.432
2 - val_loss: 1.7362 - val_accuracy: 0.4874
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8154 - accuracy: 0.467
0 - val_loss: 1.6683 - val_accuracy: 0.5007
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7494 - accuracy: 0.481
7 - val_loss: 1.6274 - val_accuracy: 0.5133
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7081 - accuracy: 0.493
1 - val_loss: 1.5945 - val_accuracy: 0.5233
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6760 - accuracy: 0.502
5 - val_loss: 1.5748 - val_accuracy: 0.5337
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6481 - accuracy: 0.510
5 - val_loss: 1.5536 - val_accuracy: 0.5337
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6171 - accuracy: 0.516
4 - val_loss: 1.5456 - val_accuracy: 0.5337
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6016 - accuracy: 0.520
8 - val_loss: 1.5281 - val_accuracy: 0.5404
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5785 - accuracy: 0.526
2 - val_loss: 1.5268 - val_accuracy: 0.5411
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5645 - accuracy: 0.533
2 - val_loss: 1.5132 - val_accuracy: 0.5478
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5443 - accuracy: 0.538
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0 - val_loss: 1.5219 - val_accuracy: 0.5433
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5269 - accuracy: 0.542
9 - val_loss: 1.5141 - val_accuracy: 0.5519
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5056 - accuracy: 0.546
3 - val_loss: 1.5137 - val_accuracy: 0.5489
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4980 - accuracy: 0.550
2 - val_loss: 1.5034 - val_accuracy: 0.5467
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2599 - accuracy: 0.32
95 - val_loss: 1.8920 - val_accuracy: 0.4485
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8954 - accuracy: 0.443
2 - val_loss: 1.7245 - val_accuracy: 0.4830
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7936 - accuracy: 0.474
3 - val_loss: 1.6554 - val_accuracy: 0.5030
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7260 - accuracy: 0.491
0 - val_loss: 1.6229 - val_accuracy: 0.5174
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6883 - accuracy: 0.498
1 - val_loss: 1.5927 - val_accuracy: 0.5263
Epoch 6/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6531 - accuracy: 0.510
4 - val_loss: 1.5633 - val_accuracy: 0.5300
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6299 - accuracy: 0.517
3 - val_loss: 1.5569 - val_accuracy: 0.5296
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6043 - accuracy: 0.523
9 - val_loss: 1.5461 - val_accuracy: 0.5315
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5844 - accuracy: 0.527
7 - val_loss: 1.5230 - val_accuracy: 0.5400
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5611 - accuracy: 0.534
2 - val_loss: 1.5219 - val_accuracy: 0.5415
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5479 - accuracy: 0.539
5 - val_loss: 1.5096 - val_accuracy: 0.5493
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5225 - accuracy: 0.547
3 - val_loss: 1.5076 - val_accuracy: 0.5533
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5013 - accuracy: 0.552
1 - val_loss: 1.5123 - val_accuracy: 0.5478
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4942 - accuracy: 0.555
4 - val_loss: 1.4971 - val_accuracy: 0.5570
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4709 - accuracy: 0.560
3 - val_loss: 1.4981 - val_accuracy: 0.5489
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2892 - accuracy: 0.31
74 - val_loss: 1.9313 - val_accuracy: 0.4233
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9080 - accuracy: 0.437
3 - val_loss: 1.7204 - val_accuracy: 0.4889
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7901 - accuracy: 0.471
1 - val_loss: 1.6548 - val_accuracy: 0.5030
```

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Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7289 - accuracy: 0.486
3 - val_loss: 1.6167 - val_accuracy: 0.5107
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6892 - accuracy: 0.498
4 - val_loss: 1.5876 - val_accuracy: 0.5226
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6576 - accuracy: 0.504
4 - val_loss: 1.5677 - val_accuracy: 0.5293
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6347 - accuracy: 0.515
1 - val_loss: 1.5543 - val_accuracy: 0.5304
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6031 - accuracy: 0.523
0 - val_loss: 1.5380 - val_accuracy: 0.5322
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5872 - accuracy: 0.523
5 - val_loss: 1.5338 - val_accuracy: 0.5326
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5661 - accuracy: 0.529
9 - val_loss: 1.5242 - val_accuracy: 0.5337
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5476 - accuracy: 0.537
0 - val_loss: 1.5175 - val_accuracy: 0.5385
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5293 - accuracy: 0.541
8 - val_loss: 1.5073 - val_accuracy: 0.5411
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5133 - accuracy: 0.545
6 - val_loss: 1.5024 - val_accuracy: 0.5452
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.4966 - accuracy: 0.548
9 - val_loss: 1.5030 - val_accuracy: 0.5478
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4873 - accuracy: 0.551
8 - val_loss: 1.5046 - val_accuracy: 0.5441
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2915 - accuracy: 0.31
78 - val_loss: 1.9311 - val_accuracy: 0.4370
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9291 - accuracy: 0.433
2 - val_loss: 1.7292 - val_accuracy: 0.4911
Epoch 3/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8111 - accuracy: 0.468
5 - val_loss: 1.6657 - val_accuracy: 0.5019
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7476 - accuracy: 0.484
8 - val_loss: 1.6232 - val_accuracy: 0.5163
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7008 - accuracy: 0.495
2 - val_loss: 1.6008 - val_accuracy: 0.5222
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6681 - accuracy: 0.503
6 - val_loss: 1.5655 - val_accuracy: 0.5311
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6431 - accuracy: 0.509
5 - val_loss: 1.5471 - val_accuracy: 0.5356
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6152 - accuracy: 0.516
2 - val_loss: 1.5339 - val_accuracy: 0.5344
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5910 - accuracy: 0.524
4 - val_loss: 1.5268 - val_accuracy: 0.5337
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5720 - accuracy: 0.527
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8 - val_loss: 1.5142 - val_accuracy: 0.5444
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5533 - accuracy: 0.536
5 - val_loss: 1.5096 - val_accuracy: 0.5426
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5304 - accuracy: 0.542
2 - val_loss: 1.5115 - val_accuracy: 0.5400
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5147 - accuracy: 0.544
4 - val_loss: 1.5108 - val_accuracy: 0.5404
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4991 - accuracy: 0.548
6 - val_loss: 1.4975 - val_accuracy: 0.5407
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4874 - accuracy: 0.552
2 - val_loss: 1.5047 - val_accuracy: 0.5467
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 13s 65ms/step - loss: 2.2752 - accuracy: 0.32
32 - val_loss: 1.9204 - val_accuracy: 0.4278
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9173 - accuracy: 0.438
1 - val_loss: 1.7339 - val_accuracy: 0.4852
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7928 - accuracy: 0.469
7 - val_loss: 1.6619 - val_accuracy: 0.5004
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7312 - accuracy: 0.488
8 - val_loss: 1.6241 - val_accuracy: 0.5137
Epoch 5/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6860 - accuracy: 0.502
7 - val_loss: 1.5880 - val_accuracy: 0.5270
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6546 - accuracy: 0.508
6 - val_loss: 1.5628 - val_accuracy: 0.5296
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6288 - accuracy: 0.515
9 - val_loss: 1.5548 - val_accuracy: 0.5326
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6051 - accuracy: 0.524
7 - val_loss: 1.5391 - val_accuracy: 0.5400
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5860 - accuracy: 0.529
0 - val_loss: 1.5307 - val_accuracy: 0.5385
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5636 - accuracy: 0.538
1 - val_loss: 1.5218 - val_accuracy: 0.5441
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5428 - accuracy: 0.541
0 - val_loss: 1.5284 - val_accuracy: 0.5389
Epoch 12/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5290 - accuracy: 0.542
4 - val_loss: 1.5184 - val_accuracy: 0.5415
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5166 - accuracy: 0.547
0 - val_loss: 1.5120 - val_accuracy: 0.5444
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5000 - accuracy: 0.552
8 - val_loss: 1.5060 - val_accuracy: 0.5504
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4784 - accuracy: 0.558
1 - val_loss: 1.5092 - val_accuracy: 0.5515
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2704 - accuracy: 0.32
97 - val_loss: 1.9216 - val_accuracy: 0.4256
```

