**VISVESVARAYA TECHNOLOGICAL UNIVERSITY**

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A PROJECT REPORT

ON

# "BRAIN TUMOR DETECTION USING ML"

*Submitted in partial fulfillment of*

*the requirements for the award of the degree of*

**Bachelor of Engineering**

**in**

**Computer Science and Engineering**

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# *Certificate*

This is to certify that project work entitled ““IoT Based Smart Pisciculture Monitoring System” is a bonafide work carried out by

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in partial fulfillment for the award of Bachelor of Engineering in Computer Science and Engineering of the Visvesvaraya Technological University, Belgavi during the year 2021-2022. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the Bachelor of Engineering Degree.

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# ABSTRACT

Clinical imaging innovation is turning out to be more huge in day to day clinical analysis and clinical exploration as present day clinical norms move along. Therefore, clinical symptomatic picture information research is basic. Mind growths have turned into a significant exploration region in the clinical field because of their successive event and multifaceted nature. Most of cerebrum growth analyse depend on the assessment of imaging information from mind cancer pictures. A basic stage in laying out a patient's status is exact understanding of mind growth pictures. Be that as it may, the gathering of specialists' very own clinical information, aberrations in experience levels, and visual weariness can all modify how well picture information are investigated. Thus, figuring out how to actually distinguish cerebrum cancer photographs is basic. At its most advanced stages, a brain tumour is one of the most deadly diseases. The strain of manually detecting images will be much reduced, and the manner of detecting cancers will be greatly improved. We used MRI greyscale pictures to spot the tumour. For clinical assessment and treatment planning of brain tumours, automatic detection of brain cancers from medical pictures is crucial. From multimodal resonance imaging, we suggest using a CNN to detect the presence of brain tumour in the Magnetic Resonance Images.

# ACKNOWLEDGEMENTS

We present with immense pleasure this work titled "BRAIN TUMOR DETECTION USING ML"

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Project Associates

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# Chapter 1

# Introduction

Medical imaging advancement is ending up being more immense in everyday clinical investigation and clinical investigation as present day clinical standards move along. Subsequently, clinical suggestive picture data research is fundamental. Mind developments have transformed into a huge investigation area in the clinical field in view of their progressive occasion and multi-layered nature. A large portion of frontal cortex development dissect rely upon the appraisal of imaging data from mind malignant growth pictures. A fundamental stage in spreading out a patient's status is accurate comprehension of brain development pictures. Nevertheless, the social affair of experts' own special clinical data, distortions in experience levels, and visual exhaustion can all adjust how well picture data are explored. Subsequently, sorting out some way to really recognize frontal cortex disease photos is fundamental. Without utilizing ionizing radiation, attractive reverberation imaging (MRI) can offer data on the size, shape and area of human tissues and organs. The photos got are fresh and clear. The utilization of MRI improves indicative productivity, takes out the requirement for thoracotomy or laparotomy investigation, and fills in as a helpful aide for sore restriction and careful treatment. Three-layered multi-band imaging advances, as well as chest X-beam examining, are utilized in cerebrum cancer MRIs. In contrast with 2D pictures, 3D multiband MRI can uncover the direction position of the sore region, which can help the specialist appropriately find the injury. Moreover, utilizing the underutilized advancement succession, MRI imaging can acquire assorted states of a similar tissue. That is, a multimodal MRI picture. Unmistakable modes can show various parts of a mind cancer. Growths are separated into two classes: harmless and dangerous cancers. Growths are frequently separated into two sorts: essential and optional cancers. The essential growth starts in the mind and spreads to different pieces of the body as an auxiliary cancer. X-beams, Computed Tomography, and Magnetic Resonance Imaging are only a couple of the clinical imaging procedures available (Magnetic Resonance Imaging). As a result 2 of their high goal and picture quality, MRI cerebrum checks are utilized in this review. It is important to isolate the growth area from the MRI cerebrum picture after it has been caught. The radiologist can orchestrate radiation all the more really with precise location of clinical pictures.

