

Identification of Brain Tumor Using Deep Learning Techniques

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Abstract- Brain tumours are one of the leading causes of cancer death international. Early detection of mind most cancers is difficult due to the fact most cancers-unique signs most effective appear in advanced degrees, and there's no reliable screening tool to discover high-risk patients. But mind most cancers can be handled if discovered early. This undertaking attempts to stumble on brain Tumor from CT snap shots. It uses imaging strategies and genetic modelling architecture for Tumor detection. After the pre-processing of the image, the architectural texture version became used to locate the Tumor place within the photo. It is mentioned that the accuracy of gaining knowledge of to detect the tumor is ready 98.7%.

1.INTRODUCTION:

Brain cancer is the 11th maximum normally diagnosed most cancers in guys and 9th in girls, but it's miles the 4th main motive of most cancers' loss of life for both ladies and men within the United States. Brain most cancers is the simplest main most cancers with a 5-year relative survival charge inside the single digits. In a recent report launched by the Brain Cancer Organization in 2020, brain most cancers is predicted to become the second one main reason of most cancers loss of life in the United States. The principal reason for that is the past due detection of brain tumors due to the shortage of powerful strategies for early detection. In addition, maximum of the symptoms of a brain tumor are indistinct and may be associated with many different abdominal diseases. Likewise, if the cancer has invaded different organs, the treatment will become more difficult. Therefore, there's a continuing need for a technique that will assist radiologists in diagnosing mind tumors at an early degree. Not a good deal work has been performed on mind tumor detection. Based on the literature evaluate, it become discovered that brain tumor detection is achieved using disease signs and symptoms and affected person history series, however no longer the usage of photo processing. This assignment attempted to discover brain tumor from CT test pictures. These photographs are pre-processed using photograph processing and deep mastering techniques and then a fundamental classifier is used to refer to the tumor location inside the photograph and determine if it's far in an ordinary nation or has any tumor within the pancreas.

1.1.INTRODUCTION TO PYTHON

Python is a excessive-degree, interpreted, interactive, and literal object-orientated language. Python is designed to be easy to read. It often uses English key phrases, even as other languages use punctuation marks, and has fewer syntactic constructions than other languages.

Python turned into evolved through Guido van Rossum inside the overdue Eighteen Nineties at the National Research Institute for Mathematics and Computer Science in Belgium. Python is derived from many different languages, inclusive of ABC, Module-III, C, C++, Algol-sixty-eight, Loquela, Unix Shell, and other scripts.

Python is criminal. Like Perl, Python's supply code is now to be had underneath the GNU General Public License (GPL) and is now maintained by the center development group, although Guido van Rossum nonetheless performs a critical position in its improvement.

Python is Interpreted- Python is processed via an interpreter at runtime. There is not any need to configure this system before executing it. Perl and PHP are similar.

Python is interactive - you may sit in Python on the command line and write your packages without delay with the interpreter.

Python is item-orientated – Python supports an orientated fashion or programming fashion that encapsulates code in items.

Python is a language for beginners. Python is a high-quality language for novice programmers that supports the improvement of a extensive variety of applications, from a simple word processor to internet browsers and video games.

Apart from the above noted, Python has a large list of exact functions a number of which can be indexed beneath • Supports useful and established programming strategies, in addition to OOP.

- Can be used as a scripting language or compiled into bytecode to build massive applications.
- Provides high-level dynamic information types and helps dynamic device checking.
- Supports automatic garbage collection.

1.2• Can be effortlessly incorporated with C, C++, COM, ActiveX, CORBA and Java.

Python is available on many unique platforms, which include Linux and Mac OS X.

INTRODUCTION TO DEEP LEARNING

Deep learning is a branch of gadget studying based absolutely on artificial neural networks, because the neural community will imitate the human mind, so deep gaining knowledge of is likewise a type of imitation of the human brain. And there may be a special sort of device learning that achieves first rate strength and versatility by learning to symbolize the arena as a nested hierarchy

of principles, wherein every concept is described in terms of simpler concepts, and extra abstract representations are computed in much less summary phrases. Of the streets