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Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9287 - accuracy: 0.435
7 - val_loss: 1.7522 - val_accuracy: 0.4841
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8137 - accuracy: 0.467
0 - val_loss: 1.6834 - val_accuracy: 0.4956
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7543 - accuracy: 0.483
4 - val_loss: 1.6342 - val_accuracy: 0.5126
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7070 - accuracy: 0.497
0 - val_loss: 1.6029 - val_accuracy: 0.5181
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6660 - accuracy: 0.505
3 - val_loss: 1.5815 - val_accuracy: 0.5289
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6338 - accuracy: 0.514
9 - val_loss: 1.5634 - val_accuracy: 0.5344
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6149 - accuracy: 0.519
1 - val_loss: 1.5509 - val_accuracy: 0.5363
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5940 - accuracy: 0.525
2 - val_loss: 1.5406 - val_accuracy: 0.5381
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5713 - accuracy: 0.530
6 - val_loss: 1.5290 - val_accuracy: 0.5400
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5568 - accuracy: 0.535
5 - val_loss: 1.5228 - val_accuracy: 0.5370
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5312 - accuracy: 0.538
1 - val_loss: 1.5205 - val_accuracy: 0.5415
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5179 - accuracy: 0.543
6 - val_loss: 1.5132 - val_accuracy: 0.5433
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4941 - accuracy: 0.549
4 - val_loss: 1.5135 - val_accuracy: 0.5430
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4795 - accuracy: 0.555
2 - val_loss: 1.5194 - val_accuracy: 0.5400
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2831 - accuracy: 0.32
20 - val_loss: 1.9134 - val_accuracy: 0.4493
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9287 - accuracy: 0.433
5 - val_loss: 1.7407 - val_accuracy: 0.4863
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8131 - accuracy: 0.470
4 - val_loss: 1.6662 - val_accuracy: 0.5007
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7547 - accuracy: 0.485
2 - val_loss: 1.6276 - val_accuracy: 0.5141
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7092 - accuracy: 0.495
6 - val_loss: 1.5907 - val_accuracy: 0.5204
Epoch 6/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6687 - accuracy: 0.505
5 - val_loss: 1.5661 - val_accuracy: 0.5296
Epoch 7/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6405 - accuracy: 0.513
5 - val_loss: 1.5536 - val_accuracy: 0.5319
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6170 - accuracy: 0.517
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5 - val_loss: 1.5425 - val_accuracy: 0.5363
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5926 - accuracy: 0.527
3 - val_loss: 1.5288 - val_accuracy: 0.5370
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5761 - accuracy: 0.529
2 - val_loss: 1.5175 - val_accuracy: 0.5463
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5552 - accuracy: 0.531
9 - val_loss: 1.5241 - val_accuracy: 0.5444
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5370 - accuracy: 0.540
3 - val_loss: 1.5028 - val_accuracy: 0.5489
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5251 - accuracy: 0.543
2 - val_loss: 1.5050 - val_accuracy: 0.5500
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5010 - accuracy: 0.548
1 - val_loss: 1.5124 - val_accuracy: 0.5411
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4903 - accuracy: 0.550
4 - val_loss: 1.5041 - val_accuracy: 0.5504
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2771 - accuracy: 0.31
78 - val_loss: 1.9104 - val_accuracy: 0.4167
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9144 - accuracy: 0.435
2 - val_loss: 1.7299 - val_accuracy: 0.4874
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7889 - accuracy: 0.474
2 - val_loss: 1.6535 - val_accuracy: 0.5059
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7309 - accuracy: 0.488
0 - val_loss: 1.6144 - val_accuracy: 0.5152
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6836 - accuracy: 0.499
7 - val_loss: 1.5843 - val_accuracy: 0.5248
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6518 - accuracy: 0.508
4 - val_loss: 1.5587 - val_accuracy: 0.5289
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6205 - accuracy: 0.516
5 - val_loss: 1.5460 - val_accuracy: 0.5385
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5930 - accuracy: 0.526
4 - val_loss: 1.5292 - val_accuracy: 0.5393
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5743 - accuracy: 0.531
7 - val_loss: 1.5172 - val_accuracy: 0.5378
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5472 - accuracy: 0.538
5 - val_loss: 1.5120 - val_accuracy: 0.5374
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5348 - accuracy: 0.542
6 - val_loss: 1.5191 - val_accuracy: 0.5385
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5136 - accuracy: 0.549
9 - val_loss: 1.5020 - val_accuracy: 0.5485
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4985 - accuracy: 0.552
2 - val_loss: 1.5080 - val_accuracy: 0.5470
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.4860 - accuracy: 0.556
0 - val_loss: 1.5103 - val_accuracy: 0.5493
Epoch 15/15
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127/127 [==============================] - 7s 59ms/step - loss: 1.4656 - accuracy: 0.556
1 - val_loss: 1.4971 - val_accuracy: 0.5511
507/507 [==============================] - 9s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2827 - accuracy: 0.31
98 - val_loss: 1.9413 - val_accuracy: 0.4389
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9184 - accuracy: 0.436
3 - val_loss: 1.7406 - val_accuracy: 0.4878
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8098 - accuracy: 0.469
5 - val_loss: 1.6739 - val_accuracy: 0.4985
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7411 - accuracy: 0.487
5 - val_loss: 1.6374 - val_accuracy: 0.5074
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6995 - accuracy: 0.493
5 - val_loss: 1.6049 - val_accuracy: 0.5119
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6687 - accuracy: 0.504
9 - val_loss: 1.5756 - val_accuracy: 0.5270
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6461 - accuracy: 0.509
8 - val_loss: 1.5627 - val_accuracy: 0.5307
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6177 - accuracy: 0.519
8 - val_loss: 1.5493 - val_accuracy: 0.5330
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6038 - accuracy: 0.521
8 - val_loss: 1.5391 - val_accuracy: 0.5381
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5759 - accuracy: 0.527
3 - val_loss: 1.5324 - val_accuracy: 0.5381
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5539 - accuracy: 0.529
3 - val_loss: 1.5161 - val_accuracy: 0.5363
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5425 - accuracy: 0.537
7 - val_loss: 1.5178 - val_accuracy: 0.5415
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5279 - accuracy: 0.542
9 - val_loss: 1.5130 - val_accuracy: 0.5437
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5065 - accuracy: 0.544
1 - val_loss: 1.5038 - val_accuracy: 0.5444
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4926 - accuracy: 0.547
0 - val_loss: 1.5016 - val_accuracy: 0.5485
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2965 - accuracy: 0.31
33 - val_loss: 1.9368 - val_accuracy: 0.4267
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9273 - accuracy: 0.434
4 - val_loss: 1.7293 - val_accuracy: 0.4926
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8064 - accuracy: 0.470
1 - val_loss: 1.6607 - val_accuracy: 0.4978
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7428 - accuracy: 0.487
2 - val_loss: 1.6231 - val_accuracy: 0.5144
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7024 - accuracy: 0.497
3 - val_loss: 1.5887 - val_accuracy: 0.5207
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6687 - accuracy: 0.505
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3 - val_loss: 1.5684 - val_accuracy: 0.5281
Epoch 7/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6390 - accuracy: 0.510
3 - val_loss: 1.5472 - val_accuracy: 0.5381
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6099 - accuracy: 0.520
3 - val_loss: 1.5362 - val_accuracy: 0.5356
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5902 - accuracy: 0.525
0 - val_loss: 1.5216 - val_accuracy: 0.5422
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5693 - accuracy: 0.530
2 - val_loss: 1.5140 - val_accuracy: 0.5459
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5522 - accuracy: 0.535
6 - val_loss: 1.5072 - val_accuracy: 0.5489
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5335 - accuracy: 0.538
7 - val_loss: 1.5039 - val_accuracy: 0.5456
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5199 - accuracy: 0.545
4 - val_loss: 1.5039 - val_accuracy: 0.5467
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5043 - accuracy: 0.547
6 - val_loss: 1.4914 - val_accuracy: 0.5504
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4859 - accuracy: 0.554
7 - val_loss: 1.5002 - val_accuracy: 0.5481
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2757 - accuracy: 0.31
82 - val_loss: 1.9261 - val_accuracy: 0.4359
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9179 - accuracy: 0.436
6 - val_loss: 1.7271 - val_accuracy: 0.4959
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7930 - accuracy: 0.473
6 - val_loss: 1.6729 - val_accuracy: 0.5059
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7289 - accuracy: 0.490
6 - val_loss: 1.6216 - val_accuracy: 0.5144
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6835 - accuracy: 0.504
0 - val_loss: 1.5893 - val_accuracy: 0.5274
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6466 - accuracy: 0.509
3 - val_loss: 1.5616 - val_accuracy: 0.5326
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6220 - accuracy: 0.516
1 - val_loss: 1.5442 - val_accuracy: 0.5374
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5935 - accuracy: 0.526
7 - val_loss: 1.5378 - val_accuracy: 0.5415
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5720 - accuracy: 0.532
3 - val_loss: 1.5275 - val_accuracy: 0.5407
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5537 - accuracy: 0.538
2 - val_loss: 1.5163 - val_accuracy: 0.5459
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5421 - accuracy: 0.542
9 - val_loss: 1.5079 - val_accuracy: 0.5467
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5160 - accuracy: 0.548
6 - val_loss: 1.5111 - val_accuracy: 0.5433
Epoch 13/15
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127/127 [==============================] - 7s 59ms/step - loss: 1.5014 - accuracy: 0.553
7 - val_loss: 1.5087 - val_accuracy: 0.5452
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.4892 - accuracy: 0.554
8 - val_loss: 1.5131 - val_accuracy: 0.5485
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4739 - accuracy: 0.559
3 - val_loss: 1.5049 - val_accuracy: 0.5504
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 13s 65ms/step - loss: 2.2890 - accuracy: 0.32
18 - val_loss: 1.9433 - val_accuracy: 0.4244
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9149 - accuracy: 0.437
0 - val_loss: 1.7454 - val_accuracy: 0.4770
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7966 - accuracy: 0.476
5 - val_loss: 1.6704 - val_accuracy: 0.5033
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7415 - accuracy: 0.489
4 - val_loss: 1.6345 - val_accuracy: 0.5130
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6988 - accuracy: 0.498
7 - val_loss: 1.5974 - val_accuracy: 0.5204
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6656 - accuracy: 0.507
6 - val_loss: 1.5784 - val_accuracy: 0.5263
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6394 - accuracy: 0.513
9 - val_loss: 1.5606 - val_accuracy: 0.5307
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6141 - accuracy: 0.517
9 - val_loss: 1.5429 - val_accuracy: 0.5352
Epoch 9/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5898 - accuracy: 0.526
4 - val_loss: 1.5421 - val_accuracy: 0.5378
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5724 - accuracy: 0.530
4 - val_loss: 1.5251 - val_accuracy: 0.5381
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5528 - accuracy: 0.535
3 - val_loss: 1.5128 - val_accuracy: 0.5422
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5324 - accuracy: 0.539
7 - val_loss: 1.5010 - val_accuracy: 0.5500
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5213 - accuracy: 0.543
8 - val_loss: 1.5011 - val_accuracy: 0.5481
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4985 - accuracy: 0.550
3 - val_loss: 1.5090 - val_accuracy: 0.5500
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4861 - accuracy: 0.552
9 - val_loss: 1.4994 - val_accuracy: 0.5496
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2852 - accuracy: 0.31
36 - val_loss: 1.9413 - val_accuracy: 0.4341
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9350 - accuracy: 0.431
8 - val_loss: 1.7383 - val_accuracy: 0.4844
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8114 - accuracy: 0.469
3 - val_loss: 1.6703 - val_accuracy: 0.5026
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7502 - accuracy: 0.484
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7 - val_loss: 1.6358 - val_accuracy: 0.5181
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7033 - accuracy: 0.496
6 - val_loss: 1.5930 - val_accuracy: 0.5281
Epoch 6/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6732 - accuracy: 0.503
5 - val_loss: 1.5780 - val_accuracy: 0.5326
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6394 - accuracy: 0.509
6 - val_loss: 1.5540 - val_accuracy: 0.5374
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6240 - accuracy: 0.517
5 - val_loss: 1.5391 - val_accuracy: 0.5385
Epoch 9/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5949 - accuracy: 0.523
5 - val_loss: 1.5287 - val_accuracy: 0.5389
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5758 - accuracy: 0.530
8 - val_loss: 1.5182 - val_accuracy: 0.5474
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5583 - accuracy: 0.534
2 - val_loss: 1.5123 - val_accuracy: 0.5467
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5286 - accuracy: 0.540
4 - val_loss: 1.5084 - val_accuracy: 0.5511
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5216 - accuracy: 0.545
8 - val_loss: 1.5056 - val_accuracy: 0.5500
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5074 - accuracy: 0.546
6 - val_loss: 1.5030 - val_accuracy: 0.5522
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4855 - accuracy: 0.552
7 - val_loss: 1.5043 - val_accuracy: 0.5541
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 13s 68ms/step - loss: 2.2871 - accuracy: 0.32
24 - val_loss: 1.9364 - val_accuracy: 0.4326
Epoch 2/15
127/127 [==============================] - 8s 61ms/step - loss: 1.9223 - accuracy: 0.439
8 - val_loss: 1.7486 - val_accuracy: 0.4837
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8008 - accuracy: 0.472
3 - val_loss: 1.6801 - val_accuracy: 0.5041
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7326 - accuracy: 0.489
4 - val_loss: 1.6274 - val_accuracy: 0.5174
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6840 - accuracy: 0.502
8 - val_loss: 1.5928 - val_accuracy: 0.5259
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6516 - accuracy: 0.512
9 - val_loss: 1.5652 - val_accuracy: 0.5333
Epoch 7/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6191 - accuracy: 0.519
6 - val_loss: 1.5532 - val_accuracy: 0.5296
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5999 - accuracy: 0.525
9 - val_loss: 1.5347 - val_accuracy: 0.5404
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5753 - accuracy: 0.531
3 - val_loss: 1.5249 - val_accuracy: 0.5378
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5557 - accuracy: 0.535
2 - val_loss: 1.5157 - val_accuracy: 0.5441
Epoch 11/15
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127/127 [==============================] - 8s 59ms/step - loss: 1.5359 - accuracy: 0.542
1 - val_loss: 1.5216 - val_accuracy: 0.5389
Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5252 - accuracy: 0.544
0 - val_loss: 1.5134 - val_accuracy: 0.5481
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5010 - accuracy: 0.551
5 - val_loss: 1.5125 - val_accuracy: 0.5437
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4822 - accuracy: 0.557
9 - val_loss: 1.5016 - val_accuracy: 0.5500
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4752 - accuracy: 0.559
4 - val_loss: 1.4920 - val_accuracy: 0.5463
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2733 - accuracy: 0.32
01 - val_loss: 1.9509 - val_accuracy: 0.4348
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9225 - accuracy: 0.433
9 - val_loss: 1.7336 - val_accuracy: 0.4867
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8049 - accuracy: 0.468
7 - val_loss: 1.6628 - val_accuracy: 0.5041
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7393 - accuracy: 0.485
7 - val_loss: 1.6188 - val_accuracy: 0.5107
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6999 - accuracy: 0.497
5 - val_loss: 1.5878 - val_accuracy: 0.5196
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6611 - accuracy: 0.506
0 - val_loss: 1.5615 - val_accuracy: 0.5311
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6393 - accuracy: 0.515
0 - val_loss: 1.5497 - val_accuracy: 0.5352
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6143 - accuracy: 0.519
5 - val_loss: 1.5307 - val_accuracy: 0.5393
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5913 - accuracy: 0.526
1 - val_loss: 1.5222 - val_accuracy: 0.5426
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5698 - accuracy: 0.530
0 - val_loss: 1.5271 - val_accuracy: 0.5333
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5532 - accuracy: 0.532
8 - val_loss: 1.5104 - val_accuracy: 0.5415
Epoch 12/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5350 - accuracy: 0.537
0 - val_loss: 1.5096 - val_accuracy: 0.5433
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5111 - accuracy: 0.547
2 - val_loss: 1.5004 - val_accuracy: 0.5452
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5047 - accuracy: 0.543
7 - val_loss: 1.5113 - val_accuracy: 0.5474
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4895 - accuracy: 0.552
6 - val_loss: 1.5137 - val_accuracy: 0.5463
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 14s 67ms/step - loss: 2.2736 - accuracy: 0.32
08 - val_loss: 1.9286 - val_accuracy: 0.4396
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9306 - accuracy: 0.429
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0 - val_loss: 1.7348 - val_accuracy: 0.4933
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8121 - accuracy: 0.470
7 - val_loss: 1.6579 - val_accuracy: 0.5111
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7467 - accuracy: 0.485
1 - val_loss: 1.6362 - val_accuracy: 0.5111
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7041 - accuracy: 0.495
4 - val_loss: 1.6019 - val_accuracy: 0.5204
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6699 - accuracy: 0.507
3 - val_loss: 1.5638 - val_accuracy: 0.5356
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6403 - accuracy: 0.511
2 - val_loss: 1.5511 - val_accuracy: 0.5370
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6147 - accuracy: 0.519
1 - val_loss: 1.5395 - val_accuracy: 0.5404
Epoch 9/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5911 - accuracy: 0.523
3 - val_loss: 1.5269 - val_accuracy: 0.5448
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5693 - accuracy: 0.531
5 - val_loss: 1.5147 - val_accuracy: 0.5507
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5550 - accuracy: 0.532
8 - val_loss: 1.5198 - val_accuracy: 0.5467
Epoch 12/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5348 - accuracy: 0.538
2 - val_loss: 1.5122 - val_accuracy: 0.5444
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5208 - accuracy: 0.546
8 - val_loss: 1.5015 - val_accuracy: 0.5452
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4990 - accuracy: 0.548
2 - val_loss: 1.5260 - val_accuracy: 0.5374
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4885 - accuracy: 0.553
2 - val_loss: 1.5009 - val_accuracy: 0.5500
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 66ms/step - loss: 2.2488 - accuracy: 0.33
41 - val_loss: 1.9021 - val_accuracy: 0.4330
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9046 - accuracy: 0.438
6 - val_loss: 1.7243 - val_accuracy: 0.4870
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7933 - accuracy: 0.471
5 - val_loss: 1.6714 - val_accuracy: 0.4989
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7314 - accuracy: 0.489
1 - val_loss: 1.6277 - val_accuracy: 0.5200
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6812 - accuracy: 0.501
9 - val_loss: 1.5913 - val_accuracy: 0.5252
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6520 - accuracy: 0.512
1 - val_loss: 1.5717 - val_accuracy: 0.5296
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6237 - accuracy: 0.520
7 - val_loss: 1.5556 - val_accuracy: 0.5352
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5914 - accuracy: 0.527
6 - val_loss: 1.5473 - val_accuracy: 0.5400
Epoch 9/15
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127/127 [==============================] - 8s 59ms/step - loss: 1.5753 - accuracy: 0.532
6 - val_loss: 1.5370 - val_accuracy: 0.5433
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5539 - accuracy: 0.537
6 - val_loss: 1.5292 - val_accuracy: 0.5456
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5297 - accuracy: 0.545
9 - val_loss: 1.5201 - val_accuracy: 0.5415
Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5126 - accuracy: 0.547
8 - val_loss: 1.5109 - val_accuracy: 0.5493
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5020 - accuracy: 0.550
7 - val_loss: 1.5192 - val_accuracy: 0.5478
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4866 - accuracy: 0.555
5 - val_loss: 1.5247 - val_accuracy: 0.5504
Epoch 15/15
127/127 [==============================] - 8s 61ms/step - loss: 1.4710 - accuracy: 0.561
5 - val_loss: 1.5115 - val_accuracy: 0.5470
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2438 - accuracy: 0.33
34 - val_loss: 1.9026 - val_accuracy: 0.4389
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9129 - accuracy: 0.439
0 - val_loss: 1.7291 - val_accuracy: 0.4900
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8040 - accuracy: 0.470
4 - val_loss: 1.6723 - val_accuracy: 0.5004
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7394 - accuracy: 0.487
7 - val_loss: 1.6235 - val_accuracy: 0.5133
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6933 - accuracy: 0.498
7 - val_loss: 1.5974 - val_accuracy: 0.5178
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6607 - accuracy: 0.508
1 - val_loss: 1.5692 - val_accuracy: 0.5259
Epoch 7/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6392 - accuracy: 0.512
6 - val_loss: 1.5624 - val_accuracy: 0.5293
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6106 - accuracy: 0.519
4 - val_loss: 1.5388 - val_accuracy: 0.5367
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5886 - accuracy: 0.523
6 - val_loss: 1.5310 - val_accuracy: 0.5356
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5726 - accuracy: 0.528
1 - val_loss: 1.5131 - val_accuracy: 0.5448
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5545 - accuracy: 0.536
3 - val_loss: 1.5129 - val_accuracy: 0.5381
Epoch 12/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5357 - accuracy: 0.539
6 - val_loss: 1.5066 - val_accuracy: 0.5478
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5149 - accuracy: 0.544
9 - val_loss: 1.5168 - val_accuracy: 0.5419
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5009 - accuracy: 0.549
5 - val_loss: 1.4947 - val_accuracy: 0.5493
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4863 - accuracy: 0.550
7 - val_loss: 1.4959 - val_accuracy: 0.5519
```

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507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2952 - accuracy: 0.31
56 - val_loss: 1.9554 - val_accuracy: 0.4267
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9415 - accuracy: 0.430
2 - val_loss: 1.7313 - val_accuracy: 0.4870
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8133 - accuracy: 0.466
5 - val_loss: 1.6726 - val_accuracy: 0.5078
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7515 - accuracy: 0.482
0 - val_loss: 1.6243 - val_accuracy: 0.5167
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7045 - accuracy: 0.496
0 - val_loss: 1.5988 - val_accuracy: 0.5244
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6741 - accuracy: 0.504
0 - val_loss: 1.5820 - val_accuracy: 0.5278
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6421 - accuracy: 0.512
0 - val_loss: 1.5545 - val_accuracy: 0.5363
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6188 - accuracy: 0.516
5 - val_loss: 1.5479 - val_accuracy: 0.5359
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5988 - accuracy: 0.521
4 - val_loss: 1.5256 - val_accuracy: 0.5422
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5742 - accuracy: 0.528
8 - val_loss: 1.5204 - val_accuracy: 0.5470
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5558 - accuracy: 0.534
0 - val_loss: 1.5154 - val_accuracy: 0.5430
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5416 - accuracy: 0.537
4 - val_loss: 1.5040 - val_accuracy: 0.5485
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5224 - accuracy: 0.542
5 - val_loss: 1.5071 - val_accuracy: 0.5467
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5017 - accuracy: 0.548
1 - val_loss: 1.4963 - val_accuracy: 0.5511
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4871 - accuracy: 0.552
7 - val_loss: 1.5039 - val_accuracy: 0.5533
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 13s 65ms/step - loss: 2.2796 - accuracy: 0.31
62 - val_loss: 1.9289 - val_accuracy: 0.4322
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9172 - accuracy: 0.439
0 - val_loss: 1.7250 - val_accuracy: 0.4848
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7899 - accuracy: 0.475
5 - val_loss: 1.6536 - val_accuracy: 0.5107
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7300 - accuracy: 0.489
0 - val_loss: 1.6156 - val_accuracy: 0.5163
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6829 - accuracy: 0.502
3 - val_loss: 1.5970 - val_accuracy: 0.5233
Epoch 6/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6508 - accuracy: 0.511
4 - val_loss: 1.5668 - val_accuracy: 0.5322
Epoch 7/15
```

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127/127 [==============================] - 8s 59ms/step - loss: 1.6229 - accuracy: 0.518
3 - val_loss: 1.5483 - val_accuracy: 0.5348
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5984 - accuracy: 0.526
7 - val_loss: 1.5394 - val_accuracy: 0.5396
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5755 - accuracy: 0.532
6 - val_loss: 1.5282 - val_accuracy: 0.5378
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5535 - accuracy: 0.538
1 - val_loss: 1.5275 - val_accuracy: 0.5430
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5366 - accuracy: 0.543
5 - val_loss: 1.5245 - val_accuracy: 0.5441
Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5194 - accuracy: 0.552
0 - val_loss: 1.5152 - val_accuracy: 0.5430
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5017 - accuracy: 0.550
5 - val_loss: 1.5128 - val_accuracy: 0.5452
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4876 - accuracy: 0.555
2 - val_loss: 1.5111 - val_accuracy: 0.5452
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4692 - accuracy: 0.558
5 - val_loss: 1.5186 - val_accuracy: 0.5522
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2758 - accuracy: 0.32
05 - val_loss: 1.9346 - val_accuracy: 0.4141
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9320 - accuracy: 0.432
6 - val_loss: 1.7583 - val_accuracy: 0.4837
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8063 - accuracy: 0.467
7 - val_loss: 1.6713 - val_accuracy: 0.5041
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7457 - accuracy: 0.483
9 - val_loss: 1.6219 - val_accuracy: 0.5115
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6886 - accuracy: 0.495
9 - val_loss: 1.5972 - val_accuracy: 0.5230
Epoch 6/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6616 - accuracy: 0.505
6 - val_loss: 1.5740 - val_accuracy: 0.5311
Epoch 7/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6340 - accuracy: 0.511
5 - val_loss: 1.5515 - val_accuracy: 0.5359
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6099 - accuracy: 0.518
4 - val_loss: 1.5366 - val_accuracy: 0.5356
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5812 - accuracy: 0.527
5 - val_loss: 1.5392 - val_accuracy: 0.5344
Epoch 10/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5697 - accuracy: 0.531
9 - val_loss: 1.5266 - val_accuracy: 0.5385
Epoch 11/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5480 - accuracy: 0.535
1 - val_loss: 1.5141 - val_accuracy: 0.5389
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5352 - accuracy: 0.539
2 - val_loss: 1.5106 - val_accuracy: 0.5422
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5130 - accuracy: 0.545
0 - val_loss: 1.5095 - val_accuracy: 0.5437
```

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Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4939 - accuracy: 0.547
9 - val_loss: 1.5158 - val_accuracy: 0.5444
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4811 - accuracy: 0.556
6 - val_loss: 1.5034 - val_accuracy: 0.5470
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2899 - accuracy: 0.31
69 - val_loss: 1.9274 - val_accuracy: 0.4319
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9280 - accuracy: 0.431
2 - val_loss: 1.7431 - val_accuracy: 0.4844
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8100 - accuracy: 0.468
5 - val_loss: 1.6781 - val_accuracy: 0.5052
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7466 - accuracy: 0.485
2 - val_loss: 1.6262 - val_accuracy: 0.5141
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7040 - accuracy: 0.494
6 - val_loss: 1.5978 - val_accuracy: 0.5244
Epoch 6/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6731 - accuracy: 0.503
9 - val_loss: 1.5795 - val_accuracy: 0.5211
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6445 - accuracy: 0.508
9 - val_loss: 1.5477 - val_accuracy: 0.5404
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6173 - accuracy: 0.517
3 - val_loss: 1.5365 - val_accuracy: 0.5385
Epoch 9/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5959 - accuracy: 0.522
4 - val_loss: 1.5251 - val_accuracy: 0.5396
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5709 - accuracy: 0.530
3 - val_loss: 1.5285 - val_accuracy: 0.5437
Epoch 11/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5500 - accuracy: 0.534
0 - val_loss: 1.5119 - val_accuracy: 0.5448
Epoch 12/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5339 - accuracy: 0.538
1 - val_loss: 1.5113 - val_accuracy: 0.5441
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5208 - accuracy: 0.542
0 - val_loss: 1.5122 - val_accuracy: 0.5467
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5042 - accuracy: 0.549
1 - val_loss: 1.4974 - val_accuracy: 0.5515
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4908 - accuracy: 0.549
3 - val_loss: 1.5112 - val_accuracy: 0.5452
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2784 - accuracy: 0.31
92 - val_loss: 1.9164 - val_accuracy: 0.4333
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9128 - accuracy: 0.435
1 - val_loss: 1.7213 - val_accuracy: 0.4952
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7941 - accuracy: 0.473
6 - val_loss: 1.6541 - val_accuracy: 0.5070
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7288 - accuracy: 0.492
6 - val_loss: 1.6152 - val_accuracy: 0.5159
Epoch 5/15
```

