In [1]:
```
!pip install tensorflow
```

```
Collecting tensorflow
  Using cached tensorflow-2.12.0-cp39-cp39-win_amd64.whl (1.9 kB)
Collecting tensorflow-intel==2.12.0
  Using cached tensorflow_intel-2.12.0-cp39-cp39-win_amd64.whl (272.8 MB)
Collecting absl-py>=1.0.0
  Using cached absl_py-1.4.0-py3-none-any.whl (126 kB)
Collecting flatbuffers>=2.0
  Using cached flatbuffers-23.5.8-py2.py3-none-any.whl (26 kB)
Collecting termcolor>=1.1.0
  Using cached termcolor-2.3.0-py3-none-any.whl (6.9 kB)
Requirement already satisfied: six>=1.12.0 in c:\users\kanag\anaconda3\lib\site-pa
ckages (from tensorflow-intel==2.12.0->tensorflow) (1.16.0)
Requirement already satisfied: packaging in c:\users\kanag\anaconda3\lib\site-pack
ages (from tensorflow-intel==2.12.0->tensorflow) (21.3)
Collecting tensorboard<2.13,>=2.12
  Using cached tensorboard-2.12.3-py3-none-any.whl (5.6 MB)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in c:\users\kanag\anaconda3\lib
\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.42.0)
Collecting gast<=0.4.0,>=0.2.1
  Using cached gast-0.4.0-py3-none-any.whl (9.8 kB)
Collecting numpy<1.24,>=1.22
  Using cached numpy-1.23.5-cp39-cp39-win_amd64.whl (14.7 MB)
Collecting astunparse>=1.6.0
  Using cached astunparse-1.6.3-py2.py3-none-any.whl (12 kB)
Collecting libclang>=13.0.0
  Using cached libclang-16.0.0-py2.py3-none-win_amd64.whl (24.4 MB)
Requirement already satisfied: h5py>=2.9.0 in c:\users\kanag\anaconda3\lib\site-pa
ckages (from tensorflow-intel==2.12.0->tensorflow) (3.6.0)
Collecting protobuf!=4.21.0,!=4.21.1,!=4.21.2,!=4.21.3,!=4.21.4,!=4.21.5,<5.0.0de
v,>=3.20.3
  Using cached protobuf-4.23.0-cp39-cp39-win_amd64.whl (422 kB)
Collecting jax>=0.3.15
  Using cached jax-0.4.8.tar.gz (1.2 MB)
  Installing build dependencies: started
  Installing build dependencies: finished with status 'done'
  Getting requirements to build wheel: started
  Getting requirements to build wheel: finished with status 'done'
    Preparing wheel metadata: started
    Preparing wheel metadata: finished with status 'done'
Requirement already satisfied: typing-extensions>=3.6.6 in c:\users\kanag\anaconda
3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (4.1.1)
Collecting google-pasta>=0.1.1
  Using cached google_pasta-0.2.0-py3-none-any.whl (57 kB)
Collecting tensorflow-estimator<2.13,>=2.12.0
  Using cached tensorflow_estimator-2.12.0-py2.py3-none-any.whl (440 kB)
Requirement already satisfied: setuptools in c:\users\kanag\anaconda3\lib\site-pac
kages (from tensorflow-intel==2.12.0->tensorflow) (61.2.0)
Requirement already satisfied: wrapt<1.15,>=1.11.0 in c:\users\kanag\anaconda3\lib
\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.12.1)
Collecting tensorflow-io-gcs-filesystem>=0.23.1
  Using cached tensorflow_io_gcs_filesystem-0.31.0-cp39-cp39-win_amd64.whl (1.5 M
B)
Collecting keras<2.13,>=2.12.0
  Using cached keras-2.12.0-py2.py3-none-any.whl (1.7 MB)
Collecting opt-einsum>=2.3.2
  Using cached opt_einsum-3.3.0-py3-none-any.whl (65 kB)
Requirement already satisfied: wheel<1.0,>=0.23.0 in c:\users\kanag\anaconda3\lib