While deep learning algorithms have selfstudying representations, they rely on ANNs that replicate how the brain computes information. In the gaining knowledge of system, algorithms use unknown elements inside the input distribution to extract capabilities, institution objects, and find beneficial styles in the records. Similar to self-getting to know gadget gaining knowledge of, this happens in a couple of stages of algorithms to build fashions. Deep learning algorithms use more examples. While no network is considered ideal, positive algorithms are better appropriate for unique obligations. To choose the right one, it is ideal to have a clean understanding of all of the essential algorithms. Here is a list of popular take a look at algorithms:

Convolutional Neural Networks (CNN)

Long Term Short Memory (LSTM) networks

Recurrent Neural Networks (RNN)

Generative Adversarial Networks (GANs)

It wishes a simple network of spines (R

Deep Fidelity Networks (DBN)

BFN)

Multilayer Perceptrons (MLP)

Self-Organizing Maps (SOM)

Restricted Boltzmann Machines (RBM)

Convolutional Neural Networks

In deep mastering, a Convolutional Neural Network (CNN/ConvNet) is a sort of deep neural networks, commonly used to investigate visible images. Now while we think about a impartial network, we think about matrix multiplication, however this isn't always the case with ConvNet. He uses a unique technique called Convolution. In mathematics, however, convolution is the mathematical operation of two functions making a third part expressing how the form of one adjustment the opposite.

Convolutional neural networks encompass several layers of artificial neurons. Artificial neurons, a crude imitation of their biological counterparts, are mathematical functions that calculate the sum of the multiplication of heavy inputs and the output activation cost. When you input an image into a ConvNet, each layer generates several activations features that bypass to the next layer.

The first layer typically attracts out the principle functions, inclusive of horizontal edges or diameters. This output passes to the subsequent step, which detects greater complicated traces inclusive of corners or related edges. As we pass deeper into the network, it can pick out even extra complicated capabilities together with items, faces, and many others.

Based on the activation map of the final convolutional layer, the type layer produces a confidence rating (values from 0 to one) indicating how likely it's far that the photo belongs to a "elegance". For instance, if you have a ConvNet that detects pics containing tumors, the output of the closing layer is probably that the enter photo consists of any of these tumors.

passwords. The rapid growth in the number of online services leads to an increasing number of different digital identities each user needs to manage. But passwords are perhaps the most common type of credential used today. To avoid the tedious task of remembering difficult passwords, users often behave less securely by using low entropy and weak passwords. Most systems today rely on static passwords to verify the user's identity. However, such passwords come with major management security concerns. Users tend to use easy-to-guess passwords, use the same password in multiple accounts or store them on their machines, etc. Furthermore, hackers have the option of using many techniques to steal passwords such as shoulder surfing, snooping, sniffing, guessing, etc. Moreover, passwords can be written down, forgotten and stolen, and guessed deliberately being told to other people.

2.LITERATURE SURVEY:

[1] **Projecting cancer incidence and deaths to 2030: the unexpected burden of thyroid, liver, and pancreas cancers in the United States**

AUTHORS: Rahib L., Smith B.D., Eisenberg R., Rosenzweig A.B., Fleshman J.M., Matrisyan L.M.

Cancer occurrence and mortality inside the United States is projected for the most not unusual kinds of most cancers in 2020 and 2030 based totally on demographic adjustments and common annual percentage adjustments in occurrence and mortality. Breast, prostate, and lung cancer will continue to be the most common cancers right now, however with the aid of 2030, thyroid most cancers will replace colorectal most cancers because the fourth most commonplace cancer diagnosis, and melanoma and uterine most cancers turns into the fifth and 6th maximum commonplace cancers; they founded Lung most cancers is anticipated to remain the pinnacle most cancers killer at the moment. But by means of 2030, pancreatic and liver cancers are projected to surpass their own cancers, and prostate and colorectal cancers as the second and third leading reasons of most cancers dying, respectively. Advances in screening, prevention, and treatment can also change most cancers incidence and/or mortality fees, but it's going to take a concerted effort by means of the research and medical network now to make tremendous modifications in the destiny.

[2] **Brain Ductal Adenocarcinoma Radiology Reporting Template: Consensus Statement of the Society of Abdominal Radiology and the American Brain Association**

AUTHORS: Al-Hawary MM, Francis IR, Chari ST, et al

Adenocarcinoma of the cerebral duct is an competitive malignant neoplasm with high mortality. Using right disease staging in staging imaging studies is one of the most vital steps in affected person management. Given the version in qualifications and levels of disease amongst other physicians, and the frequent lack of complete reporting of imaging findings in applicable x-ray

examinations, the adoption of wellknown rules for radiographic reviews the usage of typically generic and steady terminology for stable neoplasms of the mind. It is vital. A consensus announcement describing a measured record template through multidisciplinary professionals in ductal adenocarcinoma of the mind, along with radiologists, gastroenterologists, and hepato-pancreato-biliary surgeons and hepato-pancreato surgeons, became developed below the joint sponsorship of the Society of Abdominal Radiologists and the American Brain. . Company. The adoption of this general imaging report template have to enhance the selectionmaking technique for the treatment of patients with ductal adenocarcinoma of the brain, while offering whole, updated, and accurate disorder reports to optimize the treatment tips that may be provided to the patient. . Standardization can also facilitate studies and clinical trial design via using consistent and consistent staging by means of resectability reputation, which allows contrast of consequences between different establishments.

[3] Deep learning and artificial intelligence in radiology: current applications and future directions

AUTHORS: Yasaka K, Abe O.

Radiological diagnosis performs an important position within the clinical management of sufferers. Deep getting to know the usage of Convolutional Neural Networks (CNs) has currently received wide interest because of its high overall performance in photograph reputation. If CNNs supply their guarantees in the context of radiology, it's far anticipated to assist radiologists gain diagnostic excellence and enhance affected person care. Here, we talk the ultra-modern trends in the discipline, which include studies that we gift inside the cutting-edge PLOS Medicine Special Section on Machine Learning in Healthcare and Biomedicine, with statement on expectancies and coverage for the usage of synthetic intelligence (AI) in clinical radiology.

CHAPTER-3 SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

Many techniques have been proposed for the category of noisy labels for managing natural snap shots. Ren et al., endorse a method for assigning weights to education models using an extra set of mere checks. Their view is to apply smaller weights to noisy models and boom smooth schooling weights to enhance slope renewal. There is especially limited paintings at the development and application of strategies for classifying noise functions in scientific imaging information.

Dgani et al.- a noise label model as a part of a deep studying community to receive actual noisy label samples for multi-view mammogram type paintings for breast microcalcifications.

3.1.1 DISADVANTAGES OF EXISTING SYSTEM

Not a great deal work has been carried out on detecting brain tumors.

From a review of the literature, it changed into found that mind tumor detection is completed thru the signs of the disorder and the gathering of the patient's records, but not using picture processing.

Thus right here we can't predict illnesses inside the early levels, when it comes to later states it's far tough;

Detection of the disease is very gradual.

There aren't any imaging strategies used to are expecting the disorder at an early degree.

3.2 PROPOSED SYSTEM

This project attempts to come across mind tumor from CT scan photos. These photographs have been pre-processed the use of photo processing techniques after which the architectural version of the tissue turned into used to pick out the tumor area inside the image. The dataset is from the Cancer Imaging Results Repository. These CT pix of the mind tumor are fed to be input into the system. These snap shots are in a distinct format, so we ought to convert them to jpg, and the photo size is just too large, so we simplest used some of them. Classification is then accomplished the usage of a range structure version. In this case, the device is formed in line with the training described within the photograph. Once the machine has discovered the category in step with the patterns prepared for it, it will be able to assign the test statistics to this sort of training.

A range of evaluation-more desirable CT photos of sufferers to distinguish brain cancer from healthy pancreas. A better accuracy and higher sensitivity in comparison with radiologist interpretation become acquired in impartial experiments with proper performance in a set of assessments acquired from distinctive forms of sufferers. These outcomes represent the first definitive proof that Rhoncus can seize the exceptional strains of CT scans of mind most cancers to aid and supplement radiologists in detecting and diagnosing brain cancer.

3.2.1 ADVANTAGES OF PROPOSED SYSTEM:

□ Deep learning with Convolutional Neural Networks (CNN) suggests incredible promise in medical photograph analysis. The constructing of a neural network is based totally on a stack of neurons which includes activation functions and parameters to extract and integrate capabilities from photos and create a model that captures the complicated relationship between pics and diagnoses. Rhoncus has been stated to have excessive accuracy in diagnostic imaging. Rhoncus can appropriately distinguish mind most cancers from benign pancreas, and with improvements it could account for variations in affected person gender, ethnicity, and imaging parameters which are wished in actual medical practice. Rhoncus promises to broaden laptop-based tools for detecting and diagnosing brain cancer to supplement the radiologist's interpretation.