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127/127 [==============================] - 7s 59ms/step - loss: 1.6845 - accuracy: 0.500
6 - val_loss: 1.5924 - val_accuracy: 0.5163
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6504 - accuracy: 0.509
8 - val_loss: 1.5721 - val_accuracy: 0.5278
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6284 - accuracy: 0.515
1 - val_loss: 1.5528 - val_accuracy: 0.5330
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5984 - accuracy: 0.525
3 - val_loss: 1.5400 - val_accuracy: 0.5393
Epoch 9/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5739 - accuracy: 0.532
4 - val_loss: 1.5284 - val_accuracy: 0.5385
Epoch 10/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5557 - accuracy: 0.535
8 - val_loss: 1.5219 - val_accuracy: 0.5396
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5333 - accuracy: 0.543
6 - val_loss: 1.5229 - val_accuracy: 0.5422
Epoch 12/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5153 - accuracy: 0.550
8 - val_loss: 1.5087 - val_accuracy: 0.5441
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4980 - accuracy: 0.553
3 - val_loss: 1.5182 - val_accuracy: 0.5485
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4853 - accuracy: 0.557
0 - val_loss: 1.5282 - val_accuracy: 0.5396
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4617 - accuracy: 0.562
1 - val_loss: 1.5085 - val_accuracy: 0.5433
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 67ms/step - loss: 2.2604 - accuracy: 0.32
18 - val_loss: 1.9194 - val_accuracy: 0.4344
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9143 - accuracy: 0.432
8 - val_loss: 1.7366 - val_accuracy: 0.4874
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8074 - accuracy: 0.466
6 - val_loss: 1.6803 - val_accuracy: 0.4963
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7374 - accuracy: 0.487
3 - val_loss: 1.6265 - val_accuracy: 0.5115
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6933 - accuracy: 0.497
5 - val_loss: 1.5916 - val_accuracy: 0.5189
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6573 - accuracy: 0.507
3 - val_loss: 1.5714 - val_accuracy: 0.5248
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6336 - accuracy: 0.514
7 - val_loss: 1.5645 - val_accuracy: 0.5270
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6101 - accuracy: 0.518
7 - val_loss: 1.5428 - val_accuracy: 0.5385
Epoch 9/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5848 - accuracy: 0.525
2 - val_loss: 1.5303 - val_accuracy: 0.5400
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5671 - accuracy: 0.530
0 - val_loss: 1.5243 - val_accuracy: 0.5470
Epoch 11/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5466 - accuracy: 0.535
9 - val_loss: 1.5257 - val_accuracy: 0.5426
```

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Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5274 - accuracy: 0.541
1 - val_loss: 1.5131 - val_accuracy: 0.5496
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5171 - accuracy: 0.546
9 - val_loss: 1.5112 - val_accuracy: 0.5504
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4970 - accuracy: 0.549
0 - val_loss: 1.5062 - val_accuracy: 0.5552
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4848 - accuracy: 0.553
0 - val_loss: 1.5031 - val_accuracy: 0.5500
507/507 [==============================] - 8s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 67ms/step - loss: 2.3007 - accuracy: 0.31
11 - val_loss: 1.9463 - val_accuracy: 0.4378
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9451 - accuracy: 0.428
3 - val_loss: 1.7297 - val_accuracy: 0.4944
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8226 - accuracy: 0.464
5 - val_loss: 1.6729 - val_accuracy: 0.5019
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7571 - accuracy: 0.483
3 - val_loss: 1.6207 - val_accuracy: 0.5107
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7093 - accuracy: 0.495
2 - val_loss: 1.5924 - val_accuracy: 0.5200
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6718 - accuracy: 0.503
1 - val_loss: 1.5693 - val_accuracy: 0.5226
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6391 - accuracy: 0.510
1 - val_loss: 1.5468 - val_accuracy: 0.5293
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6229 - accuracy: 0.518
3 - val_loss: 1.5399 - val_accuracy: 0.5385
Epoch 9/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5910 - accuracy: 0.524
8 - val_loss: 1.5193 - val_accuracy: 0.5470
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5707 - accuracy: 0.528
5 - val_loss: 1.5085 - val_accuracy: 0.5444
Epoch 11/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5523 - accuracy: 0.535
8 - val_loss: 1.5106 - val_accuracy: 0.5430
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5348 - accuracy: 0.538
8 - val_loss: 1.5057 - val_accuracy: 0.5481
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.5191 - accuracy: 0.546
1 - val_loss: 1.4989 - val_accuracy: 0.5493
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5044 - accuracy: 0.547
7 - val_loss: 1.5014 - val_accuracy: 0.5441
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.4849 - accuracy: 0.553
3 - val_loss: 1.4971 - val_accuracy: 0.5489
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2442 - accuracy: 0.33
27 - val_loss: 1.9218 - val_accuracy: 0.4456
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9065 - accuracy: 0.441
8 - val_loss: 1.7365 - val_accuracy: 0.4896
Epoch 3/15
```

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127/127 [==============================] - 8s 60ms/step - loss: 1.7903 - accuracy: 0.474
0 - val_loss: 1.6769 - val_accuracy: 0.5033
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7380 - accuracy: 0.487
3 - val_loss: 1.6343 - val_accuracy: 0.5137
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6962 - accuracy: 0.498
1 - val_loss: 1.6048 - val_accuracy: 0.5189
Epoch 6/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6577 - accuracy: 0.509
0 - val_loss: 1.5846 - val_accuracy: 0.5237
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6388 - accuracy: 0.515
5 - val_loss: 1.5746 - val_accuracy: 0.5300
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6041 - accuracy: 0.521
8 - val_loss: 1.5555 - val_accuracy: 0.5341
Epoch 9/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5871 - accuracy: 0.527
8 - val_loss: 1.5546 - val_accuracy: 0.5326
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5635 - accuracy: 0.533
7 - val_loss: 1.5376 - val_accuracy: 0.5415
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5463 - accuracy: 0.540
5 - val_loss: 1.5366 - val_accuracy: 0.5441
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.5262 - accuracy: 0.544
8 - val_loss: 1.5378 - val_accuracy: 0.5385
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5093 - accuracy: 0.547
1 - val_loss: 1.5320 - val_accuracy: 0.5400
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4924 - accuracy: 0.553
5 - val_loss: 1.5213 - val_accuracy: 0.5404
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.4761 - accuracy: 0.560
2 - val_loss: 1.5302 - val_accuracy: 0.5415
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 14s 68ms/step - loss: 2.2839 - accuracy: 0.31
82 - val_loss: 1.9307 - val_accuracy: 0.4300
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9154 - accuracy: 0.438
6 - val_loss: 1.7245 - val_accuracy: 0.4863
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7943 - accuracy: 0.471
1 - val_loss: 1.6590 - val_accuracy: 0.5037
Epoch 4/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7355 - accuracy: 0.484
1 - val_loss: 1.6164 - val_accuracy: 0.5089
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6906 - accuracy: 0.497
8 - val_loss: 1.5883 - val_accuracy: 0.5170
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6596 - accuracy: 0.505
7 - val_loss: 1.5673 - val_accuracy: 0.5252
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6339 - accuracy: 0.512
9 - val_loss: 1.5583 - val_accuracy: 0.5256
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6121 - accuracy: 0.517
8 - val_loss: 1.5405 - val_accuracy: 0.5315
Epoch 9/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5871 - accuracy: 0.526
7 - val_loss: 1.5378 - val_accuracy: 0.5352
```

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Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5746 - accuracy: 0.529
3 - val_loss: 1.5317 - val_accuracy: 0.5367
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5513 - accuracy: 0.535
8 - val_loss: 1.5252 - val_accuracy: 0.5456
Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5347 - accuracy: 0.539
5 - val_loss: 1.5121 - val_accuracy: 0.5426
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5234 - accuracy: 0.545
8 - val_loss: 1.5133 - val_accuracy: 0.5415
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.4977 - accuracy: 0.549
4 - val_loss: 1.5161 - val_accuracy: 0.5441
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4857 - accuracy: 0.554
6 - val_loss: 1.5178 - val_accuracy: 0.5478
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 66ms/step - loss: 2.2847 - accuracy: 0.31
40 - val_loss: 1.9168 - val_accuracy: 0.4385
Epoch 2/15
127/127 [==============================] - 8s 61ms/step - loss: 1.9318 - accuracy: 0.430
7 - val_loss: 1.7297 - val_accuracy: 0.4911
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.8026 - accuracy: 0.471
3 - val_loss: 1.6470 - val_accuracy: 0.5122
Epoch 4/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7409 - accuracy: 0.487
4 - val_loss: 1.6031 - val_accuracy: 0.5215
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6970 - accuracy: 0.501
0 - val_loss: 1.5908 - val_accuracy: 0.5222
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6631 - accuracy: 0.506
9 - val_loss: 1.5606 - val_accuracy: 0.5304
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6367 - accuracy: 0.511
8 - val_loss: 1.5406 - val_accuracy: 0.5359
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6157 - accuracy: 0.520
4 - val_loss: 1.5264 - val_accuracy: 0.5441
Epoch 9/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5921 - accuracy: 0.526
6 - val_loss: 1.5274 - val_accuracy: 0.5400
Epoch 10/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5721 - accuracy: 0.530
9 - val_loss: 1.5115 - val_accuracy: 0.5474
Epoch 11/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5522 - accuracy: 0.535
4 - val_loss: 1.5148 - val_accuracy: 0.5474
Epoch 12/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5374 - accuracy: 0.541
2 - val_loss: 1.5056 - val_accuracy: 0.5493
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5182 - accuracy: 0.543
0 - val_loss: 1.4901 - val_accuracy: 0.5530
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5091 - accuracy: 0.546
5 - val_loss: 1.4918 - val_accuracy: 0.5544
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4885 - accuracy: 0.553
0 - val_loss: 1.4879 - val_accuracy: 0.5511
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
```

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127/127 [==============================] - 12s 68ms/step - loss: 2.2763 - accuracy: 0.31
58 - val_loss: 1.9379 - val_accuracy: 0.4230
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9314 - accuracy: 0.429
6 - val_loss: 1.7240 - val_accuracy: 0.4859
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7922 - accuracy: 0.472
7 - val_loss: 1.6577 - val_accuracy: 0.5026
Epoch 4/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7293 - accuracy: 0.488
2 - val_loss: 1.6144 - val_accuracy: 0.5096
Epoch 5/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6822 - accuracy: 0.503
5 - val_loss: 1.5826 - val_accuracy: 0.5267
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6473 - accuracy: 0.510
2 - val_loss: 1.5711 - val_accuracy: 0.5296
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6168 - accuracy: 0.517
6 - val_loss: 1.5481 - val_accuracy: 0.5315
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5941 - accuracy: 0.526
5 - val_loss: 1.5341 - val_accuracy: 0.5363
Epoch 9/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5697 - accuracy: 0.532
5 - val_loss: 1.5249 - val_accuracy: 0.5385
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5571 - accuracy: 0.537
2 - val_loss: 1.5204 - val_accuracy: 0.5426
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5345 - accuracy: 0.541
7 - val_loss: 1.5142 - val_accuracy: 0.5456
Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5143 - accuracy: 0.547
0 - val_loss: 1.5113 - val_accuracy: 0.5459
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5008 - accuracy: 0.552
4 - val_loss: 1.5066 - val_accuracy: 0.5493
Epoch 14/15
127/127 [==============================] - 8s 61ms/step - loss: 1.4879 - accuracy: 0.555
2 - val_loss: 1.5002 - val_accuracy: 0.5559
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4739 - accuracy: 0.558
7 - val_loss: 1.4993 - val_accuracy: 0.5522
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 66ms/step - loss: 2.2718 - accuracy: 0.32
82 - val_loss: 1.9216 - val_accuracy: 0.4337
Epoch 2/15
127/127 [==============================] - 8s 61ms/step - loss: 1.9119 - accuracy: 0.437
6 - val_loss: 1.7539 - val_accuracy: 0.4852
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.8019 - accuracy: 0.469
5 - val_loss: 1.6695 - val_accuracy: 0.5067
Epoch 4/15
127/127 [==============================] - 8s 62ms/step - loss: 1.7427 - accuracy: 0.484
9 - val_loss: 1.6241 - val_accuracy: 0.5189
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6988 - accuracy: 0.499
4 - val_loss: 1.6074 - val_accuracy: 0.5207
Epoch 6/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6628 - accuracy: 0.506
1 - val_loss: 1.5734 - val_accuracy: 0.5285
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6364 - accuracy: 0.510
4 - val_loss: 1.5613 - val_accuracy: 0.5337
```

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Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6145 - accuracy: 0.520
8 - val_loss: 1.5391 - val_accuracy: 0.5378
Epoch 9/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5885 - accuracy: 0.524
8 - val_loss: 1.5311 - val_accuracy: 0.5381
Epoch 10/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5726 - accuracy: 0.529
7 - val_loss: 1.5271 - val_accuracy: 0.5352
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5541 - accuracy: 0.532
9 - val_loss: 1.5167 - val_accuracy: 0.5419
Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5342 - accuracy: 0.539
5 - val_loss: 1.5098 - val_accuracy: 0.5459
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5121 - accuracy: 0.545
6 - val_loss: 1.5083 - val_accuracy: 0.5478
Epoch 14/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5059 - accuracy: 0.547
1 - val_loss: 1.5095 - val_accuracy: 0.5537
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4838 - accuracy: 0.550
8 - val_loss: 1.5013 - val_accuracy: 0.5552
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 13s 66ms/step - loss: 2.2819 - accuracy: 0.31
53 - val_loss: 1.9321 - val_accuracy: 0.4233
Epoch 2/15
127/127 [==============================] - 8s 61ms/step - loss: 1.9400 - accuracy: 0.423
8 - val_loss: 1.7343 - val_accuracy: 0.4852
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.8163 - accuracy: 0.464
6 - val_loss: 1.6689 - val_accuracy: 0.4993
Epoch 4/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7534 - accuracy: 0.483
1 - val_loss: 1.6163 - val_accuracy: 0.5089
Epoch 5/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7087 - accuracy: 0.494
1 - val_loss: 1.5870 - val_accuracy: 0.5193
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6744 - accuracy: 0.502
8 - val_loss: 1.5705 - val_accuracy: 0.5300
Epoch 7/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6437 - accuracy: 0.509
0 - val_loss: 1.5550 - val_accuracy: 0.5285
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6183 - accuracy: 0.520
0 - val_loss: 1.5356 - val_accuracy: 0.5381
Epoch 9/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5864 - accuracy: 0.525
4 - val_loss: 1.5263 - val_accuracy: 0.5426
Epoch 10/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5763 - accuracy: 0.528
5 - val_loss: 1.5201 - val_accuracy: 0.5411
Epoch 11/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5575 - accuracy: 0.534
6 - val_loss: 1.5150 - val_accuracy: 0.5385
Epoch 12/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5340 - accuracy: 0.539
8 - val_loss: 1.5160 - val_accuracy: 0.5448
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5164 - accuracy: 0.545
8 - val_loss: 1.5101 - val_accuracy: 0.5437
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5030 - accuracy: 0.552
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1 - val_loss: 1.5020 - val_accuracy: 0.5456
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4850 - accuracy: 0.552
2 - val_loss: 1.5031 - val_accuracy: 0.5470
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2791 - accuracy: 0.32
08 - val_loss: 1.9409 - val_accuracy: 0.4233
Epoch 2/15
127/127 [==============================] - 8s 62ms/step - loss: 1.9101 - accuracy: 0.437
4 - val_loss: 1.7347 - val_accuracy: 0.4826
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7888 - accuracy: 0.473
6 - val_loss: 1.6539 - val_accuracy: 0.5037
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7295 - accuracy: 0.491
0 - val_loss: 1.6171 - val_accuracy: 0.5159
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6811 - accuracy: 0.504
0 - val_loss: 1.5811 - val_accuracy: 0.5267
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6453 - accuracy: 0.510
6 - val_loss: 1.5641 - val_accuracy: 0.5322
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6191 - accuracy: 0.519
4 - val_loss: 1.5434 - val_accuracy: 0.5393
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5921 - accuracy: 0.524
2 - val_loss: 1.5434 - val_accuracy: 0.5400
Epoch 9/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5736 - accuracy: 0.531
3 - val_loss: 1.5298 - val_accuracy: 0.5426
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5555 - accuracy: 0.537
6 - val_loss: 1.5300 - val_accuracy: 0.5433
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5302 - accuracy: 0.545
2 - val_loss: 1.5091 - val_accuracy: 0.5485
Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5178 - accuracy: 0.544
9 - val_loss: 1.5122 - val_accuracy: 0.5470
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5063 - accuracy: 0.552
1 - val_loss: 1.5048 - val_accuracy: 0.5519
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4833 - accuracy: 0.552
9 - val_loss: 1.5038 - val_accuracy: 0.5522
Epoch 15/15
127/127 [==============================] - 8s 61ms/step - loss: 1.4678 - accuracy: 0.558
2 - val_loss: 1.5014 - val_accuracy: 0.5537
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 66ms/step - loss: 2.2791 - accuracy: 0.32
63 - val_loss: 1.9222 - val_accuracy: 0.4337
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9216 - accuracy: 0.442
6 - val_loss: 1.7290 - val_accuracy: 0.4874
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.8015 - accuracy: 0.474
6 - val_loss: 1.6636 - val_accuracy: 0.5022
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7335 - accuracy: 0.489
6 - val_loss: 1.6210 - val_accuracy: 0.5159
Epoch 5/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6938 - accuracy: 0.499
5 - val_loss: 1.5925 - val_accuracy: 0.5270
```