\site-packages (from astunparse>=1.6.0->tensorflow-intel==2.12.0->tensorflow) (0.3
7.1)
Requirement already satisfied: scipy>=1.7 in c:\users\kanag\anaconda3\lib\site-pac
kages (from jax>=0.3.15->tensorflow-intel==2.12.0->tensorflow) (1.7.3)
Collecting ml-dtypes>=0.0.3
  Using cached ml_dtypes-0.1.0-cp39-cp39-win_amd64.whl (120 kB)
Collecting numpy<1.24,>=1.22
```

```
  Using cached numpy-1.22.4-cp39-cp39-win_amd64.whl (14.7 MB)
Collecting tensorboard-data-server<0.8.0,>=0.7.0
  Downloading tensorboard_data_server-0.7.0-py3-none-any.whl (2.4 kB)
Requirement already satisfied: requests<3,>=2.21.0 in c:\users\kanag\anaconda3\lib
\site-packages (from tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflo
w) (2.27.1)
Collecting grpcio<2.0,>=1.24.3
  Downloading grpcio-1.54.0-cp39-cp39-win_amd64.whl (4.1 MB)
Requirement already satisfied: markdown>=2.6.8 in c:\users\kanag\anaconda3\lib\sit
e-packages (from tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow)
(3.3.4)
Requirement already satisfied: werkzeug>=1.0.1 in c:\users\kanag\anaconda3\lib\sit
e-packages (from tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow)
(2.0.3)
Requirement already satisfied: google-auth<3,>=1.6.3 in c:\users\kanag\anaconda3\l
ib\site-packages (from tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorfl
ow) (1.33.0)
Collecting google-auth-oauthlib<1.1,>=0.5
  Downloading google_auth_oauthlib-1.0.0-py2.py3-none-any.whl (18 kB)
ERROR: pip's dependency resolver does not currently take into account all the pack
ages that are installed. This behaviour is the source of the following dependency
conflicts.
daal4py 2021.5.0 requires daal==2021.4.0, which is not installed.
numba 0.55.1 requires numpy<1.22,>=1.18, but you have numpy 1.22.4 which is incomp
atible.
google-cloud-storage 1.31.0 requires google-auth<2.0dev,>=1.11.0, but you have goo
gle-auth 2.17.3 which is incompatible.
google-cloud-core 1.7.1 requires google-auth<2.0dev,>=1.24.0, but you have google-
auth 2.17.3 which is incompatible.
google-api-core 1.25.1 requires google-auth<2.0dev,>=1.21.1, but you have google-a
uth 2.17.3 which is incompatible.
```

```
Requirement already satisfied: cachetools<5.0,>=2.0.0 in c:\users\kanag\anaconda3
\lib\site-packages (from google-auth<3,>=1.6.3->tensorboard<2.13,>=2.12->tensorflo
w-intel==2.12.0->tensorflow) (4.2.2)
Requirement already satisfied: pyasn1-modules>=0.2.1 in c:\users\kanag\anaconda3\l
ib\site-packages (from google-auth<3,>=1.6.3->tensorboard<2.13,>=2.12->tensorflow-
intel==2.12.0->tensorflow) (0.2.8)
Requirement already satisfied: rsa<5,>=3.1.4 in c:\users\kanag\anaconda3\lib\site-
packages (from google-auth<3,>=1.6.3->tensorboard<2.13,>=2.12->tensorflow-intel==
2.12.0->tensorflow) (4.7.2)
Collecting requests-oauthlib>=0.7.0
  Downloading requests_oauthlib-1.3.1-py2.py3-none-any.whl (23 kB)
Collecting google-auth<3,>=1.6.3
  Downloading google_auth-2.17.3-py2.py3-none-any.whl (178 kB)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in c:\users\kanag\anaconda3\li
b\site-packages (from pyasn1-modules>=0.2.1->google-auth<3,>=1.6.3->tensorboard<2.