Chapter 2

# Literature Survey

## 2.1 Background Study

A mind cancer is a peculiar advancement of cells in the cerebrum. Because some tumours are cancerous, they must be identified and treated right away. Because the specific cause of brain tumours, as well as the symptoms associated with them, is unknown, people may be suffering from them without realising it. Malignant (containing cancer cells) or benign (without including cancer cells) primary brain tumours exist. A mind growth is framed when cells partition and grow unusually. It is by all accounts a strong mass while analyzed using symptomatic clinical imaging strategies.

## 2.2 Literature review

- Sachin R Jadhav [1] presented a CNN-based approach for brain tumour segmentation in MRI images. There are numerous strategies for brain tumour segmentation and classification that can be used to detect the tumour. There are numerous procedures available. This paper examines existing strategies for detecting brain tumours, as well as their benefits and drawbacks. Propose a Convolution Neural Network (CNN)-based classifier to solve these drawbacks. The best result is obtained by comparing the trained and test data using a CNN-based classifier. The Image processing is the process of examining and altering a digital image in order to extract information from it. Clinical imaging expects to uncover inner designs covered underneath the skin and bones, as well as to distinguish and fix sicknesses. It likewise makes an information base of typical life structures and physiology, permitting irregularities to be identified. One reason for the development in mortality among individuals in this day and age is mind growth. The expression "mind growth" alludes to the unusual or uncontrolled advancement of cells inside the human body. This sort of growth develops inside the skull, making normal mind movement be upset. A cerebrum cancer is a hazardous condition. Subsequently, in the event that not perceived at an early time, an individual's life might be removed. There are three sorts of cerebrum growths: harmless, threatening, and premalignant. Disease is brought about by a dangerous growth.

- Bhandari [2] has talked about Convolutional neural networks are as yet an intriguing issue in the field of mechanized cancer division. It is basic for radiologists to secure a strong information on convolutional brain networks to be ready to involve these innovations in clinical practice from here on out. This paper gives an essential acquaintance that assists the peruser with become knowledgeable in the realm of robotized division. Since mind growth division from typical parenchyma is the underlying advance in utilizing quantitative picture highlight investigation, for example, radiomics for anticipation and treatment arranging, clinical application to GBM is critical. This could be applied to different areas of radiology by additional 5 creating division procedures in cerebrum growths. Convolutional nural networks are a creating field that will no doubt help radiologists in giving more exact consideration to their patients. Convolutional nural networks work by dissecting data extricated from pictures to perform undertakings like cancer division. This starts with the organization being prepared on a physically divided dataset prior to being utilized to fragment patient photographs. This is valuable for dividing mind cancers like glioblastoma and lowergrade astrocytomas. Clinical results, for example, endurance and responsiveness to treatment can be anticipated utilizing portioned pictures.

- Ming Li [3] has examined A methodology for recognizing three-layered MRI cerebrum cancers utilizing multimodal data combination and CNN is proposed in this exploration. Regardless, it is desirable over utilize improved multimodal 3D-CNNs to get threelayered properties of cerebrum growth sores utilizing a few modalities. Remove the data about the distinctions between the different modes. Second, the mind cancer trademark information is normalized to resolve the issue of slow organization union and extreme over-fitting. One more weighted hardship work is then evolved taking into account the little volume of the sensitive area and the tremendous volume of the nonfocal locale to cripple the deterrent of the non-focal district on the ID of brain growths, and the adversity limit can be improved to diminish the area of frontal cortex tumors. The preliminary revelations show that the three appraisal records of dice, SN, and SE are upgraded, and the two-layered frontal cortex disease ID network is stood out from the first singlemode mind development disclosure technique. There's been a huge improvement.