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Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6628 - accuracy: 0.507
8 - val_loss: 1.5781 - val_accuracy: 0.5241
Epoch 7/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6309 - accuracy: 0.514
5 - val_loss: 1.5563 - val_accuracy: 0.5333
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6131 - accuracy: 0.519
6 - val_loss: 1.5444 - val_accuracy: 0.5356
Epoch 9/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5881 - accuracy: 0.522
8 - val_loss: 1.5358 - val_accuracy: 0.5359
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5681 - accuracy: 0.531
5 - val_loss: 1.5228 - val_accuracy: 0.5470
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5496 - accuracy: 0.534
8 - val_loss: 1.5161 - val_accuracy: 0.5448
Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5337 - accuracy: 0.539
7 - val_loss: 1.5089 - val_accuracy: 0.5474
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5145 - accuracy: 0.544
7 - val_loss: 1.5112 - val_accuracy: 0.5426
Epoch 14/15
127/127 [==============================] - 8s 61ms/step - loss: 1.4997 - accuracy: 0.553
7 - val_loss: 1.5203 - val_accuracy: 0.5430
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4836 - accuracy: 0.554
2 - val_loss: 1.5018 - val_accuracy: 0.5489
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2847 - accuracy: 0.31
31 - val_loss: 1.9324 - val_accuracy: 0.4348
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9510 - accuracy: 0.429
0 - val_loss: 1.7418 - val_accuracy: 0.4878
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.8175 - accuracy: 0.471
4 - val_loss: 1.6630 - val_accuracy: 0.5070
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7522 - accuracy: 0.485
7 - val_loss: 1.6203 - val_accuracy: 0.5189
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7069 - accuracy: 0.495
1 - val_loss: 1.5932 - val_accuracy: 0.5274
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6740 - accuracy: 0.502
8 - val_loss: 1.5645 - val_accuracy: 0.5319
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6505 - accuracy: 0.508
7 - val_loss: 1.5513 - val_accuracy: 0.5296
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6185 - accuracy: 0.516
6 - val_loss: 1.5473 - val_accuracy: 0.5337
Epoch 9/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5951 - accuracy: 0.521
8 - val_loss: 1.5246 - val_accuracy: 0.5407
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5822 - accuracy: 0.529
2 - val_loss: 1.5034 - val_accuracy: 0.5474
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5634 - accuracy: 0.533
2 - val_loss: 1.5053 - val_accuracy: 0.5481
Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5381 - accuracy: 0.538
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9 - val_loss: 1.4977 - val_accuracy: 0.5459
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5157 - accuracy: 0.544
5 - val_loss: 1.4930 - val_accuracy: 0.5478
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5101 - accuracy: 0.547
5 - val_loss: 1.4927 - val_accuracy: 0.5507
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4906 - accuracy: 0.550
7 - val_loss: 1.4925 - val_accuracy: 0.5515
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 13s 67ms/step - loss: 2.2301 - accuracy: 0.33
38 - val_loss: 1.9112 - val_accuracy: 0.4344
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9088 - accuracy: 0.440
3 - val_loss: 1.7440 - val_accuracy: 0.4896
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7968 - accuracy: 0.470
5 - val_loss: 1.6677 - val_accuracy: 0.5037
Epoch 4/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7279 - accuracy: 0.486
8 - val_loss: 1.6207 - val_accuracy: 0.5144
Epoch 5/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6842 - accuracy: 0.499
6 - val_loss: 1.5895 - val_accuracy: 0.5226
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6515 - accuracy: 0.508
4 - val_loss: 1.5670 - val_accuracy: 0.5296
Epoch 7/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6195 - accuracy: 0.518
3 - val_loss: 1.5526 - val_accuracy: 0.5344
Epoch 8/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5988 - accuracy: 0.523
5 - val_loss: 1.5328 - val_accuracy: 0.5326
Epoch 9/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5793 - accuracy: 0.527
4 - val_loss: 1.5307 - val_accuracy: 0.5396
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5552 - accuracy: 0.536
1 - val_loss: 1.5147 - val_accuracy: 0.5396
Epoch 11/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5413 - accuracy: 0.543
1 - val_loss: 1.5127 - val_accuracy: 0.5389
Epoch 12/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5252 - accuracy: 0.544
4 - val_loss: 1.5075 - val_accuracy: 0.5444
Epoch 13/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5091 - accuracy: 0.548
6 - val_loss: 1.5010 - val_accuracy: 0.5500
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4938 - accuracy: 0.551
7 - val_loss: 1.5010 - val_accuracy: 0.5478
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4748 - accuracy: 0.559
5 - val_loss: 1.5050 - val_accuracy: 0.5459
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 68ms/step - loss: 2.2706 - accuracy: 0.32
33 - val_loss: 1.9393 - val_accuracy: 0.4211
Epoch 2/15
127/127 [==============================] - 8s 61ms/step - loss: 1.9245 - accuracy: 0.436
8 - val_loss: 1.7330 - val_accuracy: 0.4919
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.8082 - accuracy: 0.470
6 - val_loss: 1.6645 - val_accuracy: 0.5022
```

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Epoch 4/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7422 - accuracy: 0.485
0 - val_loss: 1.6238 - val_accuracy: 0.5093
Epoch 5/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6977 - accuracy: 0.496
3 - val_loss: 1.5963 - val_accuracy: 0.5181
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6639 - accuracy: 0.505
2 - val_loss: 1.5752 - val_accuracy: 0.5263
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6386 - accuracy: 0.510
9 - val_loss: 1.5542 - val_accuracy: 0.5330
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6126 - accuracy: 0.518
6 - val_loss: 1.5478 - val_accuracy: 0.5330
Epoch 9/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6011 - accuracy: 0.522
9 - val_loss: 1.5310 - val_accuracy: 0.5415
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5673 - accuracy: 0.531
1 - val_loss: 1.5312 - val_accuracy: 0.5441
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5620 - accuracy: 0.534
8 - val_loss: 1.5196 - val_accuracy: 0.5422
Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5361 - accuracy: 0.540
7 - val_loss: 1.5183 - val_accuracy: 0.5441
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5219 - accuracy: 0.544
4 - val_loss: 1.5095 - val_accuracy: 0.5452
Epoch 14/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5096 - accuracy: 0.547
9 - val_loss: 1.5050 - val_accuracy: 0.5444
Epoch 15/15
127/127 [==============================] - 8s 61ms/step - loss: 1.4904 - accuracy: 0.551
5 - val_loss: 1.5121 - val_accuracy: 0.5444
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 66ms/step - loss: 2.2921 - accuracy: 0.31
02 - val_loss: 1.9177 - val_accuracy: 0.4307
Epoch 2/15
127/127 [==============================] - 8s 61ms/step - loss: 1.9188 - accuracy: 0.433
3 - val_loss: 1.7353 - val_accuracy: 0.4856
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.8080 - accuracy: 0.468
6 - val_loss: 1.6740 - val_accuracy: 0.5011
Epoch 4/15
127/127 [==============================] - 8s 62ms/step - loss: 1.7449 - accuracy: 0.482
1 - val_loss: 1.6239 - val_accuracy: 0.5100
Epoch 5/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7051 - accuracy: 0.493
9 - val_loss: 1.5997 - val_accuracy: 0.5233
Epoch 6/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6649 - accuracy: 0.507
2 - val_loss: 1.5665 - val_accuracy: 0.5259
Epoch 7/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6404 - accuracy: 0.510
3 - val_loss: 1.5505 - val_accuracy: 0.5285
Epoch 8/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6136 - accuracy: 0.517
9 - val_loss: 1.5457 - val_accuracy: 0.5311
Epoch 9/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5913 - accuracy: 0.523
1 - val_loss: 1.5272 - val_accuracy: 0.5359
Epoch 10/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5691 - accuracy: 0.528
```

```
5 - val_loss: 1.5178 - val_accuracy: 0.5415
Epoch 11/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5526 - accuracy: 0.532
7 - val_loss: 1.5128 - val_accuracy: 0.5359
Epoch 12/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5342 - accuracy: 0.541
1 - val_loss: 1.5066 - val_accuracy: 0.5411
Epoch 13/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5253 - accuracy: 0.542
8 - val_loss: 1.5041 - val_accuracy: 0.5393
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5016 - accuracy: 0.550
4 - val_loss: 1.4990 - val_accuracy: 0.5437
Epoch 15/15
127/127 [==============================] - 8s 61ms/step - loss: 1.4871 - accuracy: 0.552
5 - val_loss: 1.5121 - val_accuracy: 0.5378
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2637 - accuracy: 0.32
55 - val_loss: 1.8963 - val_accuracy: 0.4359
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9106 - accuracy: 0.438
9 - val_loss: 1.7219 - val_accuracy: 0.4870
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7926 - accuracy: 0.472
4 - val_loss: 1.6568 - val_accuracy: 0.5074
Epoch 4/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7310 - accuracy: 0.489
0 - val_loss: 1.6169 - val_accuracy: 0.5085
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6896 - accuracy: 0.498
5 - val_loss: 1.5822 - val_accuracy: 0.5248
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6505 - accuracy: 0.510
6 - val_loss: 1.5585 - val_accuracy: 0.5311
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6261 - accuracy: 0.516
7 - val_loss: 1.5457 - val_accuracy: 0.5326
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5977 - accuracy: 0.525
0 - val_loss: 1.5312 - val_accuracy: 0.5400
Epoch 9/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5769 - accuracy: 0.529
0 - val_loss: 1.5198 - val_accuracy: 0.5426
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5539 - accuracy: 0.535
8 - val_loss: 1.5112 - val_accuracy: 0.5478
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5460 - accuracy: 0.538
8 - val_loss: 1.5042 - val_accuracy: 0.5430
Epoch 12/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5244 - accuracy: 0.546
4 - val_loss: 1.4984 - val_accuracy: 0.5496
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5060 - accuracy: 0.550
8 - val_loss: 1.4999 - val_accuracy: 0.5441
Epoch 14/15
127/127 [==============================] - 8s 61ms/step - loss: 1.4844 - accuracy: 0.556
1 - val_loss: 1.4928 - val_accuracy: 0.5493
Epoch 15/15
127/127 [==============================] - 8s 61ms/step - loss: 1.4783 - accuracy: 0.557
1 - val_loss: 1.4933 - val_accuracy: 0.5526
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2931 - accuracy: 0.32
59 - val_loss: 1.9398 - val_accuracy: 0.4330
```

```
Epoch 2/15
127/127 [==============================] - 8s 61ms/step - loss: 1.9292 - accuracy: 0.439
9 - val_loss: 1.7394 - val_accuracy: 0.4874
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.8019 - accuracy: 0.474
6 - val_loss: 1.6653 - val_accuracy: 0.4985
Epoch 4/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7409 - accuracy: 0.488
5 - val_loss: 1.6275 - val_accuracy: 0.5074
Epoch 5/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6951 - accuracy: 0.498
7 - val_loss: 1.5982 - val_accuracy: 0.5144
Epoch 6/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6629 - accuracy: 0.509
1 - val_loss: 1.5687 - val_accuracy: 0.5267
Epoch 7/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6385 - accuracy: 0.513
1 - val_loss: 1.5558 - val_accuracy: 0.5296
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6082 - accuracy: 0.521
4 - val_loss: 1.5443 - val_accuracy: 0.5281
Epoch 9/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5919 - accuracy: 0.525
6 - val_loss: 1.5204 - val_accuracy: 0.5352
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5708 - accuracy: 0.529
0 - val_loss: 1.5121 - val_accuracy: 0.5378
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5491 - accuracy: 0.536
5 - val_loss: 1.5097 - val_accuracy: 0.5404
Epoch 12/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5325 - accuracy: 0.540
3 - val_loss: 1.5019 - val_accuracy: 0.5441
Epoch 13/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5139 - accuracy: 0.547
2 - val_loss: 1.5048 - val_accuracy: 0.5470
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5006 - accuracy: 0.550
1 - val_loss: 1.4903 - val_accuracy: 0.5526
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4896 - accuracy: 0.553
8 - val_loss: 1.4949 - val_accuracy: 0.5533
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 68ms/step - loss: 2.2668 - accuracy: 0.32
10 - val_loss: 1.9192 - val_accuracy: 0.4344
Epoch 2/15
127/127 [==============================] - 8s 61ms/step - loss: 1.9221 - accuracy: 0.433
0 - val_loss: 1.7413 - val_accuracy: 0.4822
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.8040 - accuracy: 0.469
7 - val_loss: 1.6705 - val_accuracy: 0.5015
Epoch 4/15
127/127 [==============================] - 8s 62ms/step - loss: 1.7370 - accuracy: 0.487
2 - val_loss: 1.6198 - val_accuracy: 0.5181
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6962 - accuracy: 0.498
4 - val_loss: 1.5895 - val_accuracy: 0.5244
Epoch 6/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6686 - accuracy: 0.505
5 - val_loss: 1.5653 - val_accuracy: 0.5270
Epoch 7/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6386 - accuracy: 0.514
4 - val_loss: 1.5578 - val_accuracy: 0.5356
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6134 - accuracy: 0.520
```

```
4 - val_loss: 1.5383 - val_accuracy: 0.5352
Epoch 9/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5952 - accuracy: 0.525
2 - val_loss: 1.5287 - val_accuracy: 0.5337
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5768 - accuracy: 0.526
2 - val_loss: 1.5249 - val_accuracy: 0.5437
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5552 - accuracy: 0.532
1 - val_loss: 1.5176 - val_accuracy: 0.5437
Epoch 12/15
127/127 [==============================] - 8s 59ms/step - loss: 1.5400 - accuracy: 0.536
3 - val_loss: 1.5256 - val_accuracy: 0.5430
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5209 - accuracy: 0.541
3 - val_loss: 1.5078 - val_accuracy: 0.5500
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5038 - accuracy: 0.547
8 - val_loss: 1.5095 - val_accuracy: 0.5493
Epoch 15/15
127/127 [==============================] - 8s 61ms/step - loss: 1.4883 - accuracy: 0.551
6 - val_loss: 1.4997 - val_accuracy: 0.5459
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
127/127 [==============================] - 12s 67ms/step - loss: 2.2962 - accuracy: 0.31
60 - val_loss: 1.9236 - val_accuracy: 0.4419
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9149 - accuracy: 0.438
4 - val_loss: 1.7254 - val_accuracy: 0.4937
Epoch 3/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7903 - accuracy: 0.472
0 - val_loss: 1.6573 - val_accuracy: 0.5056
Epoch 4/15
127/127 [==============================] - 8s 61ms/step - loss: 1.7267 - accuracy: 0.489
2 - val_loss: 1.6123 - val_accuracy: 0.5181
Epoch 5/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6808 - accuracy: 0.501
8 - val_loss: 1.5873 - val_accuracy: 0.5296
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6458 - accuracy: 0.513
0 - val_loss: 1.5680 - val_accuracy: 0.5304
Epoch 7/15
127/127 [==============================] - 8s 61ms/step - loss: 1.6132 - accuracy: 0.520
3 - val_loss: 1.5506 - val_accuracy: 0.5367
Epoch 8/15
127/127 [==============================] - 8s 61ms/step - loss: 1.5968 - accuracy: 0.525
6 - val_loss: 1.5333 - val_accuracy: 0.5411
Epoch 9/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5704 - accuracy: 0.533
2 - val_loss: 1.5228 - val_accuracy: 0.5452
Epoch 10/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5533 - accuracy: 0.538
6 - val_loss: 1.5222 - val_accuracy: 0.5452
Epoch 11/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5325 - accuracy: 0.543
7 - val_loss: 1.5197 - val_accuracy: 0.5467
Epoch 12/15
127/127 [==============================] - 8s 60ms/step - loss: 1.5111 - accuracy: 0.547
1 - val_loss: 1.5088 - val_accuracy: 0.5481
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4939 - accuracy: 0.557
2 - val_loss: 1.5058 - val_accuracy: 0.5511
Epoch 14/15
127/127 [==============================] - 8s 60ms/step - loss: 1.4846 - accuracy: 0.557
3 - val_loss: 1.5019 - val_accuracy: 0.5478
Epoch 15/15
```

```
127/127 [==============================] - 8s 61ms/step - loss: 1.4719 - accuracy: 0.559
5 - val_loss: 1.5105 - val_accuracy: 0.5496
507/507 [==============================] - 8s 15ms/step
Epoch 1/15
190/190 [==============================] - 17s 64ms/step - loss: 2.1786 - accuracy: 0.35
10 - val_loss: 1.7778 - val_accuracy: 0.4752
Epoch 2/15
190/190 [==============================] - 11s 60ms/step - loss: 1.8239 - accuracy: 0.46
59 - val_loss: 1.6561 - val_accuracy: 0.5093
Epoch 3/15
190/190 [==============================] - 12s 61ms/step - loss: 1.7345 - accuracy: 0.48
77 - val_loss: 1.5998 - val_accuracy: 0.5204
Epoch 4/15
190/190 [==============================] - 11s 60ms/step - loss: 1.6841 - accuracy: 0.50
07 - val_loss: 1.5616 - val_accuracy: 0.5278
Epoch 5/15
190/190 [==============================] - 11s 60ms/step - loss: 1.6459 - accuracy: 0.51
18 - val_loss: 1.5422 - val_accuracy: 0.5333
Epoch 6/15
190/190 [==============================] - 11s 59ms/step - loss: 1.6190 - accuracy: 0.51
85 - val_loss: 1.5196 - val_accuracy: 0.5396
Epoch 7/15
190/190 [==============================] - 11s 60ms/step - loss: 1.5955 - accuracy: 0.52
68 - val_loss: 1.5122 - val_accuracy: 0.5407
Epoch 8/15
190/190 [==============================] - 11s 60ms/step - loss: 1.5745 - accuracy: 0.52
95 - val_loss: 1.5021 - val_accuracy: 0.5504
Epoch 9/15
190/190 [==============================] - 11s 60ms/step - loss: 1.5548 - accuracy: 0.53
68 - val_loss: 1.4861 - val_accuracy: 0.5496
Epoch 10/15
190/190 [==============================] - 11s 60ms/step - loss: 1.5372 - accuracy: 0.53
96 - val_loss: 1.4827 - val_accuracy: 0.5504
Epoch 11/15
190/190 [==============================] - 11s 60ms/step - loss: 1.5217 - accuracy: 0.54
52 - val_loss: 1.4805 - val_accuracy: 0.5481
Epoch 12/15
190/190 [==============================] - 11s 60ms/step - loss: 1.5062 - accuracy: 0.54
99 - val_loss: 1.4644 - val_accuracy: 0.5537
Epoch 13/15
190/190 [==============================] - 11s 60ms/step - loss: 1.4930 - accuracy: 0.55
26 - val_loss: 1.4684 - val_accuracy: 0.5563
Epoch 14/15
190/190 [==============================] - 11s 60ms/step - loss: 1.4799 - accuracy: 0.55
54 - val_loss: 1.4625 - val_accuracy: 0.5596
Epoch 15/15
190/190 [==============================] - 11s 60ms/step - loss: 1.4644 - accuracy: 0.55
95 - val_loss: 1.4648 - val_accuracy: 0.5563
Total training time For Grid Search: 2169.03 seconds
Best Parameters:  {'optimizer': <keras.optimizers.rmsprop.RMSprop object at 0x7eff817673
70>}
Best Accuracy: 54.25%
```