CHAPTER 4 SYSTEM ARCHITECTURE

4.1 PROPOSED ARCHITECTURE:

It is a simple graphical formalism that may be used to represent gadget inputs to the machine, perform various tactics on that records, and generate output from that system.

□ to version device components. These components are the device approaches, the records utilized by the procedure, the outside item that corresponds to the machine, and the information flows in the device.

Shows how data movements thru the machine and the way it's miles changed via a sequence of modifications. It is a graphical technique that depicts the drift of statistics and the variations which are applied as information actions from input to output.

4.2 INPUT DESIGN

The enter strategy is the hyperlink among the information gadget and the person. It includes the development of a specification and procedure for facts training, and these steps are essential to deliver the transactional statistics into a usable system shape, which may be done by means of computer reading the statistics from a written or published script, or this may. It'll be achieved with the assist of the human beings, introducing the keys. Given immediately into defects. Input making plans specializes in controlling the amount of enter required, controlling mistakes, keeping off delays, heading off more steps, and preserving the procedure easy. The login is designed to be secure and comfortable at the same time as retaining user privacy.

4.3 OUTPUT DESIGN

Quality is a end result that meets the end consumer's necessities and suggests the records certainly. In any machine, the effects of the procedure are pronounced to users and other systems through outputs. The output plan defines how statistics is to be moved for immediate want in addition to for revealed output. It is the primary and instant supply of facts for the consumer. Efficient and shrewd output layout of the connection gadget improves, assisting the user to make choices.

The output format of the data device ought to carry out one or more of the following features.

Communicate facts about past activities, contemporary reputations or forecast

The future

Vital occasions, possibilities, questions or reminders.

Lead the movement.

Confirm motion.

4.4 SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS:

System : Intel core i5 Processor.

Hard Disk : 1000 GB.

Monitor : 15'' LED

Input Devices : Keyboard, Mouse

Ram : 8 GB

SOFTWARE REQUIREMENTS:

Operating system: Windows 10.

Coding Language: Python Web Framework: Flask.

SYSTEM DESIGN:

IMAGE PROCESSING:

What is Image Processing?

Image processing is the procedure of changing an image into a virtual shape and doing some operations on it to obtain a better photograph or to extract some beneficial data from it. This is a kind of code distribution where the input is an image, which includes a picture or video, and the output image or functions may be associated with that image. Typically, the image processing machine consists of processing photos in two dimensions by applying classical strategies already mounted. Today it is one of the fastest growing technology with its packages in various commercial enterprise aspects. Image processing is likewise a main area of research in engineering and computer technological know-how.

Image processing specially consists of the subsequent three steps.

Import an image using an optical or digital image scanner.

Image evaluation and manipulation, consisting of information compression and image enhancement, in addition to the detection of patterns that aren't perceived by means of the human eye, such as satellite photos.

Output is the closing stage wherein the end result can be an exchange of image or a document primarily based on the analysis of the image.

For Image Processing

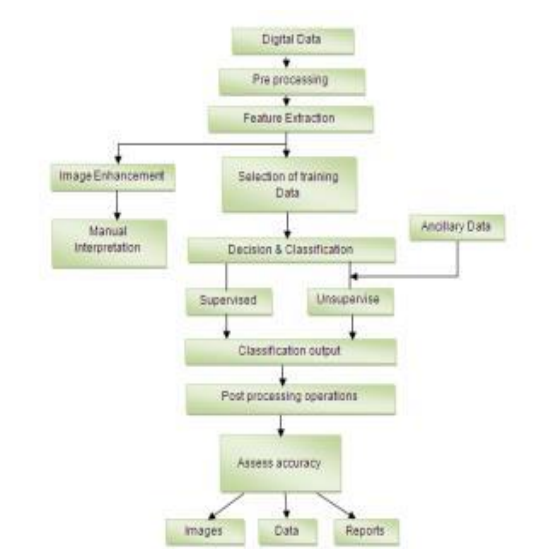
The steps of the image processing are split into five stages. They are:

1. Visualization - study the image.
2. Sharpen and restore the image - To create a better image.
3. I am seeking out an image. Search for an image of interest.
4. Measure measurements - measure different things in the image.
5. Image recognition - Distinguish objects in an image.

Genres

Two sorts of techniques are used for picture processing: analog and virtual photo processing. Analogy or visual imaging strategies can be used in printed styles inclusive of figures and pics. Image analysts use distinct bases of interpretation whilst using these visual techniques. Image processing is restricted not only to the field of look at, however also to the know-how of the analyst. Association is every other important device for organizing pix the usage of visible techniques. Thus, analysts practice a mixture of private understanding and information related to picture processing. Digital processing techniques help manipulate virtual pix using a laptop. Because the uncooked image sensor data from the satellite platform carries errors. To dispose of such defects and gain authentic records, it need to go through various tiers of processing. There are three most important steps that every one forms of information have to go through with the use of virtual era: preprocessing, amplification and display, and records extraction.

IMAGEPROCESSING CONCEPTS:



Binary Images

Binary pictures are snap shots whose factors may have handiest two intensity values. They are typically in black and white. These numeric values are often zero for black and 1 or 255 for white.

Binary photos are often created by thresholding a grayscale or color image to separate the picture item from the history. The shade of the item (generally white) is known as the foreground coloration. The relaxation (normally black) is referred to as the history coloration. However, relying on the image threshold, the verticality can be inverted, wherein case the item is presented with zero and the subject with a non-zero cost.

Some morphological operators expect a certain verticality of the enter binary photo, so if the image is processed with inverted verticality, the operator will have the other effect. For instance, if we placed a declaration for black text in a white location, the text might be opened.

Color pictures

It is viable to construct all seen shades with the aid of combining the three main colors: red, inexperienced and blue, due to the fact the human eye has simplest 3 exclusive shade receptors, every of which perceives one of the 3 colours. Various combinations of acquired stimulation permit the human eye to distinguish approximately 350,000 colors. An RGB shade picture is a composite image of 1 organization of each coloration: purple, inexperienced, and blue, ensuing in a composite of 3 primary colorations for every pixel.

A complete 24-bit shade photograph contains one bit of cost for each colour, allowing more than one colorings to be displayed.

However, the use of the total 24-bit image to store the coloration of every pixel is computationally high-priced and frequently needless. Therefore, the colour of each pixel is frequently encoded in a single byte, ensuing in an 8-bit shade image. The method of reducing the shade illustration from 24-bit to 8-bit, referred to as colour quantization, limits the wide variety of possible colours to 256. However, there is commonly no visible distinction among a 24-colour image and the equal picture as displayed. Eight-bit. Eight-bit colour images are primarily based on shade maps, which might be research tables that use the eight-bit pixel price within the index and offer an output value for every color.

CHAPTER 5 IMPLEMENTATION 5.1 MODULES

Data^{set}

Importing^g the necessary libraries

Retri^eving the images

Splitting^the dataset

Building the model

Appl^y the model and plot the graphs for accuracy and loss

Acc^uracy on test set

Saving the Trained Model

5.1.1 MODULES DESCRIPTION:

Dataset:

In the first module, we developed a device to achieve reliable facts inputs for training and trying out functions. We took the dataset from Brain Tumor Detection Using Image Processing.

Link

<https://www.cancerimagingarchive.net/collections/>

The dataset consists of 1411 brain tumour images

Importing the necessary libraries:

We will use the Python language for this. The major libraries we located necessary were keras for constructing the principle model, sklearn for plotting and studying statistics, PIL photos for changing numbers, and different libraries along with pandas, numpy, matplotlib and tensorflus.

Image acquisition:

We will deliver their images and labels. Then the pictures to resize (224x224) all snap shots ought to be the equal length. Then convert the pictures to a numpy array. The dataset is split:

Divide the dataset into train and take a look at. 80% education statistics and 20% test facts.

Model building:

To build it, we will use the following model from the Keras library. We will add layers to create a convolutional neural network. In the first two Conv2D layers, we used Filter 32 and kernel size (five.Five).

In the MaxPool2D layer we've got saved the pool size (2,2), which means the most price to be chosen for each 2 x 2 place of the photograph. In the dropout layer, we stored the dropout component = 0.25, this means that that 25% of the neurons are randomly removed.

Apply these three rows again with a few adjustments within the parameters. We then observe a warping layer to convert the 2D information right into a 1D vector. This layer is followed with the aid of a dense layer, a deciduous layer, and once more a dense layer. The closing dense layer shows 2 nodes of mind tumor or now not. This layer makes use of the softmax activation feature, which offers a possibility price and predicts which of the two options has the best opportunity.