- M Malathi [4] has discussed different target structures, such as edoema, advancing tumour, nonadvancing tumour, necrotic tumour core, and backdrop, are available in the BRATS data base. Color, grayscale, or intensity photos with a default size of 220x220 are used in the proposed work. Image segmentation and edge detection are two crucial stages in the automatic detection of a patient's brain tumour. The way from the image informational collection document to the framework index is the following critical stage. It very well might be utilized to distribute informational indexes from PC memory utilizing the Anaconda structure. It tends to be done physically or through programming using the Python OS's inherent capacities. The primary goal of segmentation is to group pixels into image regions, which aids in identifying a location 6 of interest, such as a tumour or other abnormality. In the Jupytor note book, the pixels divided part is compared to a typical brain image. This type of comparison aids in the detection of aberrant regions of a patient with a brain tumour. The next step is to detect the edges. The brain tumour component of the segmented image is classified using cannon edge detection. The whitish part depicted is a tumour. The necrotic core of the tumour is represented by red, the advancing tumour is represented by yellow, the nonadvancing tumour is represented by blue, and the swelling section of the tumour is represented by green.

- Sivaramakrishnan [5] has examined the Fuzzy C methodology gathering calculation and histogram evening out were utilized to extend an effective and imaginative revelation of the mind cancer area from an image. The use of major factor assessment is used to disintegrate images in order to lower the wavelet coefficient's extent. The FCM clustering technique accurately removed the tumour area from the MR images, as predicted.

- Asra Aslam [6] presented a brain-tumor segmentation detection 6tilizing an upgraded edge technique that primarily depended on Sobel feature detection. Their work combines the binary thresholding operation with the Sobel approach and uses a secure contour process to excavate various extents. Cancer cells are removed from the generated image using intensity values when that operation is completed.

- K. Sudharani [7] discussed To locate and confine the hysterically full-fledged component among the aberrant tissues, a K- closest neighbour method was applied to the MR images. The suggested work employs a cumbersome process, yet it yields stunning results. The sample training phase determines the accuracy.

Survey page

# Chapter 3

# METHODOLOGY

## 3.1 Module Division

According to a literature review, automated brain tumour detection is critical because high accuracy is required when human life is at stake. Feature extraction and classification using a machine learning algorithm are used to automate tumour detection in MR images. As indicated in the figure, a system to automatically detect tumour in MR images is proposed in this study.

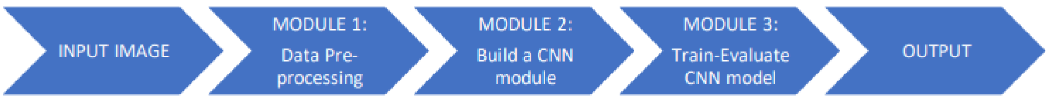


Figure 3.1: Modules identified

### 3.1.1 Data pre-processing

The Kaggle Brain MRI image dataset has been downloaded. Around 1200 MRI scans, comprising normal, benign, and malignant, make up the MRI dataset. The primary step uses these MRI pictures as input. Pre-processing is the first and most important step in enhancing the picture quality of a brain MRI image. The elimination of impulsive sounds and image scaling are crucial processes in pre-processing. In the first phase, we change the brain MRI picture to its grey scale partner. The bilateral filtering approach is utilized to decrease the noise that are available in the brain picture.

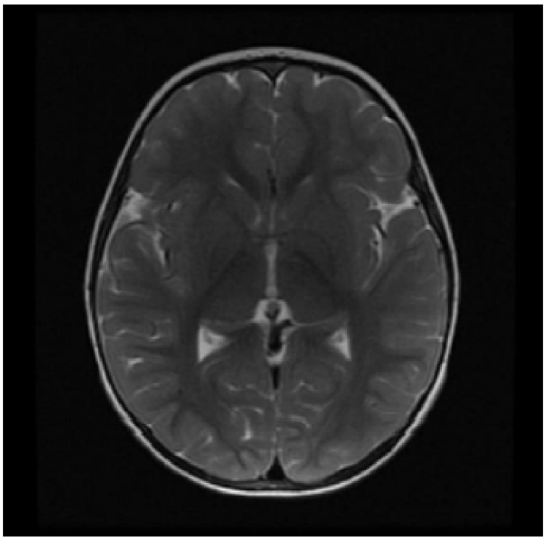

Figure 3.2: Brain MRI without tumour

- **Bilateral filter:** Using a nonlinear grouping of neighbouring picture pixels, bilateral filtering smooths images while preserving edges. This filtering method is straightforward, localised, and concise. It creates a grey level based on their similarity and symmetrical nearness, and in both range and domain, it prefers near values to farther values.
- **Image Enhancement :** The act of adjusting advanced photos to such an extent that the outcomes are more appropriate for show or extra picture examination is known as image enhancement.
- **Edge detection :** It is a division approach that uses boundary recognition to identify items or regions that are tightly related. The discontinuity of the objects is identified using this technique. This approach is mostly used in image analysis to identify areas of the image where there is a significant change in intensity.