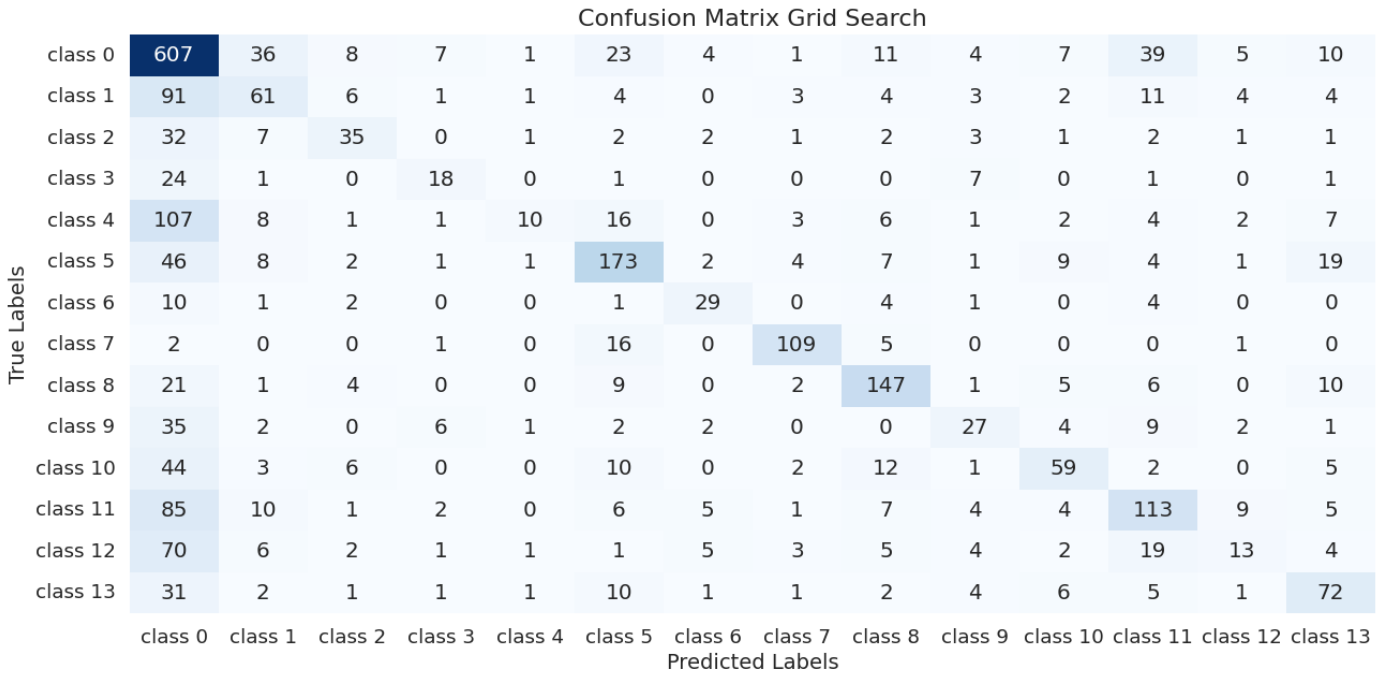
In [ ]:
```
grid_y_pred = grid.predict(X_test)
grid_y_pred_labels = np.argmax(grid_y_pred, axis=1)
grid_y_test_labels = np.argmax(y_test, axis=1)
print(classification_report(grid_y_test_labels, grid_y_pred_labels))
```

```
85/85 [==============================] - 1s 17ms/step
              precision    recall  f1-score   support

           0       0.50      0.80      0.62       763
           1       0.42      0.31      0.36       195
           2       0.51      0.39      0.44        90
           3       0.46      0.34      0.39        53
           4       0.59      0.06      0.11       168
```

5	0.63	0.62	0.63	278
6	0.58	0.56	0.57	52
7	0.84	0.81	0.83	134
8	0.69	0.71	0.70	206
9	0.44	0.30	0.36	91
10	0.58	0.41	0.48	144
11	0.52	0.45	0.48	252
12	0.33	0.10	0.15	136
13	0.52	0.52	0.52	138
accuracy			0.55	2700
macro avg	0.54	0.46	0.47	2700
weighted avg	0.54	0.55	0.52	2700

In [ ]:
```
conf_mat_grid= confusion_matrix(grid_y_test_labels, grid_y_pred_labels)
plt.figure(figsize=(15,7))
# create a heatmap of the confusion matrix
sns.set(font_scale=1.2)
sns.heatmap(conf_mat_grid, annot=True, fmt='d', cmap='Blues', cbar=False,
            xticklabels=['class 0', 'class 1', 'class 2', 'class 3', 'class 4', 'class 5
                         'class 6', 'class 7', 'class 8', 'class 9', 'class 10',
                         'class 11', 'class 12', 'class 13'],
            yticklabels=['class 0', 'class 1', 'class 2', 'class 3', 'class 4', 'class 5
                         'class 6', 'class 7', 'class 8', 'class 9', 'class 10',
                         'class 11', 'class 12', 'class 13'])
plt.xlabel('Predicted Labels', fontsize=14)
plt.ylabel('True Labels', fontsize=14)
plt.title('Confusion Matrix Grid Search', fontsize=16)
plt.show()
```



Hypertuned GRU Model Using Random Search

In [ ]:
```
# Create the KerasClassifier object
rand_model = KerasClassifier(model=create_model)

# Create the RandomizedSearchCV object
random_search = RandomizedSearchCV(estimator=rand_model, param_distributions=param_grid,

# Fit the RandomizedSearchCV object to the training data
random_result = random_search.fit(X_train,
                                  y_train,
```

```
                                    validation_data=(X_val, y_val),
                                    verbose=1,
                                    batch_size=256,
                                    epochs=15,
                                    callbacks=[callback]
                                   )
rand_training_time = sum(random_search.cv_results_['mean_fit_time'])
print("Total training time For Random Search: {:.2f} seconds".format(rand_training_time))
# Print the best parameters and the corresponding accuracy score
print("Best Parameters: ", random_result.best_params_)
print("Best Accuracy: %.2f%%" % (random_result.best_score_*100))
```

```
Epoch 1/15
127/127 [==============================] - 18s 63ms/step - loss: 2.2919 - accuracy: 0.32
22 - val_loss: 2.0265 - val_accuracy: 0.3974
Epoch 2/15
127/127 [==============================] - 7s 55ms/step - loss: 2.0302 - accuracy: 0.401
7 - val_loss: 1.9015 - val_accuracy: 0.4341
Epoch 3/15
127/127 [==============================] - 7s 56ms/step - loss: 1.9337 - accuracy: 0.431
0 - val_loss: 1.8379 - val_accuracy: 0.4507
Epoch 4/15
127/127 [==============================] - 7s 57ms/step - loss: 1.8798 - accuracy: 0.445
3 - val_loss: 1.7963 - val_accuracy: 0.4633
Epoch 5/15
127/127 [==============================] - 8s 66ms/step - loss: 1.8433 - accuracy: 0.457
1 - val_loss: 1.7736 - val_accuracy: 0.4678
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8166 - accuracy: 0.462
4 - val_loss: 1.7419 - val_accuracy: 0.4744
Epoch 7/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7884 - accuracy: 0.468
3 - val_loss: 1.7270 - val_accuracy: 0.4744
Epoch 8/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7665 - accuracy: 0.474
1 - val_loss: 1.7175 - val_accuracy: 0.4763
Epoch 9/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7465 - accuracy: 0.481
5 - val_loss: 1.7074 - val_accuracy: 0.4793
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7284 - accuracy: 0.483
6 - val_loss: 1.7048 - val_accuracy: 0.4830
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7150 - accuracy: 0.486
0 - val_loss: 1.7066 - val_accuracy: 0.4826
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6954 - accuracy: 0.493
1 - val_loss: 1.6931 - val_accuracy: 0.4856
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6856 - accuracy: 0.494
6 - val_loss: 1.7023 - val_accuracy: 0.4793
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6694 - accuracy: 0.496
7 - val_loss: 1.6908 - val_accuracy: 0.4822
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6599 - accuracy: 0.502
9 - val_loss: 1.6965 - val_accuracy: 0.4893
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.3062 - accuracy: 0.31
71 - val_loss: 2.0242 - val_accuracy: 0.3974
Epoch 2/15
127/127 [==============================] - 7s 57ms/step - loss: 2.0289 - accuracy: 0.404
8 - val_loss: 1.8941 - val_accuracy: 0.4426
Epoch 3/15
127/127 [==============================] - 7s 57ms/step - loss: 1.9335 - accuracy: 0.432
```

```
1 - val_loss: 1.8315 - val_accuracy: 0.4544
Epoch 4/15
127/127 [==============================] - 7s 57ms/step - loss: 1.8905 - accuracy: 0.443
8 - val_loss: 1.8046 - val_accuracy: 0.4585
Epoch 5/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8499 - accuracy: 0.451
9 - val_loss: 1.7657 - val_accuracy: 0.4689
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8192 - accuracy: 0.459
3 - val_loss: 1.7511 - val_accuracy: 0.4730
Epoch 7/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7904 - accuracy: 0.467
7 - val_loss: 1.7308 - val_accuracy: 0.4752
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7744 - accuracy: 0.472
9 - val_loss: 1.7244 - val_accuracy: 0.4785
Epoch 9/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7530 - accuracy: 0.478
1 - val_loss: 1.7092 - val_accuracy: 0.4841
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7354 - accuracy: 0.480
5 - val_loss: 1.7002 - val_accuracy: 0.4856
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7221 - accuracy: 0.483
7 - val_loss: 1.6969 - val_accuracy: 0.4881
Epoch 12/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7018 - accuracy: 0.489
7 - val_loss: 1.6936 - val_accuracy: 0.4904
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6937 - accuracy: 0.491
9 - val_loss: 1.7017 - val_accuracy: 0.4863
Epoch 14/15
127/127 [==============================] - 7s 57ms/step - loss: 1.6765 - accuracy: 0.497
2 - val_loss: 1.6866 - val_accuracy: 0.4867
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6621 - accuracy: 0.495
9 - val_loss: 1.6869 - val_accuracy: 0.4885
507/507 [==============================] - 6s 12ms/step
Epoch 1/15
127/127 [==============================] - 12s 63ms/step - loss: 2.2967 - accuracy: 0.31
75 - val_loss: 2.0026 - val_accuracy: 0.4007
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0198 - accuracy: 0.403
5 - val_loss: 1.8858 - val_accuracy: 0.4463
Epoch 3/15
127/127 [==============================] - 7s 58ms/step - loss: 1.9278 - accuracy: 0.430
3 - val_loss: 1.8372 - val_accuracy: 0.4511
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8735 - accuracy: 0.446
2 - val_loss: 1.7859 - val_accuracy: 0.4637
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8354 - accuracy: 0.457
5 - val_loss: 1.7521 - val_accuracy: 0.4763
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8080 - accuracy: 0.464
4 - val_loss: 1.7312 - val_accuracy: 0.4759
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7813 - accuracy: 0.470
7 - val_loss: 1.7228 - val_accuracy: 0.4763
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7615 - accuracy: 0.476
7 - val_loss: 1.7045 - val_accuracy: 0.4811
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7415 - accuracy: 0.477
7 - val_loss: 1.7025 - val_accuracy: 0.4807
Epoch 10/15
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127/127 [==============================] - 7s 58ms/step - loss: 1.7291 - accuracy: 0.484
5 - val_loss: 1.6950 - val_accuracy: 0.4833
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7150 - accuracy: 0.486
8 - val_loss: 1.6940 - val_accuracy: 0.4867
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7013 - accuracy: 0.490
5 - val_loss: 1.6880 - val_accuracy: 0.4789
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6823 - accuracy: 0.496
0 - val_loss: 1.6850 - val_accuracy: 0.4852
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6714 - accuracy: 0.499
2 - val_loss: 1.6863 - val_accuracy: 0.4819
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6604 - accuracy: 0.502
3 - val_loss: 1.6844 - val_accuracy: 0.4811
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2884 - accuracy: 0.32
65 - val_loss: 2.0269 - val_accuracy: 0.4030
Epoch 2/15
127/127 [==============================] - 7s 58ms/step - loss: 2.0153 - accuracy: 0.408
2 - val_loss: 1.8917 - val_accuracy: 0.4363
Epoch 3/15
127/127 [==============================] - 7s 58ms/step - loss: 1.9265 - accuracy: 0.431
2 - val_loss: 1.8290 - val_accuracy: 0.4574
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8773 - accuracy: 0.448
4 - val_loss: 1.8011 - val_accuracy: 0.4607
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8401 - accuracy: 0.455
8 - val_loss: 1.7683 - val_accuracy: 0.4704
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8110 - accuracy: 0.461
5 - val_loss: 1.7516 - val_accuracy: 0.4715
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7895 - accuracy: 0.470
4 - val_loss: 1.7368 - val_accuracy: 0.4741
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7646 - accuracy: 0.476
9 - val_loss: 1.7267 - val_accuracy: 0.4796
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7492 - accuracy: 0.480
2 - val_loss: 1.7142 - val_accuracy: 0.4826
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7340 - accuracy: 0.483
3 - val_loss: 1.7121 - val_accuracy: 0.4837
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7143 - accuracy: 0.485
6 - val_loss: 1.7126 - val_accuracy: 0.4874
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7003 - accuracy: 0.489
6 - val_loss: 1.7065 - val_accuracy: 0.4870
Epoch 13/15
127/127 [==============================] - 7s 57ms/step - loss: 1.6883 - accuracy: 0.494
3 - val_loss: 1.6990 - val_accuracy: 0.4933
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6765 - accuracy: 0.495
2 - val_loss: 1.7056 - val_accuracy: 0.4904
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6639 - accuracy: 0.496
3 - val_loss: 1.6979 - val_accuracy: 0.4915
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 11s 63ms/step - loss: 2.3142 - accuracy: 0.31
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74 - val_loss: 2.0254 - val_accuracy: 0.4004
Epoch 2/15
127/127 [==============================] - 7s 58ms/step - loss: 2.0402 - accuracy: 0.403
3 - val_loss: 1.8864 - val_accuracy: 0.4533
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9420 - accuracy: 0.431
2 - val_loss: 1.8331 - val_accuracy: 0.4596
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8839 - accuracy: 0.443
2 - val_loss: 1.8026 - val_accuracy: 0.4644
Epoch 5/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8502 - accuracy: 0.451
8 - val_loss: 1.7723 - val_accuracy: 0.4659
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8262 - accuracy: 0.458
2 - val_loss: 1.7434 - val_accuracy: 0.4730
Epoch 7/15
127/127 [==============================] - 7s 57ms/step - loss: 1.8017 - accuracy: 0.463
5 - val_loss: 1.7399 - val_accuracy: 0.4748
Epoch 8/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7808 - accuracy: 0.469
7 - val_loss: 1.7209 - val_accuracy: 0.4752
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7574 - accuracy: 0.476
6 - val_loss: 1.7025 - val_accuracy: 0.4815
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7370 - accuracy: 0.479
8 - val_loss: 1.7017 - val_accuracy: 0.4807
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7211 - accuracy: 0.481
6 - val_loss: 1.6966 - val_accuracy: 0.4800
Epoch 12/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7119 - accuracy: 0.486
6 - val_loss: 1.7001 - val_accuracy: 0.4826
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6915 - accuracy: 0.488
7 - val_loss: 1.6945 - val_accuracy: 0.4874
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6784 - accuracy: 0.494
5 - val_loss: 1.6994 - val_accuracy: 0.4763
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6676 - accuracy: 0.495
3 - val_loss: 1.6995 - val_accuracy: 0.4856
507/507 [==============================] - 6s 12ms/step
Epoch 1/15
127/127 [==============================] - 12s 63ms/step - loss: 2.2972 - accuracy: 0.32
03 - val_loss: 2.0051 - val_accuracy: 0.4015
Epoch 2/15
127/127 [==============================] - 7s 58ms/step - loss: 2.0175 - accuracy: 0.404
5 - val_loss: 1.8715 - val_accuracy: 0.4422
Epoch 3/15
127/127 [==============================] - 7s 58ms/step - loss: 1.9161 - accuracy: 0.434
9 - val_loss: 1.8186 - val_accuracy: 0.4563
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8702 - accuracy: 0.443
7 - val_loss: 1.7876 - val_accuracy: 0.4626
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8381 - accuracy: 0.455
6 - val_loss: 1.7629 - val_accuracy: 0.4696
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8098 - accuracy: 0.461
5 - val_loss: 1.7412 - val_accuracy: 0.4741
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7845 - accuracy: 0.469
5 - val_loss: 1.7249 - val_accuracy: 0.4789
Epoch 8/15
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127/127 [==============================] - 7s 59ms/step - loss: 1.7663 - accuracy: 0.475
1 - val_loss: 1.7258 - val_accuracy: 0.4733
Epoch 9/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7486 - accuracy: 0.480
7 - val_loss: 1.7120 - val_accuracy: 0.4830
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7331 - accuracy: 0.482
5 - val_loss: 1.7047 - val_accuracy: 0.4830
Epoch 11/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7141 - accuracy: 0.487
3 - val_loss: 1.6976 - val_accuracy: 0.4837
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7017 - accuracy: 0.492
4 - val_loss: 1.6971 - val_accuracy: 0.4815
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6861 - accuracy: 0.492
8 - val_loss: 1.6926 - val_accuracy: 0.4819
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6687 - accuracy: 0.498
2 - val_loss: 1.6920 - val_accuracy: 0.4822
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6630 - accuracy: 0.498
4 - val_loss: 1.6865 - val_accuracy: 0.4885
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 63ms/step - loss: 2.2882 - accuracy: 0.32
55 - val_loss: 2.0158 - val_accuracy: 0.4022
Epoch 2/15
127/127 [==============================] - 7s 58ms/step - loss: 2.0158 - accuracy: 0.406
6 - val_loss: 1.8975 - val_accuracy: 0.4393
Epoch 3/15
127/127 [==============================] - 7s 58ms/step - loss: 1.9288 - accuracy: 0.433
0 - val_loss: 1.8356 - val_accuracy: 0.4544
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8819 - accuracy: 0.445
7 - val_loss: 1.8011 - val_accuracy: 0.4593
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8410 - accuracy: 0.453
6 - val_loss: 1.7708 - val_accuracy: 0.4659
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8127 - accuracy: 0.461
2 - val_loss: 1.7531 - val_accuracy: 0.4722
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7886 - accuracy: 0.469
3 - val_loss: 1.7460 - val_accuracy: 0.4722
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7672 - accuracy: 0.474
2 - val_loss: 1.7239 - val_accuracy: 0.4811
Epoch 9/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7519 - accuracy: 0.480
3 - val_loss: 1.7176 - val_accuracy: 0.4841
Epoch 10/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7361 - accuracy: 0.482
3 - val_loss: 1.7140 - val_accuracy: 0.4870
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7184 - accuracy: 0.486
1 - val_loss: 1.7114 - val_accuracy: 0.4815
Epoch 12/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7044 - accuracy: 0.490
2 - val_loss: 1.7021 - val_accuracy: 0.4867
Epoch 13/15
127/127 [==============================] - 7s 57ms/step - loss: 1.6905 - accuracy: 0.491
1 - val_loss: 1.7060 - val_accuracy: 0.4878
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6757 - accuracy: 0.498
9 - val_loss: 1.7038 - val_accuracy: 0.4863
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Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6641 - accuracy: 0.500
7 - val_loss: 1.7095 - val_accuracy: 0.4841
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.3195 - accuracy: 0.30
79 - val_loss: 2.0362 - val_accuracy: 0.3967
Epoch 2/15
127/127 [==============================] - 7s 58ms/step - loss: 2.0415 - accuracy: 0.397
7 - val_loss: 1.8935 - val_accuracy: 0.4444
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9412 - accuracy: 0.429
5 - val_loss: 1.8318 - val_accuracy: 0.4578
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8877 - accuracy: 0.439
0 - val_loss: 1.7889 - val_accuracy: 0.4656
Epoch 5/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8446 - accuracy: 0.454
1 - val_loss: 1.7673 - val_accuracy: 0.4674
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8207 - accuracy: 0.461
8 - val_loss: 1.7435 - val_accuracy: 0.4733
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7936 - accuracy: 0.467
2 - val_loss: 1.7302 - val_accuracy: 0.4759
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7688 - accuracy: 0.473
9 - val_loss: 1.7175 - val_accuracy: 0.4804
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7524 - accuracy: 0.476
2 - val_loss: 1.7088 - val_accuracy: 0.4867
Epoch 10/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7330 - accuracy: 0.481
6 - val_loss: 1.7059 - val_accuracy: 0.4856
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7196 - accuracy: 0.484
3 - val_loss: 1.6964 - val_accuracy: 0.4907
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7069 - accuracy: 0.488
9 - val_loss: 1.6924 - val_accuracy: 0.4896
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6925 - accuracy: 0.491
6 - val_loss: 1.6909 - val_accuracy: 0.4896
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6802 - accuracy: 0.492
7 - val_loss: 1.6900 - val_accuracy: 0.4967
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6635 - accuracy: 0.497
7 - val_loss: 1.6925 - val_accuracy: 0.4896
507/507 [==============================] - 7s 12ms/step
Epoch 1/15
127/127 [==============================] - 12s 63ms/step - loss: 2.2869 - accuracy: 0.31
75 - val_loss: 2.0057 - val_accuracy: 0.4078
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0128 - accuracy: 0.404
5 - val_loss: 1.8859 - val_accuracy: 0.4415
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9279 - accuracy: 0.432
9 - val_loss: 1.8326 - val_accuracy: 0.4541
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8696 - accuracy: 0.447
2 - val_loss: 1.7916 - val_accuracy: 0.4593
Epoch 5/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8331 - accuracy: 0.455
6 - val_loss: 1.7591 - val_accuracy: 0.4685
Epoch 6/15
```