Apply the model and plot accuracy and damage;

We will compile the version and follow it the usage of the ideal function. The scale of the mass might be 2. Then we are able to plot the precision and the loss. We were given a mean recuperation accuracy of 100% and an average training accuracy of 98.7%.

Care inside the take a look at set:

We were given a hundred% accuracy at the check set

Save the pattern set;

When you are confident enough to have the version educated and tested in a manufacturing surroundings, the first step is to save it as a .H5 or .Pkl file using a library like muria.

5.2 Convolutional Neural Networks

The targets of the primary module of direction IV; recognize the convolution of the operation

Understand how the union works

□ Memorization of phrases utilized in convolutional neural networks (padding, step, clear out, etc.)

Building a convolutional neural network for multi-elegance photograph class **5.2.1 Computer Vision**

Here are some laptop imaginative and prescient issues that we are able to address in this text:

1. Image division
2. Object detection
3. Neural style switch

One of the main troubles with computer vision is that the enter facts can become very huge. Let the picture be 68 X sixty eight X three. Then the enter length turns into 12288. This may be even larger if we have large pictures (say 720 X 720 X 3). Now if we feed any such large input to the neural community, the variety of parameters will increase HUGELY (just like the quantity of hidden layers and hidden gadgets). This will result in expanded computing sources and reminiscence needs, which maximum of us can not take care of.

Edge detection example:

In the preceding article, we noticed that the vintage neural network used to hit upon the rims of an image. Deeper layers can discover the cause of objects, and even deeper layers can come across the reason of all matters (as an instance, someone's face). In this segment we can focus on how you could locate edges in an image. Consider the image beneath: As you could see, there are many vertical and horizontal edges within the image. The first element to do is to locate those edges;

But how do we find those beaches? To illustrate this, let's take a 6 X 6 grayscale image (i.E. One channel handiest);

We consequently cut this 6 X 6 vulva with a 3 X 3 collapsed one;

After convolution we render a 4 X 4 photo. The first detail of the 4 X four matrix may be calculated:

Similarly, we can disintegrate the complete picture and get the end result 4 X 4:So convolving a 6 X 6 input with a 3 X 3 clear out gave us a 4 X 4 output.

Note:Higher pixel values represent the brighter a part of the photograph, and lower pixel values represent darker regions. This way we are able to detect the vertical side within the picture.

Adding a max-union to this matrix effects in a 2 X 2 output:

For each consecutive 2 X 2 block we get the most number. Here we've got implemented a filter of amplitude 2 and a noise of two. These are the hyperparameters for compressing the map. In addition to the most pool, we can also use the common, where as opposed to the most numbers, we take their average cost. So the hyperparameters for compressing tables are:

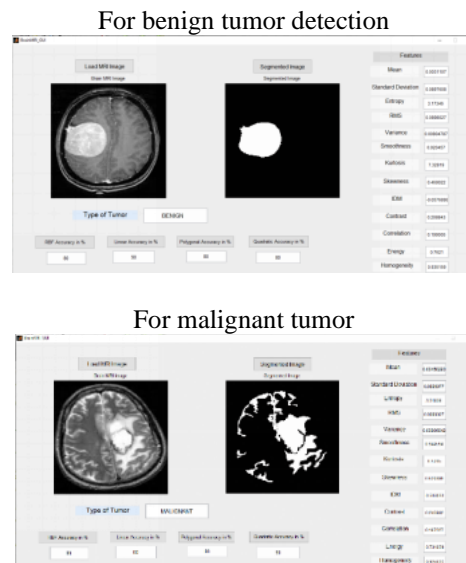
1. Filter with the aid of length

2d step

3. Maximum or average union

If the enter to the collation layer is $nh \times nw \times nc$, the output is $[(nh - f)/s + 1 \times (nw - f)/s + 1 \times nc]$.

Now we will take the scenario to a brand new degree. Let's see how a convolutional neural network performs with convolutional and convolutional layers. Let us anticipate that we enter statistics of the shape 32 X 32 X3 : at the start there is a concretion of convolution and union layers, numerous absolutely related layers on the quit, and sooner or later a softmax classifier to refer the enter into exclusive categories. There are many hyperparameters on this network that we also need to specify. Output screen shots



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