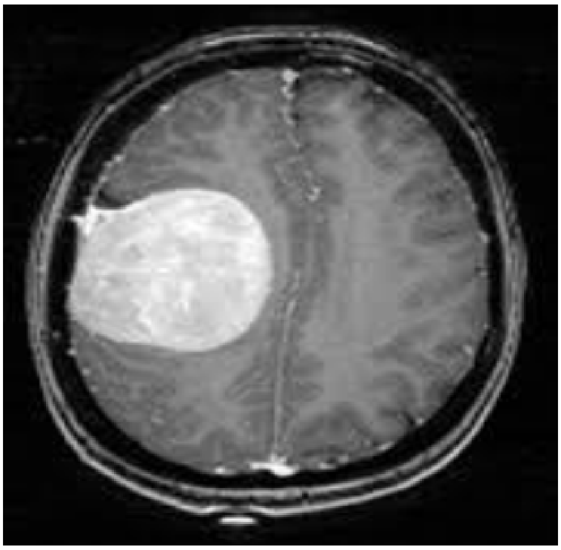

Figure 3.3: Brain MRI with tumour

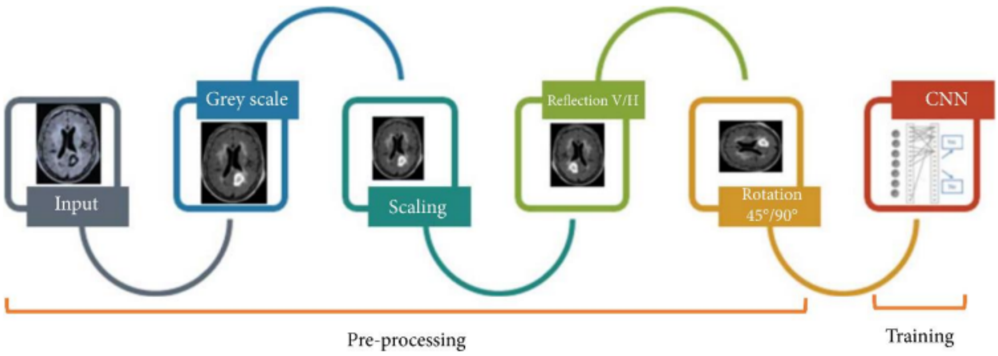


Figure 3.4: Data pre-processing

### 3.1.2 Build a CNN module

- A Convolutional Neural Network is a counterfeit brain network that is usually used to investigate visual pictures.

- Image classification and detection, as well as image detection, benefit from these sorts of networks. A CNN is made up of two primary components:
  i) A feature extraction layer made up of convolutional layers.
  ii) Toward the end, a completely associated layer uses the aftereffect of the convolutional layers to predict the image's class.