13,>=2.12->tensorflow-intel==2.12.0->tensorflow) (0.4.8)
Requirement already satisfied: certifi>=2017.4.17 in c:\users\kanag\anaconda3\lib
\site-packages (from requests<3,>=2.21.0->tensorboard<2.13,>=2.12->tensorflow-inte
l==2.12.0->tensorflow) (2021.10.8)
Requirement already satisfied: charset-normalizer~=2.0.0 in c:\users\kanag\anacond
a3\lib\site-packages (from requests<3,>=2.21.0->tensorboard<2.13,>=2.12->tensorflo
w-intel==2.12.0->tensorflow) (2.0.4)
Requirement already satisfied: idna<4,>=2.5 in c:\users\kanag\anaconda3\lib\site-p
ackages (from requests<3,>=2.21.0->tensorboard<2.13,>=2.12->tensorflow-intel==2.1
2.0->tensorflow) (3.3)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in c:\users\kanag\anaconda3\l
ib\site-packages (from requests<3,>=2.21.0->tensorboard<2.13,>=2.12->tensorflow-in
tel==2.12.0->tensorflow) (1.26.9)
Collecting oauthlib>=3.0.0
  Downloading oauthlib-3.2.2-py3-none-any.whl (151 kB)
Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in c:\users\kanag\anaconda
3\lib\site-packages (from packaging->tensorflow-intel==2.12.0->tensorflow) (3.0.4)
Building wheels for collected packages: jax
  Building wheel for jax (PEP 517): started
  Building wheel for jax (PEP 517): finished with status 'done'
  Created wheel for jax: filename=jax-0.4.8-py3-none-any.whl size=1439795 sha256=2
1ad4db738efb827c6d4b580bd0bdb3b6608eafb98e0910c3a15d1747a7e57e4
  Stored in directory: c:\users\kanag\appdata\local\pip\cache\wheels\05\94\dc\8104
2da9bced43ff430bc02043d213d9e4b210b584c39e31c1
Successfully built jax
Installing collected packages: oauthlib, requests-oauthlib, numpy, google-auth, te
nsorboard-data-server, protobuf, opt-einsum, ml-dtypes, grpcio, google-auth-oauthl
ib, absl-py, termcolor, tensorflow-io-gcs-filesystem, tensorflow-estimator, tensor
board, libclang, keras, jax, google-pasta, gast, flatbuffers, astunparse, tensorfl
ow-intel, tensorflow
  Attempting uninstall: numpy
    Found existing installation: numpy 1.21.5
    Uninstalling numpy-1.21.5:
      Successfully uninstalled numpy-1.21.5
  Attempting uninstall: google-auth
    Found existing installation: google-auth 1.33.0
    Uninstalling google-auth-1.33.0:
      Successfully uninstalled google-auth-1.33.0
  Attempting uninstall: protobuf
    Found existing installation: protobuf 3.19.1
    Uninstalling protobuf-3.19.1:
      Successfully uninstalled protobuf-3.19.1
  Attempting uninstall: grpcio
    Found existing installation: grpcio 1.42.0
    Uninstalling grpcio-1.42.0:
      Successfully uninstalled grpcio-1.42.0
Successfully installed absl-py-1.4.0 astunparse-1.6.3 flatbuffers-23.5.8 gast-0.4.
0 google-auth-2.17.3 google-auth-oauthlib-1.0.0 google-pasta-0.2.0 grpcio-1.54.0 j
ax-0.4.8 keras-2.12.0 libclang-16.0.0 ml-dtypes-0.1.0 numpy-1.22.4 oauthlib-3.2.2
```

```
opt-einsum-3.3.0 protobuf-4.23.0 requests-oauthlib-1.3.1 tensorboard-2.12.3 tensor
board-data-server-0.7.0 tensorflow-2.12.0 tensorflow-estimator-2.12.0 tensorflow-i
ntel-2.12.0 tensorflow-io-gcs-filesystem-0.31.0 termcolor-2.3.0
```

