```
!pip install tensorflow
!pip install pandas
!pip install numpy
```

```
Requirement already satisfied: tensorflow in /usr/local/lib/python3.10/dist-packages (2.17.0)
Requirement already satisfied: absl-py>=1.0.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.4.0)
Requirement already satisfied: astunparse>=1.6.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.6.3)
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Requirement already satisfied: gast!=0.5.0,!=0.5.1,!=0.5.2,>=0.2.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (0.6
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Requirement already satisfied: protobuf!=4.21.0,!=4.21.1,!=4.21.2,!=4.21.3,!=4.21.4,!=4.21.5,<5.0.0dev,>=3.20.3 in /usr/local/lib/py
Requirement already satisfied: requests<3,>=2.21.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (2.32.3)
Requirement already satisfied: setuptools in /usr/local/lib/python3.10/dist-packages (from tensorflow) (71.0.4)
Requirement already satisfied: six>=1.12.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.16.0)
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Requirement already satisfied: keras>=3.2.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (3.4.1)
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Requirement already satisfied: numpy in /usr/local/lib/python3.10/dist-packages (1.26.4)
```

```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Embedding, Dense, Dropout, Flatten, Conv1D, MaxPooling1D
```

```
df = pd.read_csv('train.csv')  # Use the correct name of your CSV file here
df.head()  # Display the first few rows of the dataset
```

	id	comment_text	toxic	severe_toxic	obscene	threat	insult	identity_hate
0	0000997932d777bf	Explanation\nWhy the edits made under my usern...	0	0	0	0	0	0
1	000103f0d9cfb60f	D'aww! He matches this background colour I'm s...	0	0	0	0	0	0
2	000113f07ec002fd	Hey man, I'm really not trying to edit war. It...	0	0	0	0	0	0
3	0001b41b1c6bb37e	"\nMore\nI can't make any real suggestions on ...	0	0	0	0	0	0
4	0001d958c54c6e35	You, sir, are my hero. Any chance you remember...	0	0	0	0	0	0

```
# Extract features and labels
X = df['comment_text']
y = df[['toxic', 'severe_toxic', 'obscene', 'threat', 'insult', 'identity_hate']].valu

# Tokenize and pad sequences
tokenizer = Tokenizer(num_words=20000, oov_token='<OOV>')
tokenizer.fit_on_texts(X)
```

```
X_seq = tokenizer.texts_to_sequences(X)
X_padded = pad_sequences(X_seq, maxlen=200)

# Split dataset into training and test sets
X_train, X_test, y_train, y_test = train_test_split(X_padded, y, test_size=0.2, random_state=42)



# VGG-like model
vgg_model = Sequential([
    Embedding(input_dim=20000, output_dim=128, input_length=200),
    Conv1D(128, 3, activation='relu'),
    MaxPooling1D(pool_size=2),
    Conv1D(128, 3, activation='relu'),
    MaxPooling1D(pool_size=2),
    Flatten(),
    Dense(128, activation='relu'),
    Dropout(0.5),
    Dense(6, activation='sigmoid')  # 6 output classes for multi-label classification
])

vgg_model.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accuracy'])
vgg_model.summary()  # Display the model summary
```

```
/usr/local/lib/python3.10/dist-packages/keras/src/layers/core/embedding.py:90: UserWarning: Argument `input_length` is deprecated. J
  warnings.warn(
```

Model: "sequential"

Layer (type)	Output Shape	Param #
embedding (Embedding)	?	0 (unbuilt)
conv1d (Conv1D)	?	0 (unbuilt)
max_pooling1d (MaxPooling1D)	?	0 (unbuilt)
conv1d_1 (Conv1D)	?	0 (unbuilt)
max_pooling1d_1 (MaxPooling1D)	?	0 (unbuilt)
flatten (Flatten)	?	0 (unbuilt)
dense (Dense)	?	0 (unbuilt)
dropout (Dropout)	?	0 (unbuilt)
dense_1 (Dense)	?	0 (unbuilt)

Total params: 0 (0.00 B)
Trainable params: 0 (0.00 B)

```
# Train VGG-like model
history_vgg = vgg_model.fit(X_train, y_train, epochs=5, batch_size=64, validation_split=0.2)
```

```
Epoch 1/5
1596/1596 ━━━━━━━━━━━━━━━━━━━━ 353s 220ms/step - accuracy: 0.7736 - loss: 0.1160 - val_accuracy: 0.9943 - val_loss: 0.0648
Epoch 2/5
1596/1596 ━━━━━━━━━━━━━━━━━━━━ 335s 210ms/step - accuracy: 0.9869 - loss: 0.0568 - val_accuracy: 0.9943 - val_loss: 0.0648
Epoch 3/5
1596/1596 ━━━━━━━━━━━━━━━━━━━━ 380s 209ms/step - accuracy: 0.9915 - loss: 0.0482 - val_accuracy: 0.9943 - val_loss: 0.0728
Epoch 4/5
1596/1596 ━━━━━━━━━━━━━━━━━━━━ 333s 209ms/step - accuracy: 0.9795 - loss: 0.0410 - val_accuracy: 0.9942 - val_loss: 0.0798
Epoch 5/5
1596/1596 ━━━━━━━━━━━━━━━━━━━━ 378s 206ms/step - accuracy: 0.9561 - loss: 0.0365 - val_accuracy: 0.9899 - val_loss: 0.0883
```

```
# Evaluate VGG-like model
vgg_loss, vgg_acc = vgg_model.evaluate(X_test, y_test)
print(f"VGG-like Model Accuracy: {vgg_acc:.4f}")
```

```
998/998 ━━━━━━━━━━━━━━━━━━━━ 28s 28ms/step - accuracy: 0.9903 - loss: 0.0841
VGG-like Model Accuracy: 0.9902
```

```
import matplotlib.pyplot as plt

# Plot training & validation accuracy values
plt.plot(history_vgg.history['accuracy'])
plt.plot(history_vgg.history['val_accuracy'])
plt.title('Model accuracy')
plt.ylabel('Accuracy')
plt.xlabel('Epoch')
plt.legend(['Train', 'Test'], loc='upper left')
```

```
plt.show()

# Plot training & validation loss values
plt.plot(history_vgg.history['loss'])
plt.plot(history_vgg.history['val_loss'])
plt.title('Model loss')
plt.ylabel('Loss')
plt.xlabel('Epoch')
plt.legend(['Train', 'Test'], loc='upper left')
plt.show()
```