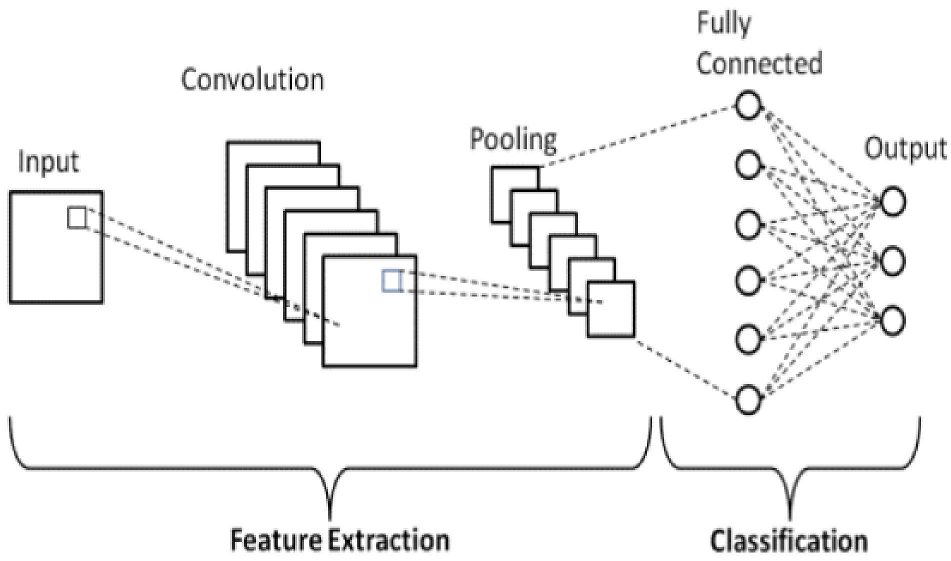


Figure 3.5: CNN layers

A CNN design is partitioned into two parts.

• In a cycle known as Feature Extraction, a convolution contraption disengages and recognizes the various components of an image for examination.

• A completely associated layer that uses the consequence of the convolution collaboration to guess the image's class using the information got in past stages.

**The Convolutional layer**- This layer combines input photos of a selected size, which can be appropriate for network training, with filters or convolutional kernels to produce function maps. These filters on this layer had been changed approximately in the dimensions.

**Pooling layer**- The reason behind this layer is to reduce the dimensions of the matrix and minimise the parameters, subsequently down sampling the characteristic maps of the Convolutional layer A sliding filter across the output of the Convolutional layer is used to calculate the most common or weighted average.

**Fully Connected**- The motive of this deposit is to locate and label the pixel that arise from the preceding two layers. This accretion makes use of the SoftMax layer to become aware of the possibilities of values between 0 and 1 because it makes use of the SoftMax layer to determine the likelihood of values among 0 and 1. The Batch normalisation is likewise used to growth the schooling price and reduce overfitting.

## 3.2 Hardware requirement

- Processor: Intel Core I5
- Processor Speed: 1.2ghz
- RAM: 4 GB +
- Hard Disk Space: 50GB +

## 3.3 Software Requirement

- Software Requirements
- Operating System: Windows 7 And Above
- Language: Python
- IDE: Jupiter Notebook Modules required: Keras, Tensorflow, Numpy, Pandas

## Chapter 4

# RESULT ANALYSIS

## 4.1 Experimental results

Sample input:

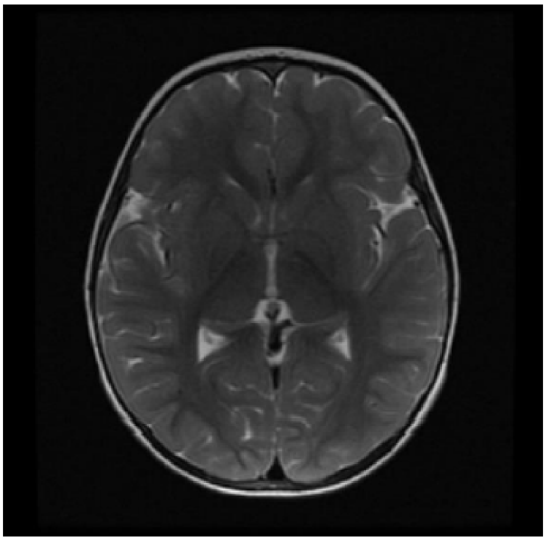

Figure 4.1: Brain MRI without tumour

In [17]:

```
from matplotlib.pyplot import imshow
img = Image.open(r"C:\Users\NAHUSHA\Music\Untitled Folder 1\archive (1)\no\no 89.jpg")
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
res = model.predict_on_batch(x)
classification = np.where(res == np.amax(res))[1][0]
imshow(img)
print(str(res[0][classification]*100) + '% Confidence This Is A ' + names(classification))
```

```
100.0% Confidence This Is A No, Its not a tumor
```

