

```
from google.colab import files
uploaded = files.upload()
```



Choose Files img.zip

- **img.zip**(application/x-zip-compressed) - 10410380 bytes, last modified: 4/8/2025 - 100% done
Saving img.zip to img.zip

```
import zipfile
import os
```

```
zip_path = '/content/img.zip' # change this to match the uploaded filename
with zipfile.ZipFile(zip_path, 'r') as zip_ref:
    zip_ref.extractall('/content/images') # extract to folder
```

```
!unzip -o /content/img.zip -d /content/images
```



```
inflating: /content/images/img/volume-2_49.png
inflating: /content/images/img/volume-2_5.png
inflating: /content/images/img/volume-2_50.png
inflating: /content/images/img/volume-2_6.png
inflating: /content/images/img/volume-2_7.png
inflating: /content/images/img/volume-2_8.png
inflating: /content/images/img/volume-2_9.png
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inflating: /content/images/img/volume-3_45.png
inflating: /content/images/img/volume-3_46.png
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inflating: /content/images/img/volume-3_48.png
inflating: /content/images/img/volume-3_49.png
inflating: /content/images/img/volume-3_5.png
inflating: /content/images/img/volume-3_50.png
inflating: /content/images/img/volume-3_6.png
inflating: /content/images/img/volume-3_7.png
inflating: /content/images/img/volume-3_8.png
inflating: /content/images/img/volume-3_9.png
```

```
image_folder = '/content/images/img'
images = [f for f in os.listdir(image_folder) if f.lower().endswith('.png')]
print(f"Total images: {len(images)}")
```

↩ Total images: 611

```
import os
import numpy as np
import pandas as pd
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras import layers, models, Input, Model
from sklearn.model_selection import train_test_split
import xgboost as xgb
from xgboost import XGBClassifier
from sklearn.metrics import accuracy_score
import cv2
import glob

# Load CSV files
df_train = pd.read_csv('/content/lits_train.csv')
df_test = pd.read_csv('/content/lits_test.csv')

# Folder where images are stored
image_folder = '/content/images/img'
dataset_paths = sorted(glob.glob(os.path.join(image_folder, '*.png')))

# Define the load_images function
def load_images(image_paths):
    images = []
    for path in image_paths:
        img = cv2.imread(path, cv2.IMREAD_GRAYSCALE)
        if img.shape != (128, 128):
            img = cv2.resize(img, (128, 128))
        images.append(img)
    return np.array(images).reshape(-1, 128, 128, 1)

# Load dataset
X = load_images(dataset_paths)
X = X / 255.0

# Extract labels
y = df_train['tumor_mask_empty'].values[:len(X)]

# Split data
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42, stratify=y)

# CNN model
inputs = Input(shape=(128, 128, 1))
x = layers.Conv2D(64, (3, 3), activation='relu')(inputs)
x = layers.MaxPooling2D((2, 2))(x)
x = layers.Conv2D(128, (3, 3), activation='relu')(x)
x = layers.MaxPooling2D((2, 2))(x)
x = layers.Flatten()(x)
x = layers.Dense(256, activation='relu')(x)
outputs = layers.Dense(1, activation='sigmoid')(x)

cnn_model = Model(inputs=inputs, outputs=outputs)
cnn_model.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accuracy'])

# Train CNN
history = cnn_model.fit(X_train, y_train, epochs=10, batch_size=4, validation_split=0.2)
# Extract CNN features
feature_extractor = Model(inputs=cnn_model.input, outputs=cnn_model.layers[-2].output)
X_train_features = feature_extractor.predict(X_train)
X_test_features = feature_extractor.predict(X_test)

# XGBoost on CNN features
xgb_model = XGBClassifier(n_estimators=100, learning_rate=0.1, max_depth=3)
xgb_model.fit(X_train_features, y_train.ravel())
```

```
y_pred = xgb_model.predict(X_test_features)
accuracy = accuracy_score(y_test, y_pred)
print(f'XGBoost Accuracy: {accuracy:.4f}')
```

```
Epoch 1/10
98/98 ————— 9s 36ms/step - accuracy: 0.9058 - loss: 1.5072 - val_accuracy: 0.9592 - val_loss: 0.258
Epoch 2/10
98/98 ————— 1s 12ms/step - accuracy: 0.9499 - loss: 0.2784 - val_accuracy: 0.9592 - val_loss: 0.169
Epoch 3/10
98/98 ————— 1s 12ms/step - accuracy: 0.9554 - loss: 0.1945 - val_accuracy: 0.9592 - val_loss: 0.549
Epoch 4/10
98/98 ————— 1s 13ms/step - accuracy: 0.9524 - loss: 0.2973 - val_accuracy: 0.9592 - val_loss: 0.166
Epoch 5/10
98/98 ————— 2s 12ms/step - accuracy: 0.9620 - loss: 0.1863 - val_accuracy: 0.9592 - val_loss: 0.193
Epoch 6/10
98/98 ————— 1s 13ms/step - accuracy: 0.9436 - loss: 0.2148 - val_accuracy: 0.9592 - val_loss: 0.156
Epoch 7/10
98/98 ————— 1s 12ms/step - accuracy: 0.9656 - loss: 0.1480 - val_accuracy: 0.9592 - val_loss: 0.556
Epoch 8/10
98/98 ————— 1s 13ms/step - accuracy: 0.9547 - loss: 0.2903 - val_accuracy: 0.9592 - val_loss: 0.162
Epoch 9/10
98/98 ————— 1s 13ms/step - accuracy: 0.9728 - loss: 0.1366 - val_accuracy: 0.9592 - val_loss: 0.182
Epoch 10/10
98/98 ————— 1s 13ms/step - accuracy: 0.9376 - loss: 0.2214 - val_accuracy: 0.9592 - val_loss: 0.154
16/16 ————— 1s 39ms/step
4/4 ————— 1s 271ms/step
XGBoost Accuracy: 0.9593
```

```
feature_extractor.save('/content/feature_extractor_model.h5')
```

```
WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save_model(model)`. Thi
```

```
feature_extractor = tf.keras.models.load_model('/content/feature_extractor_model.h5')
```

```
WARNING:absl:No training configuration found in the save file, so the model was *not* compiled. Compile it manuall
```

```
# Save your trained models (you should have already done this)
feature_extractor.save('/content/feature_extractor_model.h5')
```

```
import joblib
joblib.dump(xgb_model, '/content/xgb_model.pkl')
```

```
WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save_model(model)`. Thi
['/content/xgb_model.pkl']
```

```
!pip install streamlit pyngrok xgboost opencv-python
```

```
Collecting streamlit
  Downloading streamlit-1.45.1-py3-none-any.whl.metadata (8.9 kB)
Collecting pyngrok
  Downloading pyngrok-7.2.8-py3-none-any.whl.metadata (10 kB)
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Requirement already satisfied: numpy<3,>=1.23 in /usr/local/lib/python3.11/dist-packages (from streamlit) (2.0.2
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Collecting watchdog<7,>=2.1.5 (from streamlit)
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  44.3/44.3 kB 3.3 MB/s eta 0:00:00
Requirement already satisfied: gitpython!=3.1.19,<4,>=3.0.7 in /usr/local/lib/python3.11/dist-packages (from str
```

```

Collecting pydeck<1,>=0.8.0b4 (from streamlit)
  Downloading pydeck-0.9.1-py2.py3-none-any.whl.metadata (4.1 kB)
Requirement already satisfied: tornado<7,>=6.0.3 in /usr/local/lib/python3.11/dist-packages (from streamlit) (6.
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Downloading pydeck-0.9.1-py2.py3-none-any.whl (6.9 MB)
  6.9/6.9 MB 115.6 MB/s eta 0:00:00
Downloading watchdog-6.0.0-py3-none-manylinux2014_x86_64.whl (79 kB)
  79.1/79.1 kB 7.6 MB/s eta 0:00:00
Installing collected packages: watchdog, pyngrok, pydeck, streamlit
Successfully installed pydeck-0.9.1 pyngrok-7.2.8 streamlit-1.45.1 watchdog-6.0.0

```

```

import os
os.environ["NGROK_AUTH_TOKEN"] = "2jobd681TGhlxwJLhtUfB2JfBrp_7BBJHimf3bV2aJyti3B5K"

```

```

%%writefile app.py
import streamlit as st
import numpy as np
import pandas as pd
import cv2
import glob
import os
from tensorflow.keras.models import load_model, Model
from tensorflow.keras import layers, Input
from xgboost import XGBClassifier
import joblib

# Load trained models (you must save them after training in Colab)
cnn_model = load_model('/content/feature_extractor_model.h5')
xgb_model = joblib.load('/content/xgb_model.pkl')

# Feature extractor
feature_extractor = Model(inputs=cnn_model.input, outputs=cnn_model.layers[-2].output)

def load_image(image_file):
    img = cv2.imdecode(np.frombuffer(image_file.read(), np.uint8), cv2.IMREAD_GRAYSCALE)
    img = cv2.resize(img, (128, 128))
    return img.reshape(1, 128, 128, 1) / 255.0

st.title("Tumor Detection using CNN + XGBoost")

uploaded_file = st.file_uploader("Upload an image", type=['png', 'jpg', 'jpeg'])
if uploaded_file is not None:
    st.image(uploaded_file, caption='Uploaded Image', width=250)
    img = load_image(uploaded_file)

    cnn_features = feature_extractor.predict(img)
    prediction = xgb_model.predict(cnn_features)[0]
    st.write("Prediction:", "Tumor Detected" if prediction == 1 else "No Tumor")

```

✎ Writing app.py

```
!streamlit run app.py &
```



Collecting usage statistics. To deactivate, set `browser.gatherUsageStats` to `false`.