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127/127 [==============================] - 7s 58ms/step - loss: 1.8093 - accuracy: 0.464
1 - val_loss: 1.7529 - val_accuracy: 0.4741
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7812 - accuracy: 0.469
4 - val_loss: 1.7299 - val_accuracy: 0.4804
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7673 - accuracy: 0.472
6 - val_loss: 1.7237 - val_accuracy: 0.4793
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7483 - accuracy: 0.477
4 - val_loss: 1.7103 - val_accuracy: 0.4807
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7260 - accuracy: 0.485
6 - val_loss: 1.7008 - val_accuracy: 0.4848
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7172 - accuracy: 0.488
5 - val_loss: 1.6916 - val_accuracy: 0.4878
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7035 - accuracy: 0.493
9 - val_loss: 1.6935 - val_accuracy: 0.4859
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6779 - accuracy: 0.498
8 - val_loss: 1.6873 - val_accuracy: 0.4889
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6723 - accuracy: 0.499
0 - val_loss: 1.7036 - val_accuracy: 0.4878
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6609 - accuracy: 0.504
3 - val_loss: 1.6887 - val_accuracy: 0.4881
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 11s 63ms/step - loss: 2.2896 - accuracy: 0.32
29 - val_loss: 2.0009 - val_accuracy: 0.4067
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0164 - accuracy: 0.405
5 - val_loss: 1.8993 - val_accuracy: 0.4393
Epoch 3/15
127/127 [==============================] - 7s 58ms/step - loss: 1.9320 - accuracy: 0.431
3 - val_loss: 1.8285 - val_accuracy: 0.4552
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8804 - accuracy: 0.445
0 - val_loss: 1.7970 - val_accuracy: 0.4593
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8431 - accuracy: 0.453
0 - val_loss: 1.7706 - val_accuracy: 0.4670
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8128 - accuracy: 0.462
2 - val_loss: 1.7535 - val_accuracy: 0.4693
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7926 - accuracy: 0.469
0 - val_loss: 1.7304 - val_accuracy: 0.4737
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7708 - accuracy: 0.474
4 - val_loss: 1.7241 - val_accuracy: 0.4763
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7499 - accuracy: 0.476
6 - val_loss: 1.7166 - val_accuracy: 0.4763
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7315 - accuracy: 0.482
3 - val_loss: 1.7069 - val_accuracy: 0.4770
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7174 - accuracy: 0.485
6 - val_loss: 1.7015 - val_accuracy: 0.4826
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7045 - accuracy: 0.486
0 - val_loss: 1.6918 - val_accuracy: 0.4837
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Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6897 - accuracy: 0.493
1 - val_loss: 1.6930 - val_accuracy: 0.4867
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6704 - accuracy: 0.498
1 - val_loss: 1.6973 - val_accuracy: 0.4826
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6599 - accuracy: 0.499
4 - val_loss: 1.6962 - val_accuracy: 0.4844
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 66ms/step - loss: 2.3115 - accuracy: 0.31
30 - val_loss: 2.0184 - val_accuracy: 0.4022
Epoch 2/15
127/127 [==============================] - 7s 58ms/step - loss: 2.0338 - accuracy: 0.402
1 - val_loss: 1.8842 - val_accuracy: 0.4411
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9359 - accuracy: 0.428
7 - val_loss: 1.8256 - val_accuracy: 0.4541
Epoch 4/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8778 - accuracy: 0.446
2 - val_loss: 1.7904 - val_accuracy: 0.4611
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8402 - accuracy: 0.453
7 - val_loss: 1.7616 - val_accuracy: 0.4681
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8126 - accuracy: 0.463
1 - val_loss: 1.7377 - val_accuracy: 0.4785
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7844 - accuracy: 0.468
7 - val_loss: 1.7217 - val_accuracy: 0.4756
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7611 - accuracy: 0.474
7 - val_loss: 1.7129 - val_accuracy: 0.4767
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7467 - accuracy: 0.478
1 - val_loss: 1.6971 - val_accuracy: 0.4819
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7327 - accuracy: 0.480
7 - val_loss: 1.7063 - val_accuracy: 0.4811
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7157 - accuracy: 0.486
0 - val_loss: 1.6910 - val_accuracy: 0.4830
Epoch 12/15
127/127 [==============================] - 7s 57ms/step - loss: 1.6999 - accuracy: 0.486
8 - val_loss: 1.6970 - val_accuracy: 0.4800
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6851 - accuracy: 0.493
2 - val_loss: 1.6816 - val_accuracy: 0.4867
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6749 - accuracy: 0.493
1 - val_loss: 1.6912 - val_accuracy: 0.4841
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6595 - accuracy: 0.497
5 - val_loss: 1.6875 - val_accuracy: 0.4856
507/507 [==============================] - 7s 12ms/step
Epoch 1/15
127/127 [==============================] - 13s 65ms/step - loss: 2.3157 - accuracy: 0.31
51 - val_loss: 2.0289 - val_accuracy: 0.4019
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 2.0271 - accuracy: 0.403
0 - val_loss: 1.8811 - val_accuracy: 0.4478
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9351 - accuracy: 0.431
4 - val_loss: 1.8250 - val_accuracy: 0.4570
Epoch 4/15
```

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127/127 [==============================] - 8s 60ms/step - loss: 1.8830 - accuracy: 0.445
9 - val_loss: 1.7922 - val_accuracy: 0.4637
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8427 - accuracy: 0.455
1 - val_loss: 1.7681 - val_accuracy: 0.4700
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8121 - accuracy: 0.463
1 - val_loss: 1.7537 - val_accuracy: 0.4704
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7878 - accuracy: 0.469
4 - val_loss: 1.7269 - val_accuracy: 0.4807
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7652 - accuracy: 0.474
9 - val_loss: 1.7188 - val_accuracy: 0.4815
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7453 - accuracy: 0.481
9 - val_loss: 1.7081 - val_accuracy: 0.4807
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7318 - accuracy: 0.485
1 - val_loss: 1.6966 - val_accuracy: 0.4822
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7153 - accuracy: 0.487
8 - val_loss: 1.7046 - val_accuracy: 0.4826
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7047 - accuracy: 0.490
1 - val_loss: 1.6898 - val_accuracy: 0.4852
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6823 - accuracy: 0.494
8 - val_loss: 1.6902 - val_accuracy: 0.4800
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6705 - accuracy: 0.497
3 - val_loss: 1.6904 - val_accuracy: 0.4874
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6553 - accuracy: 0.500
9 - val_loss: 1.6963 - val_accuracy: 0.4830
507/507 [==============================] - 7s 12ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2956 - accuracy: 0.32
14 - val_loss: 2.0287 - val_accuracy: 0.4085
Epoch 2/15
127/127 [==============================] - 7s 58ms/step - loss: 2.0249 - accuracy: 0.409
3 - val_loss: 1.8883 - val_accuracy: 0.4422
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9332 - accuracy: 0.432
4 - val_loss: 1.8310 - val_accuracy: 0.4507
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8770 - accuracy: 0.446
0 - val_loss: 1.7879 - val_accuracy: 0.4593
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8397 - accuracy: 0.453
2 - val_loss: 1.7625 - val_accuracy: 0.4670
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8068 - accuracy: 0.463
2 - val_loss: 1.7382 - val_accuracy: 0.4748
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7879 - accuracy: 0.469
2 - val_loss: 1.7255 - val_accuracy: 0.4822
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7661 - accuracy: 0.474
3 - val_loss: 1.7127 - val_accuracy: 0.4822
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7437 - accuracy: 0.479
5 - val_loss: 1.7072 - val_accuracy: 0.4830
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7296 - accuracy: 0.484
3 - val_loss: 1.7046 - val_accuracy: 0.4870
```