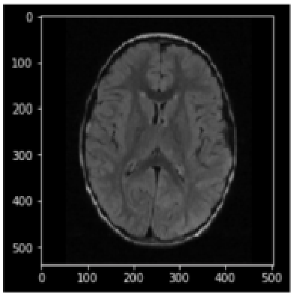


Figure 4.2: Sample output 1

[14]:

```
from matplotlib.pyplot import imshow
img = Image.open(r"C:\Users\NAHUSHA\Music\Untitled Folder 1\archive (1)\yes\Y1.jpg")
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
res = model.predict_on_batch(x)
classification = np.where(res == np.amax(res))[1][0]
imshow(img)
print(str(res[0][classification]*100) + '% Confidence This Is ' + names(classification))
```

```
100.0% Confidence This Is Its a Tumor
```

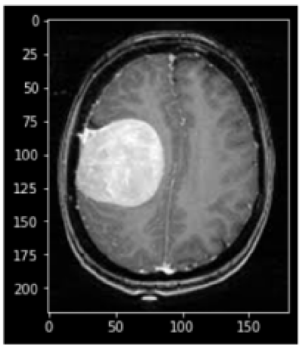


Figure 4.3: : Sample output 2

Chapter 5

# CONCLUSION AND FUTURE SCOPE

## 5.1 Conclusion

The basic goal of this investigation work is to design capable customized cerebrum cancer development gathering with high precision, execution and low multifaceted nature. Convolutional brain organization is one of the significant learning methods, which contains game plan of feed forward layers. Similarly python language is used for execution. Picture net information base is utilized for grouping. It is one of the preprepared models. So the training is performed for just last layer.

## 5.2 Future Scope

There is a wide degree for future execution of Brain Tumor Detection utilizing Convolutional Neural Networks. It very well may be upgraded into a Mobile Application. And furthermore in later we can make an Artificial Intelligence Deep Neural Network Model for the assessment for any remaining sort of illnesses.

## APPENDIX A

# Python code

```
import os
import keras
from keras.models import Sequential
from keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout,
BatchNormalization
from PIL import Image
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
plt.style.use('dark_background')
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import OneHotEncoder

data = []
paths = []
result = []

for r, d, f in os.walk(r'C:/Users/NAHUSHA/Music/Efficient detection of
brain tumor using CNN/archive (1)/yes'):
    for file in f:
        if '.jpg' in file:
            paths.append(os.path.join(r, file))

for path in paths:
    img = Image.open(path)
    img = img.resize((128,128))
    img = np.array(img)
    if(img.shape == (128,128,3)):
        data.append(np.array(img))
        result.append(encoder.transform([[0]]).toarray())
```

```
paths = []
for r, d, f in os.walk(r"C:/Users/NAHUSHA/Music/Efficient detection of
brain tumor using CNN/archive (1)/no"):
    for file in f:
        if '.jpg' in file:
            paths.append(os.path.join(r, file))

for path in paths:
    img = Image.open(path)
    img = img.resize((128,128))
    img = np.array(img)
    if(img.shape == (128,128,3)):
        data.append(np.array(img))
        result.append(encoder.transform([[1]]).toarray())

model = Sequential()

model.add(Conv2D(32, kernel_size=(2, 2), input_shape=(128, 128, 3),
padding = 'Same'))
model.add(Conv2D(32, kernel_size=(2, 2),  activation ='relu',
padding = 'Same'))


model.add(BatchNormalization())
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Dropout(0.25))

model.add(Conv2D(64, kernel_size = (2,2), activation ='relu', padding = 'Same'))
model.add(Conv2D(64, kernel_size = (2,2), activation ='relu', padding = 'Same'))

model.add(BatchNormalization())
model.add(MaxPooling2D(pool_size=(2,2), strides=(2,2)))
model.add(Dropout(0.25))

model.add(Flatten())

model.add(Dense(512, activation='relu'))
model.add(Dropout(0.5))
model.add(Dense(2, activation='softmax'))
```

```
model.compile(loss = "categorical_crossentropy", optimizer='Adamax')
print(model.summary())

plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('Model Loss')
plt.ylabel('Loss')
plt.xlabel('Epoch')
plt.legend(['Test', 'Validation'], loc='upper right')
plt.show()
```

# Reference


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