You can now view your Streamlit app in your browser.

Local URL: <http://localhost:8501>

Network URL: <http://172.28.0.12:8501>

External URL: <http://34.143.211.108:8501>

Stopping...

```
import streamlit as st
import numpy as np
import cv2
import tensorflow as tf
import pickle

# Load models
cnn_model = tf.keras.models.load_model('/content/feature_extractor_model.h5') # Make sure this file exists
with open("/content/xgb_model.pkl", "rb") as f:
    xgb_model = pickle.load(f) # XGBoost model on CNN features

st.title("Liver Tumor Detection from CT Scan")

uploaded_file = st.file_uploader("Upload a Liver CT Scan Image", type=["png", "jpg", "jpeg"])

if uploaded_file is not None:
    # Display image
    file_bytes = np.asarray(bytearray(uploaded_file.read()), dtype=np.uint8)
    img = cv2.imdecode(file_bytes, cv2.IMREAD_GRAYSCALE)

    # Preprocess
    img_resized = cv2.resize(img, (128, 128))
    img_input = img_resized.reshape(1, 128, 128, 1) / 255.0

    st.image(img, caption="Uploaded CT Scan", use_container_width=True)

    # Feature extraction from CNN
    feature_extractor = tf.keras.Model(inputs=cnn_model.input, outputs=cnn_model.layers[-2].output)
    cnn_features = feature_extractor.predict(img_input)

    # XGBoost Prediction
    prediction = xgb_model.predict(cnn_features)[0]
    label = "Tumor Detected" if prediction == 1 else "No Tumor Found"

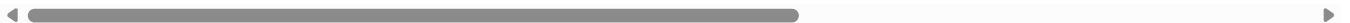
    # Display result
    st.success(f"Prediction: {label}")
```



WARNING:absl:No training configuration found in the save file, so the model was *not* compiled. Compile it manually
 2025-05-14 12:10:10.797 WARNING streamlit.runtime.scriptrunner_utils.script_run_context: Thread 'MainThread': miss
 2025-05-14 12:10:11.241

Warning: to view this Streamlit app on a browser, run it with the following command:

```
streamlit run /usr/local/lib/python3.11/dist-packages/colab_kernel_launcher.py [ARGUMENTS]
2025-05-14 12:10:11.242 Thread 'MainThread': missing ScriptRunContext! This warning can be ignored when running in
2025-05-14 12:10:11.243 Thread 'MainThread': missing ScriptRunContext! This warning can be ignored when running in
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2025-05-14 12:10:11.246 Thread 'MainThread': missing ScriptRunContext! This warning can be ignored when running in
```



```
!pip install streamlit pyngrok pillow
```



Requirement already satisfied: streamlit in /usr/local/lib/python3.11/dist-packages (1.45.1)
 Requirement already satisfied: pyngrok in /usr/local/lib/python3.11/dist-packages (7.2.8)
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Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.11/dist-packages (from jinja2->altair<6,>
Requirement already satisfied: attrs>=22.2.0 in /usr/local/lib/python3.11/dist-packages (from jsonschema>=3.0->alt
Requirement already satisfied: jsonschema-specifications>=2023.03.6 in /usr/local/lib/python3.11/dist-packages (fr
Requirement already satisfied: referencing>=0.28.4 in /usr/local/lib/python3.11/dist-packages (from jsonschema>=3.
Requirement already satisfied: rpds-py>=0.7.1 in /usr/local/lib/python3.11/dist-packages (from jsonschema>=3.0->al
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.11/dist-packages (from python-dateutil>=2.8.2->p

```

!ngrok config add-authtoken 2w5cMSLJWZtB20oKypL38j8uJgj_7Ets2As4UPW5udBCnKJoY

Authtoken saved to configuration file: /root/.config/ngrok/ngrok.yml

```

# Install required packages
!pip install streamlit pyngrok pillow

# Write the Streamlit app to a file
code = """
import streamlit as st
from PIL import Image
import numpy as np

def predict_tumor(image_array):
    return "Tumor Detected" if np.mean(image_array) < 100 else "No Tumor Detected"

st.title("Liver Cancer Detection from CT Scans")
st.write("Upload a CT scan image to detect presence of liver tumor.")

uploaded_file = st.file_uploader("Choose a CT scan image", type=["jpg", "jpeg", "png"])

if uploaded_file is not None:
    image = Image.open(uploaded_file).convert('L') # grayscale
    st.image(image, caption="Uploaded CT Image", use_container_width=True)

    image_resized = image.resize((224, 224))
    image_array = np.array(image_resized)

    prediction = predict_tumor(image_array)
    st.subheader("Prediction:")
    st.success(prediction)
    """

with open("app.py", "w") as f:
    f.write(code)

```

Requirement already satisfied: streamlit in /usr/local/lib/python3.11/dist-packages (1.45.1)
Requirement already satisfied: pyngrok in /usr/local/lib/python3.11/dist-packages (7.2.8)

Requirement already satisfied: pillow in /usr/local/lib/python3.11/dist-packages (11.2.1)
 Requirement already satisfied: altair<6,>=4.0 in /usr/local/lib/python3.11/dist-packages (from streamlit) (5.5.0)
 Requirement already satisfied: blinker<2,>=1.5.0 in /usr/local/lib/python3.11/dist-packages (from streamlit) (1.9.
 Requirement already satisfied: cachetools<6,>=4.0 in /usr/local/lib/python3.11/dist-packages (from streamlit) (5.5
 Requirement already satisfied: click<9,>=7.0 in /usr/local/lib/python3.11/dist-packages (from streamlit) (8.1.8)
 Requirement already satisfied: numpy<3,>=1.23 in /usr/local/lib/python3.11/dist-packages (from streamlit) (2.0.2)
 Requirement already satisfied: packaging<25,>=20 in /usr/local/lib/python3.11/dist-packages (from streamlit) (24.2
 Requirement already satisfied: pandas<3,>=1.4.0 in /usr/local/lib/python3.11/dist-packages (from streamlit) (2.2.2
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 Requirement already satisfied: requests<3,>=2.27 in /usr/local/lib/python3.11/dist-packages (from streamlit) (2.32
 Requirement already satisfied: tenacity<10,>=8.1.0 in /usr/local/lib/python3.11/dist-packages (from streamlit) (9.
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 Requirement already satisfied: tornado<7,>=6.0.3 in /usr/local/lib/python3.11/dist-packages (from streamlit) (6.4.
 Requirement already satisfied: PyYAML>=5.1 in /usr/local/lib/python3.11/dist-packages (from pyngrok) (6.0.2)
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 Requirement already satisfied: jsonschema>=3.0 in /usr/local/lib/python3.11/dist-packages (from altair<6,>=4.0->st
 Requirement already satisfied: narwhals>=1.14.2 in /usr/local/lib/python3.11/dist-packages (from altair<6,>=4.0->s
 Requirement already satisfied: gitdb<5,>=4.0.1 in /usr/local/lib/python3.11/dist-packages (from gitpython!=3.1.19,
 Requirement already satisfied: python-dateutil>=2.8.2 in /usr/local/lib/python3.11/dist-packages (from pandas<3,>=
 Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.11/dist-packages (from pandas<3,>=1.4.0->str
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 Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.11/dist-packages (from requests<
 Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.11/dist-packages (from requests<3,>=2.27->st
 Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.11/dist-packages (from requests<3,>=2.
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 Requirement already satisfied: smmap<6,>=3.0.1 in /usr/local/lib/python3.11/dist-packages (from gitdb<5,>=4.0.1->g
 Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.11/dist-packages (from jinja2->altair<6,>
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 Requirement already satisfied: rpds-py>=0.7.1 in /usr/local/lib/python3.11/dist-packages (from jsonschema>=3.0->al
 Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.11/dist-packages (from python-dateutil>=2.8.2->p

```
# Start ngrok
from pyngrok import ngrok
ngrok.kill()
public_url = ngrok.connect(8501)
print(f"Public URL: {public_url}")

# Run Streamlit app
!streamlit run app.py --server.enableCORS false --server.enableXsrfProtection false &

... Public URL: NgrokTunnel: "https://1817-34-143-211-108.ngrok-free.app" -> "http://localhost:8501"

Collecting usage statistics. To deactivate, set browser.gatherUsageStats to false.
```

You can now view your Streamlit app in your browser.

Local URL: <http://localhost:8501>
 Network URL: <http://172.28.0.12:8501>
 External URL: <http://34.143.211.108:8501>