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Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7145 - accuracy: 0.490
0 - val_loss: 1.6917 - val_accuracy: 0.4841
Epoch 12/15
127/127 [==============================] - 7s 57ms/step - loss: 1.7003 - accuracy: 0.488
5 - val_loss: 1.6893 - val_accuracy: 0.4889
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6846 - accuracy: 0.492
7 - val_loss: 1.6985 - val_accuracy: 0.4819
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6754 - accuracy: 0.496
2 - val_loss: 1.6850 - val_accuracy: 0.4863
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6625 - accuracy: 0.500
7 - val_loss: 1.6851 - val_accuracy: 0.4852
507/507 [==============================] - 7s 12ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.3018 - accuracy: 0.31
05 - val_loss: 2.0209 - val_accuracy: 0.3993
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0263 - accuracy: 0.403
8 - val_loss: 1.8923 - val_accuracy: 0.4459
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9360 - accuracy: 0.429
9 - val_loss: 1.8338 - val_accuracy: 0.4574
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8846 - accuracy: 0.444
9 - val_loss: 1.8002 - val_accuracy: 0.4600
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8469 - accuracy: 0.451
8 - val_loss: 1.7718 - val_accuracy: 0.4659
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8200 - accuracy: 0.459
1 - val_loss: 1.7525 - val_accuracy: 0.4730
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7956 - accuracy: 0.466
3 - val_loss: 1.7420 - val_accuracy: 0.4748
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7702 - accuracy: 0.471
4 - val_loss: 1.7297 - val_accuracy: 0.4778
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7500 - accuracy: 0.479
9 - val_loss: 1.7202 - val_accuracy: 0.4793
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7363 - accuracy: 0.480
5 - val_loss: 1.7089 - val_accuracy: 0.4822
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7180 - accuracy: 0.483
9 - val_loss: 1.7036 - val_accuracy: 0.4844
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7052 - accuracy: 0.487
9 - val_loss: 1.7013 - val_accuracy: 0.4856
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6899 - accuracy: 0.493
0 - val_loss: 1.7068 - val_accuracy: 0.4830
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6752 - accuracy: 0.497
3 - val_loss: 1.7019 - val_accuracy: 0.4837
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6663 - accuracy: 0.498
0 - val_loss: 1.6994 - val_accuracy: 0.4830
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 13s 71ms/step - loss: 2.3031 - accuracy: 0.32
00 - val_loss: 2.0215 - val_accuracy: 0.4026
Epoch 2/15
```

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127/127 [==============================] - 7s 59ms/step - loss: 2.0211 - accuracy: 0.406
9 - val_loss: 1.8828 - val_accuracy: 0.4515
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9279 - accuracy: 0.434
3 - val_loss: 1.8313 - val_accuracy: 0.4596
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8737 - accuracy: 0.449
5 - val_loss: 1.7979 - val_accuracy: 0.4637
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8400 - accuracy: 0.457
4 - val_loss: 1.7611 - val_accuracy: 0.4733
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8092 - accuracy: 0.467
8 - val_loss: 1.7408 - val_accuracy: 0.4711
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7873 - accuracy: 0.471
3 - val_loss: 1.7254 - val_accuracy: 0.4756
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7597 - accuracy: 0.477
4 - val_loss: 1.7128 - val_accuracy: 0.4826
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7440 - accuracy: 0.481
9 - val_loss: 1.7051 - val_accuracy: 0.4852
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7309 - accuracy: 0.484
5 - val_loss: 1.7054 - val_accuracy: 0.4822
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7076 - accuracy: 0.491
5 - val_loss: 1.6994 - val_accuracy: 0.4841
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6934 - accuracy: 0.492
6 - val_loss: 1.6964 - val_accuracy: 0.4863
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6796 - accuracy: 0.496
4 - val_loss: 1.6981 - val_accuracy: 0.4878
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6714 - accuracy: 0.498
8 - val_loss: 1.6873 - val_accuracy: 0.4859
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6579 - accuracy: 0.503
6 - val_loss: 1.6850 - val_accuracy: 0.4844
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.3112 - accuracy: 0.31
20 - val_loss: 2.0375 - val_accuracy: 0.3915
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 2.0342 - accuracy: 0.400
1 - val_loss: 1.9061 - val_accuracy: 0.4315
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9447 - accuracy: 0.426
4 - val_loss: 1.8455 - val_accuracy: 0.4493
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8807 - accuracy: 0.446
7 - val_loss: 1.8036 - val_accuracy: 0.4644
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8441 - accuracy: 0.457
3 - val_loss: 1.7786 - val_accuracy: 0.4656
Epoch 6/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8218 - accuracy: 0.460
7 - val_loss: 1.7599 - val_accuracy: 0.4674
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7899 - accuracy: 0.468
2 - val_loss: 1.7323 - val_accuracy: 0.4737
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7726 - accuracy: 0.472
7 - val_loss: 1.7238 - val_accuracy: 0.4819
```

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Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7516 - accuracy: 0.480
1 - val_loss: 1.7172 - val_accuracy: 0.4863
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7396 - accuracy: 0.481
8 - val_loss: 1.7026 - val_accuracy: 0.4881
Epoch 11/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7190 - accuracy: 0.486
6 - val_loss: 1.7058 - val_accuracy: 0.4841
Epoch 12/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7064 - accuracy: 0.490
3 - val_loss: 1.6950 - val_accuracy: 0.4900
Epoch 13/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6907 - accuracy: 0.491
9 - val_loss: 1.6953 - val_accuracy: 0.4896
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6736 - accuracy: 0.499
1 - val_loss: 1.6910 - val_accuracy: 0.4922
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6595 - accuracy: 0.498
5 - val_loss: 1.6977 - val_accuracy: 0.4863
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.3272 - accuracy: 0.30
31 - val_loss: 2.0378 - val_accuracy: 0.3937
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0352 - accuracy: 0.401
1 - val_loss: 1.8762 - val_accuracy: 0.4474
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9354 - accuracy: 0.431
7 - val_loss: 1.8315 - val_accuracy: 0.4544
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8837 - accuracy: 0.444
7 - val_loss: 1.7978 - val_accuracy: 0.4604
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8452 - accuracy: 0.451
2 - val_loss: 1.7684 - val_accuracy: 0.4663
Epoch 6/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8214 - accuracy: 0.458
8 - val_loss: 1.7497 - val_accuracy: 0.4685
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7915 - accuracy: 0.465
2 - val_loss: 1.7292 - val_accuracy: 0.4767
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7701 - accuracy: 0.469
8 - val_loss: 1.7198 - val_accuracy: 0.4785
Epoch 9/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7542 - accuracy: 0.478
5 - val_loss: 1.7182 - val_accuracy: 0.4833
Epoch 10/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7391 - accuracy: 0.480
2 - val_loss: 1.7008 - val_accuracy: 0.4870
Epoch 11/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7234 - accuracy: 0.481
7 - val_loss: 1.6899 - val_accuracy: 0.4893
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7030 - accuracy: 0.485
9 - val_loss: 1.6911 - val_accuracy: 0.4870
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6868 - accuracy: 0.490
5 - val_loss: 1.6949 - val_accuracy: 0.4881
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6785 - accuracy: 0.492
1 - val_loss: 1.6919 - val_accuracy: 0.4874
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6683 - accuracy: 0.497
```

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4 - val_loss: 1.6911 - val_accuracy: 0.4885
507/507 [==============================] - 7s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.3059 - accuracy: 0.31
45 - val_loss: 2.0358 - val_accuracy: 0.3981
Epoch 2/15
127/127 [==============================] - 8s 60ms/step - loss: 2.0309 - accuracy: 0.399
0 - val_loss: 1.8946 - val_accuracy: 0.4352
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9344 - accuracy: 0.430
9 - val_loss: 1.8314 - val_accuracy: 0.4541
Epoch 4/15
127/127 [==============================] - 8s 61ms/step - loss: 1.8760 - accuracy: 0.445
4 - val_loss: 1.7938 - val_accuracy: 0.4637
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8360 - accuracy: 0.453
6 - val_loss: 1.7713 - val_accuracy: 0.4630
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8178 - accuracy: 0.459
2 - val_loss: 1.7543 - val_accuracy: 0.4656
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7894 - accuracy: 0.465
6 - val_loss: 1.7424 - val_accuracy: 0.4674
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7722 - accuracy: 0.473
6 - val_loss: 1.7234 - val_accuracy: 0.4744
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7523 - accuracy: 0.475
4 - val_loss: 1.7172 - val_accuracy: 0.4789
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7298 - accuracy: 0.484
0 - val_loss: 1.7074 - val_accuracy: 0.4759
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7192 - accuracy: 0.486
0 - val_loss: 1.7050 - val_accuracy: 0.4759
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6985 - accuracy: 0.490
9 - val_loss: 1.6999 - val_accuracy: 0.4796
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6859 - accuracy: 0.493
6 - val_loss: 1.6953 - val_accuracy: 0.4748
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6723 - accuracy: 0.496
0 - val_loss: 1.6902 - val_accuracy: 0.4815
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6582 - accuracy: 0.500
7 - val_loss: 1.6949 - val_accuracy: 0.4763
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 13s 65ms/step - loss: 2.2927 - accuracy: 0.32
70 - val_loss: 2.0463 - val_accuracy: 0.3926
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0384 - accuracy: 0.401
2 - val_loss: 1.9217 - val_accuracy: 0.4326
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9501 - accuracy: 0.428
8 - val_loss: 1.8501 - val_accuracy: 0.4504
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8859 - accuracy: 0.444
1 - val_loss: 1.8114 - val_accuracy: 0.4596
Epoch 5/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8477 - accuracy: 0.453
2 - val_loss: 1.7837 - val_accuracy: 0.4696
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8164 - accuracy: 0.462
2 - val_loss: 1.7694 - val_accuracy: 0.4704
```

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Epoch 7/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8024 - accuracy: 0.468
4 - val_loss: 1.7568 - val_accuracy: 0.4689
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7788 - accuracy: 0.473
1 - val_loss: 1.7385 - val_accuracy: 0.4733
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7589 - accuracy: 0.474
6 - val_loss: 1.7253 - val_accuracy: 0.4767
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7385 - accuracy: 0.480
0 - val_loss: 1.7133 - val_accuracy: 0.4837
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7235 - accuracy: 0.486
0 - val_loss: 1.7168 - val_accuracy: 0.4859
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7076 - accuracy: 0.487
7 - val_loss: 1.7057 - val_accuracy: 0.4837
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6938 - accuracy: 0.493
4 - val_loss: 1.7089 - val_accuracy: 0.4852
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6814 - accuracy: 0.497
3 - val_loss: 1.7030 - val_accuracy: 0.4852
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6665 - accuracy: 0.499
4 - val_loss: 1.7067 - val_accuracy: 0.4874
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 65ms/step - loss: 2.2998 - accuracy: 0.31
71 - val_loss: 2.0001 - val_accuracy: 0.4089
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 2.0298 - accuracy: 0.400
0 - val_loss: 1.8785 - val_accuracy: 0.4456
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9335 - accuracy: 0.430
1 - val_loss: 1.8299 - val_accuracy: 0.4567
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8840 - accuracy: 0.445
2 - val_loss: 1.7904 - val_accuracy: 0.4619
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8479 - accuracy: 0.451
9 - val_loss: 1.7640 - val_accuracy: 0.4696
Epoch 6/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8153 - accuracy: 0.459
8 - val_loss: 1.7386 - val_accuracy: 0.4778
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7952 - accuracy: 0.466
2 - val_loss: 1.7241 - val_accuracy: 0.4737
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7692 - accuracy: 0.474
1 - val_loss: 1.7152 - val_accuracy: 0.4856
Epoch 9/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7534 - accuracy: 0.478
5 - val_loss: 1.7082 - val_accuracy: 0.4844
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7357 - accuracy: 0.477
4 - val_loss: 1.7073 - val_accuracy: 0.4859
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7210 - accuracy: 0.483
8 - val_loss: 1.7136 - val_accuracy: 0.4841
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7081 - accuracy: 0.486
9 - val_loss: 1.6896 - val_accuracy: 0.4911
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6901 - accuracy: 0.490
```

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6 - val_loss: 1.6948 - val_accuracy: 0.4915
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6793 - accuracy: 0.492
3 - val_loss: 1.6916 - val_accuracy: 0.4915
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6663 - accuracy: 0.497
9 - val_loss: 1.6901 - val_accuracy: 0.4933
507/507 [==============================] - 7s 12ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.3064 - accuracy: 0.31
36 - val_loss: 2.0403 - val_accuracy: 0.3981
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 2.0316 - accuracy: 0.396
4 - val_loss: 1.8806 - val_accuracy: 0.4430
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9300 - accuracy: 0.429
4 - val_loss: 1.8254 - val_accuracy: 0.4530
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8843 - accuracy: 0.444
4 - val_loss: 1.8025 - val_accuracy: 0.4611
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8444 - accuracy: 0.451
1 - val_loss: 1.7698 - val_accuracy: 0.4670
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8183 - accuracy: 0.461
2 - val_loss: 1.7518 - val_accuracy: 0.4711
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7955 - accuracy: 0.464
7 - val_loss: 1.7360 - val_accuracy: 0.4741
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7754 - accuracy: 0.469
1 - val_loss: 1.7193 - val_accuracy: 0.4804
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7483 - accuracy: 0.481
0 - val_loss: 1.7088 - val_accuracy: 0.4804
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7312 - accuracy: 0.482
5 - val_loss: 1.7012 - val_accuracy: 0.4826
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7166 - accuracy: 0.486
9 - val_loss: 1.6986 - val_accuracy: 0.4778
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7016 - accuracy: 0.490
6 - val_loss: 1.7027 - val_accuracy: 0.4819
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6879 - accuracy: 0.493
5 - val_loss: 1.6919 - val_accuracy: 0.4822
Epoch 14/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6752 - accuracy: 0.495
1 - val_loss: 1.6962 - val_accuracy: 0.4822
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6584 - accuracy: 0.499
7 - val_loss: 1.6916 - val_accuracy: 0.4859
507/507 [==============================] - 7s 12ms/step
Epoch 1/15
127/127 [==============================] - 12s 66ms/step - loss: 2.2954 - accuracy: 0.31
93 - val_loss: 2.0320 - val_accuracy: 0.3993
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0362 - accuracy: 0.401
0 - val_loss: 1.9095 - val_accuracy: 0.4374
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9360 - accuracy: 0.432
5 - val_loss: 1.8427 - val_accuracy: 0.4511
Epoch 4/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8865 - accuracy: 0.446
3 - val_loss: 1.8059 - val_accuracy: 0.4589
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Epoch 5/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8441 - accuracy: 0.452
6 - val_loss: 1.7834 - val_accuracy: 0.4619
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8194 - accuracy: 0.462
3 - val_loss: 1.7506 - val_accuracy: 0.4704
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7936 - accuracy: 0.468
9 - val_loss: 1.7307 - val_accuracy: 0.4737
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7729 - accuracy: 0.470
1 - val_loss: 1.7291 - val_accuracy: 0.4744
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7523 - accuracy: 0.475
7 - val_loss: 1.7094 - val_accuracy: 0.4807
Epoch 10/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7369 - accuracy: 0.480
6 - val_loss: 1.7019 - val_accuracy: 0.4819
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7222 - accuracy: 0.483
6 - val_loss: 1.7012 - val_accuracy: 0.4900
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7111 - accuracy: 0.489
2 - val_loss: 1.6969 - val_accuracy: 0.4881
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6899 - accuracy: 0.490
3 - val_loss: 1.6979 - val_accuracy: 0.4830
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6792 - accuracy: 0.496
6 - val_loss: 1.6898 - val_accuracy: 0.4859
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6635 - accuracy: 0.498
5 - val_loss: 1.6816 - val_accuracy: 0.4878
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 63ms/step - loss: 2.2975 - accuracy: 0.31
70 - val_loss: 2.0188 - val_accuracy: 0.4067
Epoch 2/15
127/127 [==============================] - 7s 58ms/step - loss: 2.0277 - accuracy: 0.404
9 - val_loss: 1.8915 - val_accuracy: 0.4448
Epoch 3/15
127/127 [==============================] - 7s 58ms/step - loss: 1.9331 - accuracy: 0.434
1 - val_loss: 1.8411 - val_accuracy: 0.4544
Epoch 4/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8823 - accuracy: 0.444
0 - val_loss: 1.8125 - val_accuracy: 0.4589
Epoch 5/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8491 - accuracy: 0.449
5 - val_loss: 1.7803 - val_accuracy: 0.4719
Epoch 6/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8171 - accuracy: 0.458
1 - val_loss: 1.7573 - val_accuracy: 0.4744
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7935 - accuracy: 0.465
5 - val_loss: 1.7402 - val_accuracy: 0.4856
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7706 - accuracy: 0.471
6 - val_loss: 1.7221 - val_accuracy: 0.4807
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7514 - accuracy: 0.475
2 - val_loss: 1.7225 - val_accuracy: 0.4837
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7349 - accuracy: 0.481
8 - val_loss: 1.7045 - val_accuracy: 0.4852
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7114 - accuracy: 0.486
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0 - val_loss: 1.7064 - val_accuracy: 0.4841
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7019 - accuracy: 0.489
5 - val_loss: 1.7009 - val_accuracy: 0.4870
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6882 - accuracy: 0.492
9 - val_loss: 1.6992 - val_accuracy: 0.4863
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6750 - accuracy: 0.493
9 - val_loss: 1.6951 - val_accuracy: 0.4859
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6625 - accuracy: 0.497
3 - val_loss: 1.6959 - val_accuracy: 0.4896
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 66ms/step - loss: 2.3184 - accuracy: 0.31
01 - val_loss: 2.0468 - val_accuracy: 0.3893
Epoch 2/15
127/127 [==============================] - 7s 58ms/step - loss: 2.0362 - accuracy: 0.401
2 - val_loss: 1.8858 - val_accuracy: 0.4422
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9374 - accuracy: 0.428
6 - val_loss: 1.8429 - val_accuracy: 0.4552
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8849 - accuracy: 0.445
7 - val_loss: 1.8004 - val_accuracy: 0.4604
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8492 - accuracy: 0.451
3 - val_loss: 1.7709 - val_accuracy: 0.4667
Epoch 6/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8155 - accuracy: 0.461
8 - val_loss: 1.7518 - val_accuracy: 0.4707
Epoch 7/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7969 - accuracy: 0.467
8 - val_loss: 1.7407 - val_accuracy: 0.4774
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7701 - accuracy: 0.473
1 - val_loss: 1.7208 - val_accuracy: 0.4752
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7482 - accuracy: 0.478
1 - val_loss: 1.7094 - val_accuracy: 0.4733
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7331 - accuracy: 0.483
9 - val_loss: 1.7038 - val_accuracy: 0.4796
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7127 - accuracy: 0.487
3 - val_loss: 1.6903 - val_accuracy: 0.4793
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6996 - accuracy: 0.491
5 - val_loss: 1.6927 - val_accuracy: 0.4819
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6886 - accuracy: 0.493
8 - val_loss: 1.6918 - val_accuracy: 0.4819
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6754 - accuracy: 0.497
9 - val_loss: 1.6919 - val_accuracy: 0.4789
Epoch 15/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6577 - accuracy: 0.501
9 - val_loss: 1.6933 - val_accuracy: 0.4833
507/507 [==============================] - 7s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2726 - accuracy: 0.32
95 - val_loss: 2.0114 - val_accuracy: 0.3981
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0136 - accuracy: 0.406
0 - val_loss: 1.8950 - val_accuracy: 0.4393
```

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Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9296 - accuracy: 0.431
0 - val_loss: 1.8416 - val_accuracy: 0.4467
Epoch 4/15
127/127 [==============================] - 7s 58ms/step - loss: 1.8855 - accuracy: 0.444
4 - val_loss: 1.7960 - val_accuracy: 0.4604
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8437 - accuracy: 0.457
1 - val_loss: 1.7745 - val_accuracy: 0.4652
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8173 - accuracy: 0.459
1 - val_loss: 1.7539 - val_accuracy: 0.4689
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7924 - accuracy: 0.468
5 - val_loss: 1.7354 - val_accuracy: 0.4774
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7730 - accuracy: 0.473
8 - val_loss: 1.7211 - val_accuracy: 0.4756
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7589 - accuracy: 0.476
1 - val_loss: 1.7117 - val_accuracy: 0.4807
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7318 - accuracy: 0.484
3 - val_loss: 1.7049 - val_accuracy: 0.4852
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7227 - accuracy: 0.486
1 - val_loss: 1.7001 - val_accuracy: 0.4867
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7081 - accuracy: 0.487
6 - val_loss: 1.7067 - val_accuracy: 0.4856
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6885 - accuracy: 0.495
4 - val_loss: 1.7097 - val_accuracy: 0.4870
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6803 - accuracy: 0.494
4 - val_loss: 1.7012 - val_accuracy: 0.4881
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6640 - accuracy: 0.498
7 - val_loss: 1.7032 - val_accuracy: 0.4770
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
127/127 [==============================] - 13s 65ms/step - loss: 2.2980 - accuracy: 0.31
33 - val_loss: 2.0039 - val_accuracy: 0.4037
Epoch 2/15
127/127 [==============================] - 8s 59ms/step - loss: 2.0211 - accuracy: 0.406
0 - val_loss: 1.8863 - val_accuracy: 0.4504
Epoch 3/15
127/127 [==============================] - 7s 59ms/step - loss: 1.9301 - accuracy: 0.433
6 - val_loss: 1.8310 - val_accuracy: 0.4567
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8857 - accuracy: 0.443
3 - val_loss: 1.8044 - val_accuracy: 0.4607
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8550 - accuracy: 0.451
7 - val_loss: 1.7817 - val_accuracy: 0.4644
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8264 - accuracy: 0.459
9 - val_loss: 1.7610 - val_accuracy: 0.4719
Epoch 7/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8047 - accuracy: 0.464
4 - val_loss: 1.7451 - val_accuracy: 0.4767
Epoch 8/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7813 - accuracy: 0.470
0 - val_loss: 1.7302 - val_accuracy: 0.4793
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7605 - accuracy: 0.475
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7 - val_loss: 1.7281 - val_accuracy: 0.4748
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7394 - accuracy: 0.479
9 - val_loss: 1.7075 - val_accuracy: 0.4874
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7215 - accuracy: 0.486
9 - val_loss: 1.7055 - val_accuracy: 0.4837
Epoch 12/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7061 - accuracy: 0.487
6 - val_loss: 1.7011 - val_accuracy: 0.4856
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6941 - accuracy: 0.489
7 - val_loss: 1.6953 - val_accuracy: 0.4889
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6717 - accuracy: 0.497
8 - val_loss: 1.7017 - val_accuracy: 0.4863
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6653 - accuracy: 0.497
5 - val_loss: 1.6981 - val_accuracy: 0.4900
507/507 [==============================] - 7s 14ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2865 - accuracy: 0.32
46 - val_loss: 2.0132 - val_accuracy: 0.3963
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0279 - accuracy: 0.400
5 - val_loss: 1.8914 - val_accuracy: 0.4348
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9321 - accuracy: 0.428
0 - val_loss: 1.8300 - val_accuracy: 0.4530
Epoch 4/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8835 - accuracy: 0.443
3 - val_loss: 1.7961 - val_accuracy: 0.4700
Epoch 5/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8400 - accuracy: 0.453
0 - val_loss: 1.7625 - val_accuracy: 0.4748
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8122 - accuracy: 0.460
4 - val_loss: 1.7403 - val_accuracy: 0.4770
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7860 - accuracy: 0.467
6 - val_loss: 1.7250 - val_accuracy: 0.4726
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7627 - accuracy: 0.475
3 - val_loss: 1.7241 - val_accuracy: 0.4737
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7455 - accuracy: 0.479
8 - val_loss: 1.7031 - val_accuracy: 0.4778
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7329 - accuracy: 0.483
3 - val_loss: 1.7028 - val_accuracy: 0.4752
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7159 - accuracy: 0.488
3 - val_loss: 1.6911 - val_accuracy: 0.4793
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7006 - accuracy: 0.490
3 - val_loss: 1.6891 - val_accuracy: 0.4833
Epoch 13/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6851 - accuracy: 0.493
5 - val_loss: 1.6987 - val_accuracy: 0.4822
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6678 - accuracy: 0.496
1 - val_loss: 1.6869 - val_accuracy: 0.4907
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6559 - accuracy: 0.502
7 - val_loss: 1.6861 - val_accuracy: 0.4863
507/507 [==============================] - 7s 13ms/step
```

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Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.3303 - accuracy: 0.31
10 - val_loss: 2.0415 - val_accuracy: 0.4007
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0300 - accuracy: 0.405
4 - val_loss: 1.8925 - val_accuracy: 0.4400
Epoch 3/15
127/127 [==============================] - 8s 59ms/step - loss: 1.9277 - accuracy: 0.434
3 - val_loss: 1.8267 - val_accuracy: 0.4504
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8813 - accuracy: 0.443
5 - val_loss: 1.7937 - val_accuracy: 0.4593
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8376 - accuracy: 0.454
9 - val_loss: 1.7710 - val_accuracy: 0.4707
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8135 - accuracy: 0.462
0 - val_loss: 1.7425 - val_accuracy: 0.4752
Epoch 7/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7913 - accuracy: 0.468
5 - val_loss: 1.7383 - val_accuracy: 0.4737
Epoch 8/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7722 - accuracy: 0.474
8 - val_loss: 1.7263 - val_accuracy: 0.4733
Epoch 9/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7490 - accuracy: 0.478
3 - val_loss: 1.7174 - val_accuracy: 0.4781
Epoch 10/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7392 - accuracy: 0.483
2 - val_loss: 1.7090 - val_accuracy: 0.4793
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7194 - accuracy: 0.486
2 - val_loss: 1.7006 - val_accuracy: 0.4844
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7000 - accuracy: 0.492
4 - val_loss: 1.6993 - val_accuracy: 0.4833
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6888 - accuracy: 0.492
0 - val_loss: 1.6976 - val_accuracy: 0.4793
Epoch 14/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6729 - accuracy: 0.496
1 - val_loss: 1.6998 - val_accuracy: 0.4819
Epoch 15/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6616 - accuracy: 0.500
6 - val_loss: 1.6940 - val_accuracy: 0.4815
507/507 [==============================] - 7s 13ms/step
Epoch 1/15
127/127 [==============================] - 12s 64ms/step - loss: 2.2906 - accuracy: 0.32
15 - val_loss: 2.0122 - val_accuracy: 0.3981
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0194 - accuracy: 0.404
5 - val_loss: 1.8762 - val_accuracy: 0.4515
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9287 - accuracy: 0.432
0 - val_loss: 1.8273 - val_accuracy: 0.4593
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8787 - accuracy: 0.446
3 - val_loss: 1.7922 - val_accuracy: 0.4604
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8459 - accuracy: 0.454
6 - val_loss: 1.7659 - val_accuracy: 0.4674
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8122 - accuracy: 0.461
2 - val_loss: 1.7440 - val_accuracy: 0.4726
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7959 - accuracy: 0.465
```

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9 - val_loss: 1.7373 - val_accuracy: 0.4774
Epoch 8/15
127/127 [==============================] - 8s 60ms/step - loss: 1.7726 - accuracy: 0.468
8 - val_loss: 1.7276 - val_accuracy: 0.4759
Epoch 9/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7496 - accuracy: 0.476
1 - val_loss: 1.7109 - val_accuracy: 0.4774
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7344 - accuracy: 0.484
3 - val_loss: 1.7094 - val_accuracy: 0.4811
Epoch 11/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7220 - accuracy: 0.483
6 - val_loss: 1.6961 - val_accuracy: 0.4852
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7071 - accuracy: 0.490
2 - val_loss: 1.7038 - val_accuracy: 0.4881
Epoch 13/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6902 - accuracy: 0.491
0 - val_loss: 1.6942 - val_accuracy: 0.4889
Epoch 14/15
127/127 [==============================] - 7s 59ms/step - loss: 1.6772 - accuracy: 0.497
1 - val_loss: 1.6936 - val_accuracy: 0.4833
Epoch 15/15
127/127 [==============================] - 8s 59ms/step - loss: 1.6622 - accuracy: 0.496
7 - val_loss: 1.6983 - val_accuracy: 0.4893
507/507 [==============================] - 7s 12ms/step
Epoch 1/15
127/127 [==============================] - 13s 67ms/step - loss: 2.3232 - accuracy: 0.31
23 - val_loss: 2.0276 - val_accuracy: 0.3978
Epoch 2/15
127/127 [==============================] - 7s 59ms/step - loss: 2.0351 - accuracy: 0.400
0 - val_loss: 1.8962 - val_accuracy: 0.4370
Epoch 3/15
127/127 [==============================] - 8s 60ms/step - loss: 1.9364 - accuracy: 0.428
1 - val_loss: 1.8358 - val_accuracy: 0.4530
Epoch 4/15
127/127 [==============================] - 8s 60ms/step - loss: 1.8806 - accuracy: 0.447
1 - val_loss: 1.7950 - val_accuracy: 0.4578
Epoch 5/15
127/127 [==============================] - 8s 59ms/step - loss: 1.8391 - accuracy: 0.455
1 - val_loss: 1.7694 - val_accuracy: 0.4667
Epoch 6/15
127/127 [==============================] - 7s 59ms/step - loss: 1.8075 - accuracy: 0.460
8 - val_loss: 1.7436 - val_accuracy: 0.4752
Epoch 7/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7847 - accuracy: 0.471
6 - val_loss: 1.7251 - val_accuracy: 0.4778
Epoch 8/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7635 - accuracy: 0.474
9 - val_loss: 1.7166 - val_accuracy: 0.4830
Epoch 9/15
127/127 [==============================] - 8s 59ms/step - loss: 1.7414 - accuracy: 0.480
1 - val_loss: 1.7035 - val_accuracy: 0.4863
Epoch 10/15
127/127 [==============================] - 7s 58ms/step - loss: 1.7272 - accuracy: 0.487
5 - val_loss: 1.7031 - val_accuracy: 0.4807
Epoch 11/15
127/127 [==============================] - 7s 59ms/step - loss: 1.7112 - accuracy: 0.488
6 - val_loss: 1.6971 - val_accuracy: 0.4852
Epoch 12/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6953 - accuracy: 0.492
7 - val_loss: 1.6901 - val_accuracy: 0.4878
Epoch 13/15
127/127 [==============================] - 7s 58ms/step - loss: 1.6874 - accuracy: 0.496
7 - val_loss: 1.6843 - val_accuracy: 0.4870
Epoch 14/15
```

```
127/127 [==============================] - 8s 59ms/step - loss: 1.6735 - accuracy: 0.494
4 - val_loss: 1.6875 - val_accuracy: 0.4863
Epoch 15/15
127/127 [==============================] - 8s 60ms/step - loss: 1.6605 - accuracy: 0.500
3 - val_loss: 1.6765 - val_accuracy: 0.4830
507/507 [==============================] - 8s 14ms/step
Epoch 1/15
190/190 [==============================] - 16s 64ms/step - loss: 2.2143 - accuracy: 0.34
23 - val_loss: 1.9346 - val_accuracy: 0.4285
Epoch 2/15
190/190 [==============================] - 11s 58ms/step - loss: 1.9586 - accuracy: 0.42
15 - val_loss: 1.8329 - val_accuracy: 0.4548
Epoch 3/15
190/190 [==============================] - 11s 59ms/step - loss: 1.8810 - accuracy: 0.44
39 - val_loss: 1.7755 - val_accuracy: 0.4652
Epoch 4/15
190/190 [==============================] - 11s 59ms/step - loss: 1.8346 - accuracy: 0.45
79 - val_loss: 1.7398 - val_accuracy: 0.4759
Epoch 5/15
190/190 [==============================] - 11s 58ms/step - loss: 1.8035 - accuracy: 0.46
55 - val_loss: 1.7231 - val_accuracy: 0.4744
Epoch 6/15
190/190 [==============================] - 11s 58ms/step - loss: 1.7745 - accuracy: 0.47
23 - val_loss: 1.7052 - val_accuracy: 0.4826
Epoch 7/15
190/190 [==============================] - 11s 58ms/step - loss: 1.7563 - accuracy: 0.47
90 - val_loss: 1.6889 - val_accuracy: 0.4867
Epoch 8/15
190/190 [==============================] - 11s 58ms/step - loss: 1.7361 - accuracy: 0.48
20 - val_loss: 1.6815 - val_accuracy: 0.4856
Epoch 9/15
190/190 [==============================] - 11s 58ms/step - loss: 1.7184 - accuracy: 0.48
55 - val_loss: 1.6784 - val_accuracy: 0.4870
Epoch 10/15
190/190 [==============================] - 11s 58ms/step - loss: 1.7098 - accuracy: 0.48
73 - val_loss: 1.6696 - val_accuracy: 0.4889
Epoch 11/15
190/190 [==============================] - 11s 58ms/step - loss: 1.6943 - accuracy: 0.49
20 - val_loss: 1.6697 - val_accuracy: 0.4948
Epoch 12/15
190/190 [==============================] - 11s 58ms/step - loss: 1.6821 - accuracy: 0.49
45 - val_loss: 1.6610 - val_accuracy: 0.4933
Epoch 13/15
190/190 [==============================] - 11s 58ms/step - loss: 1.6653 - accuracy: 0.49
76 - val_loss: 1.6546 - val_accuracy: 0.4967
Epoch 14/15
190/190 [==============================] - 11s 59ms/step - loss: 1.6595 - accuracy: 0.49
98 - val_loss: 1.6582 - val_accuracy: 0.4915
Epoch 15/15
190/190 [==============================] - 11s 58ms/step - loss: 1.6518 - accuracy: 0.50
01 - val_loss: 1.6622 - val_accuracy: 0.4985
Total training time For Random Search: 1392.61 seconds
Best Parameters:  {'optimizer': <keras.optimizers.adagrad.Adagrad object at 0x7fce04f340
70>}
Best Accuracy: 49.03%
```

In [ ]:
```
rand_y_pred = random_search.predict(X_test)
rand_y_pred_labels = np.argmax(rand_y_pred, axis=1)
rand_y_test_labels = np.argmax(y_test, axis=1)
print(classification_report(rand_y_test_labels, rand_y_pred_labels))
```

```
85/85 [==============================] - 2s 13ms/step
              precision    recall  f1-score   support

           0       0.43      0.83      0.57       763
           1       0.42      0.30      0.35       195
```

2	0.53	0.22	0.31	90
3	0.47	0.28	0.35	53
4	0.54	0.11	0.19	168
5	0.58	0.55	0.57	278
6	0.61	0.42	0.50	52
7	0.80	0.84	0.82	134
8	0.57	0.32	0.41	206
9	0.34	0.23	0.27	91
10	0.56	0.42	0.48	144
11	0.45	0.18	0.25	252
12	0.33	0.04	0.07	136
13	0.48	0.51	0.49	138
accuracy			0.48	2700
macro avg	0.51	0.38	0.40	2700
weighted avg	0.49	0.48	0.44	2700

In [ ]:
```
conf_mat_rand= confusion_matrix(rand_y_test_labels, rand_y_pred_labels)
plt.figure(figsize=(15,7))
# create a heatmap of the confusion matrix
sns.set(font_scale=1.2)
sns.heatmap(conf_mat_rand, annot=True, fmt='d', cmap='Blues', cbar=False,
            xticklabels=['class 0', 'class 1', 'class 2', 'class 3', 'class 4', 'class 5
                         'class 6', 'class 7', 'class 8', 'class 9', 'class 10',
                         'class 11', 'class 12', 'class 13'],
            yticklabels=['class 0', 'class 1', 'class 2', 'class 3', 'class 4', 'class 5
                         'class 6', 'class 7', 'class 8', 'class 9', 'class 10',
                         'class 11', 'class 12', 'class 13'])
plt.xlabel('Predicted Labels', fontsize=14)
plt.ylabel('True Labels', fontsize=14)
plt.title('Confusion Matrix Random Search', fontsize=16)
plt.show()
```