In [2]:
```
import numpy as np
import tensorflow as tf
from tensorflow.keras import layers
from tensorflow.keras.models import Sequential
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

In [3]:
```
img_width, img_height = 32, 32
num_classes = 36
```

In [4]:
```
train_dir = r"C:\Users\kanag\OneDrive\Documents\DevanagariHandwrittenCharacterDatas
test_dir = r"C:\Users\kanag\OneDrive\Documents\DevanagariHandwrittenCharacterDatase
```

In [5]:
```
train_datagen = ImageDataGenerator(rescale=1./255)
test_datagen = ImageDataGenerator(rescale=1./255)
```

In [6]:
```
train_generator = train_datagen.flow_from_directory(
        train_dir,
        target_size=(img_width, img_height),
        batch_size=32,
        color_mode='grayscale',
        class_mode='categorical')

test_generator = test_datagen.flow_from_directory(
        test_dir,
        target_size=(img_width, img_height),
        batch_size=32,
        color_mode='grayscale',
        class_mode='categorical')
```

```
Found 61200 images belonging to 36 classes.
Found 10800 images belonging to 36 classes.
```

In [7]:
```
model = Sequential([
    layers.Conv2D(32, (3, 3), activation='relu', input_shape=(img_width, img_heigh
    layers.MaxPooling2D((2, 2)),
    layers.Conv2D(64, (3, 3), activation='relu'),
    layers.MaxPooling2D((2, 2)),
    layers.Conv2D(128, (3, 3), activation='relu'),
    layers.MaxPooling2D((2, 2)),
    layers.Flatten(),
    layers.Dense(128, activation='relu'),
    layers.Dense(num_classes, activation='softmax')
])
```

In [8]:
```
# Compile the model
model.compile(optimizer='adam',
              loss='categorical_crossentropy',
              metrics=['accuracy'])
```

In [9]:
```
history = model.fit(
        train_generator,
        epochs=1,
        validation_data=test_generator)
```

```
1913/1913 [==============================] - 442s 230ms/step - loss: 0.5647 - accu
racy: 0.8346 - val_loss: 0.2082 - val_accuracy: 0.9353
```

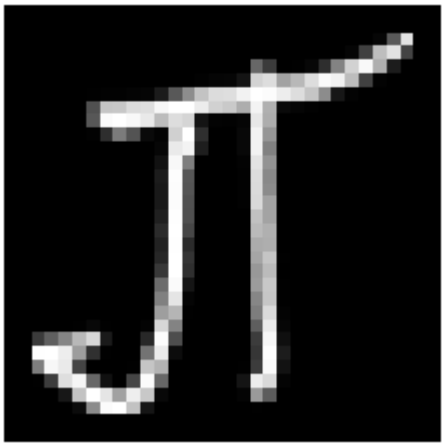
In [10]:
```
# Evaluate the model on the testing dataset
test_loss, test_acc = model.evaluate(test_generator)

print('Test accuracy:', test_acc)
```

```
338/338 [==============================] - 6s 18ms/step - loss: 0.2082 - accuracy:
0.9353
Test accuracy: 0.9352777600288391
```

In [11]:
```
# Load an input image of a Hindi character to classify
img_path = r"C:\Users\kanag\OneDrive\Documents\DevanagariHandwrittenCharacterDatase
img = tf.keras.preprocessing.image.load_img(img_path, target_size=(img_width, img_

# Preprocess the input image
x = tf.keras.preprocessing.image.img_to_array(img)
x = np.expand_dims(x, axis=0)
x /= 255.

# Classify the input image using the trained model
prediction = model.predict(x)

# Get the predicted class label
predicted_class = np.argmax(prediction)

# Get the folder name of the predicted class
class_dict = train_generator.class_indices
folder_name = [k for k, v in class_dict.items() if v == predicted_class][0]

print('Predicted folder name:', folder_name)
```

```
1/1 [==============================] - 0s 234ms/step
Predicted folder name: character_3_ga
```

In [12]:
```
import matplotlib.pyplot as plt
plt.imshow(img, cmap='gray')
plt.axis('off')
plt.show()
```



In [ ]: