Abstract

Image data augmentation is a technique where the input data is modified by adding noise,

rotation, and other transformations to the original dataset. This can be used to improve the

performance of machine learning algorithms that are17eing trained on these inputs. One of the

most common use cases for this technique is to improve the performance of image

classification models by augmenting images with random perturbations in order to better

approximate natural variation.

The goal of this project was to explore different image data augmentation techniques on flowers

dataset in order to find out which one performs better when it comes to classification accuracy.

1. Aims and Objectives

Data augmentation is a method for faking fresh classification model out of old dataset. To use

it, knowledge methods have been applied on patterns again from trained data to generate label

as well as unique support vectors. The very well kind of data augm2ation, described simply

"image feature augmentation," is transforming pictures from the training dataset into new

copies that are members of the same class as the original image. Shifts, flips, zooms, and many

more picture alteration techniques were included in category of changes.

Their goal should be to provide fresh, believable instances towards the learning collection. In

other words, variants of the training set photos also that models will be interested in examining.

A horizontal flip of a photograph of something like a cat, for instance, might stand to reason

that the image might have been captured whether from the left or even the right. Considering

it is extremely uncommon is for models should view a flipside cat shot, flipping a cat image

vertically fails but also is certainly not normal.

Like a result, it is obvious as selecting exact precise data augmentation methods to utilise with

something like a testing set requires thoughtful consideration of both the training dataset and

the issue area. Additionally, it might be helpful to test different data augmentation techniques

alone and in combination to determine that may enhance predictive accuracy in a tangible

sense, potentially using a tiny prototype dataset, model, and training run.

Deep learning approaches, or CNN, and other contemporary artificial neural networks may

understand characteristics that have been independent of where they appear inside a picture.

But augmenting may help a transform-joyariant instructional strategies and further help the

researcher understand properties which are also trans form-invariant, like left-to-right and top-

to-bottom ordering, light levels in pictures, and far more.

Generally, validating as well as testing datasets weren't included in the use of image data

augmentation; only the training dataset used. Unlike dataset preparation method like picture

shrinking and colour cropping, which must be carried out uniformly across all datasets that the

algorithm interacts on, so it does not.

2. Image Augmentation

Image augmentation is a technique that has been used in the past to make images more realistic.

It is also used for training artificial neural networks.

Image data augmentation is the process of enhancing the contents in an image or video by

replacing part of it with an artificial content. Drug discovery platforms, search engines and e-

commerce apps are among the many to use this service. Some examples of image data

augmentation include to process and extract relevant information from the image, Al systems

are often applied in computer vision, including: The first use of machine learning technology

for extracting information from images was in the 1990s. It enables a computer to learn from

example images how to classify new ones. One way to do this is to feed in images and have

the computer classify them with a success rate that improves the more data is fed into it. Image

recognition can be achieved by using artificial neural networks. The use of deep learning for

computer vision has only recently become possible, due to increased availability of powerful

computing hardware (i.e., GPs) and new software libraries (i.e., OpenCV). An image is a two-dimensional representation of a physical object. For example, an image of a person can be

taken by photographing them and depicts the visible human body. The camera used to take the

picture would be capturing light reflected from the object and creating an inverted projection

that becomes the image on film or in digital memory. The number and position of objects in an

image is called the pixel dimension. The term "pixel" comes from the fact that pictures are

made up of a grid of tiny dots, each dot representing a point on the image. An object on the

film plane is at right angles to the lens and the light rays entering it. This means that the parallel

lines produced by an object on a film plane are at right angles to each other.

The main reason Image Data Augmentation is used is because it offers more options for people

to provide feedback about the product. This can be done through surveys, which allow online

and offline lead generation about product trials, study completion-failure rates, intention to

purchase and more. The most popular techniques are Aerial imaging, which is done by a drone,

an unmanned aerial vehicle that can carry a camera to give the effect of capturing images from

a bird's eye view. The drone produces high-resolution images that are usually in 360 degrees.

Image stitching using software like Adobe Photoshop and Illustrator. It takes multiple. This is

a list of some reasons why image data augmentation can provide a better user experience for

your product:-Surveys allow online and offline lead generation about product trials, study

completion-failure rates, intention to purchase, and more.-Images can be used in research

studies which show the benefits of augmented solutions versus traditional designs

Or

competitive solutions.-Images can give more insight into a person's identity, emotions, and

backgrounds.

-Images can show how a product might look in the real world and help people envision

themselves using it.

-Images can illustrate product steps and process, providing context for cognitive load.

-Images can show

"attention grabbing" features which attract potential customers to your product

-Images provide a great deal of information about what your customers may find useful.

-Pictures with colour variations provide more information

The benefits of image data augmentation include:

1) Moving from focus group research asking consumers what they think a particular design

looks like then collecting opinions towards it. Transforming consumer insights into meaningful

digital analytics data

2) Creating realistic looking images that likely will increase likelihood of purchasing

The first thing one should consider when it comes to image data augmentation, is what type of

augmentation they want to use. There are three main types of augmentation:

1) Spatial augmentation:

This type of augmentation involves adding or removing pixels from the image, which can be

done by using a filter such as a Gaussian blur or median filter.

The goal of this technique is to give more information than a proposal using camera framing,

and there are two forms possible. A georeferenced 360 spatial dataset provides information

about the environment in which an experiment was conducted. The second form is the

experimental video itself, which provides data on motion both with any non-spatial or

movement-related characteristics (footage recorded in a conventional camera) Possible uses of

spatial augmentation technology:

- Gaining new knowledge about gaming techniques

- Documenting habitat changes due to climate change

- Recording activities

Visualizing environmentally important ecosystems

2) Temporal Augmentation:

This type of augmentation involves adding or removing frames from the video. Temporal

Augmentation is a technology capable of using original sources to create more realistic and

interactive simulations in games, experiments, and documentaries Temporal Augmentation applies "deep learning" which is a combination of computer learning

techniques, as well as knowledge from physics, chemistry, and engineering. It works on the

belief that all objects undergoing physical changes, like breaking tiles in a wall or rearranging

atoms in an object's molecular structure, have distinctive changes signal these events apart.

These identifiable features that form identity should directly be translated into videos to mimic

those actions. In the new video, you can see an individual in a white lab coat using a large drill

to separate two objects. The person then pulls away the objects and holds them up to camera.

The augmentation technique can create highly realistic videos because it mimics this event with

another person in a white lab coat with a large drill. The Temporal Augmentation system is

currently being used to enhance live broadcasts of sporting events. In the example, you can see

a training area on TV. Right before a shot is snapped, an individual wearing a white lab coat

and holding a large drill appears on camera and begins drilling in the ground. It can create

highly realistic videos because it mimics this event with another person in a white lab coat and

using a large drill. To begin, you will want to attach the augmented reality device to your phone.

To do this, you will need to insert the AR device into the phone's headphone jack. Next,

download the Temporal Augmentation app for iOS or Android onto your smartphone. After

this is complete, you should be able to see the app's icon on your phone. Tap the app and then

choose "Start in augmented reality" if you want to start the video in augmented reality or choose

"Play video" if you want to watch a video without watching it in augmented reality. You should

also be able to search for videos by category or by genre to begin, you will want to attach the

augmented reality device to your phone. To do this, you will need to insert the AR device into

the phone's headphone jack. Next, download the Temporal Augmentation app for iOS or

Android onto your smartphone. After this is complete, you should be able to see the app's icon

The results of the technique are not limited to videos only but also computer-generated

graphical images for motion capture and artificial intelligence on robotics. This can blossom

humanity's technology used extensively further in this technological era with the advent of

immersive virtual worlds such as games and virtual reality. Motion capture is an animation

technique used to record the movement of objects or people. This technique is challenging due

to its high-precision and low-frame-rate requirements when it comes to capturing real human

motion, which translates into demanding hardware/software solutions. To address this

challenge, a group of researchers introduced an interactive rendering technique that can be used

to digitally create 3D models of constrained spaces. This technique, called ray casting,

produces wide-angle perspective views of the scene by tracing rays from a single point and can

handle scenes with many objects in them. The researchers developed their technique by

combining ray casting with a finite difference method, which simulates the behaviour of light

bouncing around an object using a mesh-like network of cells.

3) Content Augmentations:

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Imagery data augmentation is the process of utilizing the algorithmic versions of image-based

content plus its context to enhance human knowledge or understanding. Imagery data

augmentation is a process by which humans receive information about the content and context

of an image, with assistance from technology. Visualizations can be augmented with imagery

data to enhance human knowledge or understanding via augmented reality visualization, where

the imagery is supplemented by digital information about the location and time of creation

Augmented reality visualization aids in the understanding of a location via augmented reality.

Augmented reality is the superimposition of a physical, real-world environment with additional

elements that are perceived through one or more sensory input devices, such as computer

graphics or video. The use of augmented reality visualization aids in the understanding of a

location via augmented reality. Augmented reality is the superimposition of a physical, real-

world environment with additional elements that are perceived through one or more sensory

input devices, such as computer graphics or video.

The process involves components such as building predictive models that relies on key

combinations of image data belonging to two or more contexts, applying such models as a

template to new images that benefit from applied model patterns economically and efficiently,

and providing feedback tailored to individual needs with respect to risk levels associated with

specific consequences. The process also involves detecting, determining, and identifying

objects/ personas and contextual information that belong to one or more contexts in image data

belonging to two or more contexts. The process is well suited to privacy-protecting applications

that use image data belonging to two or more contexts, such as image recognition and visual

search systems. The process also involves

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that use image data belonging to two or more contexts, such as image recognition and visual

search systems.

Further, the process also involves classifying images into one of multiple contexts based on

object/persona detection and contextual information detection. The process further involves

using rules-based decision making such as risk soon, research indicates predictive models

based on imagery data augmentation will play a key role in decrypted Al device operation,

enabling complex behaviour for software hand-off operations modes. Several applications have

been made possible by this technology; the most well-known are face detection software for

reconstructing human facial family portraits after crisis situations have disappeared,

development of information-processing software to help individuals with disabilities, and the

development of personalized healthcare. The use of imagery data augmentation is currently not

widely embraced outside of academia or the military. The process still requires significant

expertise in image processing and contextual modelling, which are both nascent areas in

machine learning technology. One reason for this is that while it provides a tremendous amount

of value in current applications, it is not yet cost-effective to apply the technology to

commercial products outside of medical and law enforcement.

TENSORFLOW:

TensorFlow is an open-source software library for machine learning written in Python and

released under Apache 2.0 License. TensorFlow was created by the Google Brain team and is

used by offices in product groups across Google as well as academic institutions worldwide.

The design of TensorFlow is simple but powerful. It makes it easy to model complex

relationships between data. And to build deep neural networks with a single API call instead

of weeks of coding and debugging. It can be efficiently used on any machine, including mobile

phones, with little more than the computer's CPU or GPU and the TensorFlow API installed

in Python libraries from PyPI. TensorFlow has open-source libraries that are available to

programmers. The system uses a Keras backend, which is a high-level neural network API with

the same structure as Theano and CNTK. It also has an easy-to-use Python interface instead of

having to learn cumbersome numerical libraries. There is no need for programmers that have

no experience with machine learning to use this system. The system is very flexible, enabling

a variety of different types of models. TensorFlow has the following benefits: The system has

a wide range of pre-built models that can be used with little effort The system is compatible

with other deep learning systems, such as CNTK and Theano It supports a variety of different

programming languages, including Python, Jupyter notebooks, Studio and MATLAB.

Keras:

Here we are adding Hue and Saturation to Input Image.

Channels for colour and saturation should be given to augmenters.

A calibrator transforms an appearance from a given hsv colour space.

We can see that the original Image have been enhanced using the Hue ar

Saturation transform API.

From this transformation, we created extra image in the dataset.

Elemental noise using gaussian distributions was applied towards the images.

Here, we added noise to the image.

In the above figure, it created enhanced image using the initial image.

We can see that the original Image have been enhanced using the

AdditiveGaussianNoise transform API.

From this transformation, we created extra image in the dataset.

Keras is a high-level neural networks API, written in Python and capable of running on top of

either TensorFlow or Theano. It was developed with a focus on enabling fast experimentation.

The library provides a high-level interface to develop and train all types of deep learning

models. On top of providing common neural networks layers as building blocks, it also allows

instantaneously compiling models for both classification and regression problems without the

need to manually set up the training loop. What are the different types of Al models? The

library currently provides a high-level interface for all types of deep learning models. On top

of providing common neural networks layers as building blocks, it also allows instantaneously

compiling models for both classification and regression problems without the need to manually

set up the training loop. The following are some examples: -- Different types of neural networks

Neural network: Neural network layers, such as convolutional, fully connected, and recurrent

layers, are available to follow a common learning pipeline. The library provides flexible

building blocks for creating different types of neural networks. Two examples include a two-

layer feedforward neural network and a three-layer convolutional neural network.

Best Features Utilizing TensorFlow and Keras:

There has been a lot of interest in image augmentation for deep learning. The process

essentially improves the data with artificial and synthesized examples to increase the amount

of data available to train neural networks, resulting in more accurate classification models. In

this talk we will show how it is possible to augment images with synthetic examples by

carefully sampling images from the data we are working with. We will use Python and OpenCV

to perform the augmentation and visualize the results. This talk will be of interest to machine

learning practitioners and computer vision researchers. Augmentation with synthetic examples

(totally) in Python and OpenCV

This technique was first used by researchers to improve existing algorithms that are not able to

take advantage of experience from earlier tasks due to lack of training data, such as rare

diseases or neologisms. It is now widely used by companies when they need more training data

for their machine learning teams with minimal resource allocation overhead.

Data

augmentation is a technique to improve the quality and quantity of data for machine learning

algorithms. Data augmentation does this by adding artificial examples of the desired class that

do not exist in the original dataset, or by transforming existing examples in some way. It can

be performed at any stage in machine learning but is typically used as a pre-processing step. to

make datasets more suitable for machine learning algorithms.

Imgaug package:

Al at the machine level can be used to identify missing information and complete tasks from

easy to difficult Today, many companies face a huge data challenge - source and prepare their

own data. Although machine learning provides an abundant amount of data, there is still a

limitation on how much sense it makes of that data, especially in the science or engineering

industry. In addition, farmers use costly machinery and chemical solutions, which assumes

certain progress demands. So, all these industries need inexpensive solutions that can handle

both difficult tasks and massive amounts of generated content. That's where imgaug comes in.

An imgaug is a distributed machine learning system, which can assess and summarize the

digitized contents of images and help process them in an automated manner. An imgaug works

in association with a database and operates on the same principle as deep learning. The systems

can be configured with efficient hardware, making them more affordable than conventional

solutions. They also cut the need for human intervention in many tasks since the machines can

assess and process the images more effectively. The imgaugs are custom-made for a particular

use case, processed into an algorithm in real time according to that use case, and connected to

a database to extract data. The databases store information about different subject matter

categories such as food and drink, medicines, clothing, or cars. The images have been designed

to both recognize and extract information about a particular subject. For example, for food, the

system will identify what the number of cups of coffee there are on a plate or how many eggs

are present on a tray. It can also look at the product and scan QR codes to see what it is, how

much it costs, or where to get it. It's also able to handle any barcode too, so you can use it to

find out more about a product that doesn't have a QR code but has an item number on it.

Imgaug captures photos from sources like marketing material samples or aerial maps which

are distributed throughout parks or other environments with large land areas by automated

drone doors built into roads. It offers unmatchable performance in both cost-effectiveness and

accuracy for map-making, as well as for other software functions such as 3D object recognition

and analysis. Going from the paper to reality, imgaug is a machine-learning solution that allow businesses to create maps with high accuracy at incredibly low cost. It is a series of drones that

capture images automatically and then run the data through a machine learning algorithm to

create maps. The drone can be programmed to take a photo of any point in the park, which is

then analysed by artificial intelligence to create a map of the park. The map can then be

presented to visitors, who can explore the park in a new and different way. The machine-

learning algorithm automatically converts the raw image data into a map of the park by

analysing the landmarks to answer questions such as "What is the percentage of trees in this

area?" or "How many roads are there in this park?" From there, designers can make changes to

features such as walking trails, entrances, and exits, and parking.

Albumentations package:

The package provides a suite of tools for image data augmentation, including rotation,

cropping, zooming, flipping, and colour adjustment. Albumentations is a Python package

providing image augmentations that really is fast & customizable. Albumentations contains a

short, but effective image augmentation api to different image processing applications,

including such classification tasks, segment, and recognition, yet results in the creation a rich

variety on understand the bigger picture functions some of which are optimised overall

performance.

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Image data augmentation is a technique which is used to improve the quality of the data

that we have. It can be used to improve the quality of the images and videos that we have.

This technique can be used in various ways such-as:

- Improving the quality of images and videos by adding more data to them.

- If you have a dataset with less-than-ideal images, you can use this technique to generate better

ones.

- You can also use this technique if you want to create an image style transfer or video style

transfer algorithm without having access to high resolution examples for training your

algorithm.

OpenCV Package:

OpenCV Package is an open-source library for real-time computer vision.

Image augmentation means changing an image with additional features to make it more

sematic, better representing the answer to a certain question and easier for readers to

understand. Image augmentations can be done and repeated with different combinations of

transformations: scaling (increasing size or decreasing to reduce detail from larger images), rotation, deviation, shear (horizontal or vertical slide). Some transformations don't change the

location of pixels, but only their brightness values. The following image on the left is a

photograph of two people holding hands. The image on the right has a darker tone, zoomed out

and tilted to the right, giving it a surreal look. Aesthetic changes include brightness and

saturation inversion, contrast, tinting (adding a color), '

"vignetting" (darkening the edges of an

image), blurring and noise. These transformations can often be used together to make clearer

"information architecture."

" In image augmentation, the pixels are not changed in their position.

, only the brightness values, which created an "impressionistic effect." Image processing is theuse of image editing software to manipulate an image. Image editing software packages may

provide basic and advanced features, including levels, curves, sharpening and noise filtering.

Image processing can be used to create a variety of special effects or visualizations such as

HDR imaging. Image processing may also be used for medical imaging, such as MRIs and CT

scans. The basic digital image processing functions are Luminance (brightness) adjustment;

color adjustment, such as colour balance; image noise reduction; and bit depth reduction.

Luminance adjustment is the process of adjusting the brightness of an image without altering

its contrast or hue. The technique used to adjust luminance is called "brightness and contrast"

which is a very popular technique in image editing software. Luminance adjustments,

sometimes called brightness and contrast adjustments, can be used to remove noise or to make

shadows more visible by increasing brightness. The technique used to adjust luminance is

called "brightness and contrast" which is a very popular technique in image editing software.

Luminance adjustments, sometimes called brightness and contrast adjustments, can be used to

remove noise or to make shadows more visible by increasing brightness.

It becomes possible for OpenCV api team members not just to monitor their facial expressions

before deciding what signal response should be done but also actualize their intentions on

screen through this live feed stream and try different variations in facial expressions as they

wish. TensorF low aspires towards solving the real-time facial expression recognition problem.

The current version of this TensorFlow library is targeted to work on Android and iOS devices

while being compatible with Windows, Mac, Linux, and Raspberry Pi

Features: - Machine learning and Al on mobile devices is restricted to apply computer vision

techniques for machine learning purposes. But, due to the limitations of device power and

computational resources, the original source code of existing machine learning libraries

designed for single platform cannot be ported easily. To address these issues, TensorFlow Lite

(TFL) was written in Python as a lightweight library that can casily be ported from one device

platform to another. TFL has all the functionalities of TensorFlow for mobile platforms but is design to run on small device such as Raspberry Pi.

Matplotlib Package:

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Python is an appealing choice of language precisely because it can be succinet and expressive.

This subsection provides a Python library to explore building and counting graphs. Graphs can

be represented by graphs in a variety of formats. A graph may have nodes and edges, where

nodes are connected to other things, and edges are connections between the two nodes. If we

want to write a program that counts the number of times each node is connected to another

node, we might do this with a Python library like Reaph X. We can create a Python graph from

our information by importing the Graph»23 brary: import numpy as np import matplotlib.pyplot

as pit #Create a dataframe of our nodes df = pd.DataFrame(data = ('A' : [[0, 11, [0, 2], [1

,311, 'B' : (0, 1 ]1, 'C' : ( 1,2 ], [2 , 3 ]], 'D' : [[3, 4 1. [ (]5 ]IP) Create a graph from the

nodes and connections in our dataframe:graph4- GraphX(df) Create a directed edge from node

A to node C: edge = graph.edge( 'A'

'C' ) Create a directed edge from node B to Diedge

graph.edge( 'B'

'D' )

Create an

undirected edge from A to B and Ciedge

graph. undirected\_link, weight-1Create a directed edge from A to D and Ciedge

graph.directed link, weight-1 Visualizing the graph1

This subsection introduces the Matplotlib module in Python, which is just one option for

plotting graphs. in Python. This subsection introduces the NumPy module in Python, which

ere to search

operations. The NumPy function is used to evaluate an expression in NumPy, such as: The

code uses the NumPy function to evaluate an expression in NumPy. Matplotlib is a popular

plotting library for python that uses the default Python graphics library, and therefore the

matplotlib module is not required on its own. This subsection introduces Matplotlib as an

option for p Btting graphs. . This can be accomplished by calling the function with the following

arguments 5 import matplotlib.pyplot as plt x = np.linspace(©, 10, 100) y =\* \*\* 2 pIt.plot(x, y)

pit.showOMatplotlib is a popular plotting library for python that uses the default Python

Augmenting data more effectively:

6]

Augmentation is the process of annotating images with a batch of metadata which can then be

used to help machine learning models. Metadata can include information about the type and

make of a certain building (e.g., for use with see-trough to augment data), weather trends,

geography, expenses etc. Augmentation works by finding a small amount of data that is likely

to be similar in nature to the input data, and then using this as a seed for training. This can help

improve accuracy, especially if the augmentation dataset has been carefully chosen to match

the input data sufficiently. Augmentation helps create more accurate machine learning models

by providing an external dataset which is similar in nature to the input data. An example of

Augmentation would be if a company wanted to use the input data from all the different forms

of its employees e.g., their name, occupation, employment start date etc. In order to create a

training dataset for machine learning models which will generally use first and last names as

labels, the input data could be augmented with metadata such as full names, the company's

address, job title etc. The data could come from a range of sources such as (g man resources

systems, CVs, and employment contracts. The augmented dataset would be used to train

machine learning models and/or build customer profiles if your company has a customer data

management system.

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Augmentation is a subset of the broader process of transfer learning. Augmentation uses a

dataset that is similar in nature to the input data and then trains machine learning models by

using this external dataset as a seed for the training. Transfer learning refers to creating or

evolving machine-learning models from one or more existing models with additional inputs,

or new domains (117 necessarily from the same domain). A common example of transfer

learning is training a deep neural network with a pre-trained model from ImageNet. This deep

network will have an output layer that predicts object lalsls for inputs. from the ImageNet

dataset. This is arsexample of transfer learning as it uses a pre-trained model to identify labels

in a new domain. Transfer learning is the process of building models from one or more existing

models, with additional input data, or new domains. of application.

Data Augmentation is a process in which an algorithm augments clean training data by

reinterpreting and recreating missing or obscured parts in the input image data, to form datasets

containing more representations of real-world objects than g traditional single frame data sets.

The technology of Deep Learning has been heavily used in the field of computer vision for

image recognition and classification tasks. However, in many real-world scenarios, there is

incomplete data or missing parts which may be due to different reasons such as noise,

occlusions, and other low-quality variations. For example, an algorithm may not have enough

training data to recognize a certain object, or the algorithm may not be able to classify an object

because it is missing a certain part of the input image. Deep Learning has been able to overcome

a lot of these problems and improve accuracy in tasks like image classification by using

Augmentation Techniques. These techniques are used in both training and testing phases. Some

common augmentation algorithms are:

Pooling: The algorithm is applied to individual units of data and combines them into larger

units, resulting in fewer output values

Reduction; The algorithm reduces the dimensionality of data to a smaller number

Merging: Augmented inputs are combined using a neural network with one input layer.

Google Colab:

Google launched Collaboratory as a scientific study to share computer learning-related studies

as well as instructional resources.

It is a cloud-based Text Editor system that doesn't need any setting.

Google Cloud stores collaborative notes, which may be exchanged similarly as Excel

Spreadsheet or Google Documents. It costs nothing to use Collaboratory. Python 2 and Python

3 programmes may be executed in the collaborative environment, as well as TensorFlow, as

well as other tools, matplotlib might be used to view various charts.

Data set:

https://storage.googleapis.com/download.tensorflow.org/example\_images/flower \_photos.tgz

5

Image augmentation is the process of generating new images that differ from the original image

by a small perturbation. This technique can be used to generate novel and realistic-looking

variations of any given dataset. The purpose of this technique is to generate visually pleasing

variations on an existing set of images. When applied to flowers, this technique yields many

different combinations between flower petals, colours, shapes, and arrangements.

The dataset we will be using for this blog post is based on a flower dataset.

Techniques:

The CNN is a deep neural network that will learn how to process an input image and then

produce an output image. This technique is called Spatial Augmentation as it applies

transformations to the spatial domain of an image. Temporal augmentation, on the other hand,

takes place in the temporal domain and can be used for video processing or audio processing.

Content augmentations are generated by adding new content to existing images or videos like

cropping, scaling, rotating, and flipping., content noise, zooming and so on.

Whereas data augmentation may be utilised in a wide range of fields, it is most typically

employed in object recognition. These below are among the most prominent image data

augmentation:

Flipping Image:

Flipping Images is a technique which creates an appearance of dynamic vividness by applying

operations to the images of someone in one's surroundings. Introduction: From simple cut-outs

to computer games, flipping images has been around since the advent of cinema. A key feature

of this technique is its instantaneous capability of exchanging eye perspective and perception

in areas that are familiar.

Introduction: The Flipping Images application provides a way to "flip" the colours and textures

present within an image on the user's screen. This process can be used with photos that you

have experienced or possibly shared; it may also be used in virtual environments using web

cameras or computer vision software frameworks like OpenCV.

TensorFlow Flip Image:

This application uses TensorFlow for image generation via image warping and transformations.

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operations to the images of someone in one's surroundings.

Introduction: From simple cut-outs to computer games, flipping images has been around since

the advent of cinema. A key feature of this technique is its instantaneous capability of

exchanging eye perspective and perception in areas that are familiar and unfamiliar to the

viewer.

Image Resizing:

With the adoption of artificial intelligence, image size is increasingly important. It is imperative

to ensure that you optimize images by keeping them of a right height. This section will tell you

how to resize your images with TensorFlow efficiently. To achieve our goal of resizing an

image, we need to fingerprint it using the length as width and height as height - (width, height).

A scalable version needs to be created earlier on by scaling it down for us to resize our new

larger version up without distortion! Now that we have a basic understanding of the process.

Image cast:

An Image cast is a type of augmented reality. It is used to animate a single photo in an

environment and make it seem like you are exploring an entire world with that image.

This technique involves three principles:

- Switching images dynamically to create the illusion of 3D stereoscopic when using them from

different angles

- Creating real-time recognition with TensorFlow data set generation

- Using object recognition so that only the subject gets recognised, and the background does

not get interrupted by other objects.

The following images are an example of the process:

1. For this type of augmented reality, an image is chosen and printed on a sheet of paper.

2. A second piece of paper is cut out in the same size as the first one, but not quite a perfect fit

so that it can fold and be put into place over it.

3. The second piece of paper is placed into the first one, matching up the edges and sealing

them closed by pressing them down against each other.

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4. An opening is made at the top left corner of the first image, and a second piece of paper is

cut out in that same size as well and folded to complete it

5. A section of this new piece of paper is cut out and folded in half so that it can be pushed into the opening at the top left corner of the image.

6. A small hole is then cut into the bottom left corner of this newly created piece of paper.

7. A matching piece of paper, but not quite a perfect fit, is put over this new piece from step 6,

sealing them together.

8. The two pieces are printed and glued together, then cut up to make a book.

Image Rescaling:

Image Augmentation is the process of artificially manipulating an image to create new

variations. It has been around for a while, with the first known examples dating back to the late

1990s.

- The following are two different images, one with a car and one without:

Image 1: Location

Image 2: Car

The car in Image 2 is not present in Image 1 - but in augmentation process it can be added into

Image 1 to make it more realistic. This is achieved by augmenting Image 2 into Image 1 by

positioning the car at a similar location and orientation as that of the car in image 2. With

TensorFlow's API, this process can be automated and done automatically with minimal effort.

Image Cropping:

The Image Cropping technique is a computer vision technique that enables the automatic

cropping of images.

The Image Croppo)g technique is an algorithm that can be used to automatically crop images.

The algorithm is based on the use of a Convolutional Neural Network (CNN) and it has been

trained with a dataset. A CNN has been used to extract features and perform image

classification. After the Al was trained, the algorithm can recognize and classifying images

into a category. like nature, food, vehicle, and any other category.

Image Brightness:

Image Augmentation is the process of creating realistic augmented images - basically, to depict

different lighting or shading scenarios before taking a picture, for example with HDR. Image

Brightness is an extension of Image Augmentation that tries to produce brighter pictures by

adding lights at different levels. It uses a machine learning algorithm to determine how much

light should be ramped up in the image, to make it resemble natural light when necessarv. This

technique is especially useful for generating realistic pictures from low-quality photos or

videos captured inaccurately under strong lighting, such as dark and bright scenes taken by

smartphone cameras.

General applications of Image Brightness depend on capturing and enhancing many images

over time devices that are not accurate under strong lighting which can then be applied across

a larger photo set. But there are also specific use cases in computational photography. For

example, when taking pictures of stars and planets with a DSLR camera and need to darken

the images artificially, you can use image brightness as a filter to get the desired result.

The Image Brightness technique is a data augmentation technique comprised of a series of

operations: for every input image, compute its images by cyclically modulating pixel values by

the Gray-scale value [128 -255] with uniform overlap. The phase radius used as the mapping

parameter, , and the phase increment length, p, normally come in pairs while they constitute

two independent variables that affect the strategy's effectiveness.

Data augmentation can be useful because it increases the volume of training data which is often

critical to support generalization. One way to increase training set size is through synthetic

transformations such as brightness enhancement. Increasing image brightness using a data

augmentation technique can help increase training set size. Data augmentation is often (22d in

computer vision and machine learning to increase the volume of training data. and it can be

used to increase the training set size.

The Gray-scaled technique was developed by Google researchers, and it works by adding a

random grayscale filter over the original image and then adding noise to the image. The result

is a more diverse set of training data with the same number of images as before. Image

augmentation with TensorFlow is a technique that can be used to generate new images from an

existing set of images, which can be useful for training neural networks or generating content

for training data sets. The process starts by creating a model, The is the output of an algorithm

that takes in a list of inputs and outputs the probability distribution over these inputs. This

probability distribution can be visualized as a histogram. A common choice for histograms is

the Laplacian operator. Laplace smoothing, also known as Gaussian smoothing.

Image Edge Detection:

Edge detection is a process which is used to find boundaries on an object.

Edge detection provides many uses, regular detection is mostly used in computer vision, and

we can use it for filtering out noise, identifying foreground objects and detecting the shape of

objects.

Edge detection is the process of finding boundaries on an object. It has many uses, with regular

edge detection being used in computer vision and we can use it for filtering out noise.

In the field of image processing, a common technique called edge detection establishes

boundaries of regions where some photo processing may have been applied.

If edge detections were traditionally limited to grayscale images or sometimes planer or

cylindrical images, then these resources would not be able to provide proper analyses of human

shapes or other complex geometrical subjects but with Al techniques we are now questioning

the limits of this technique for combinatory grayscale images that only use intensity

information. To illustrate, the following figure shows a sketch of a human shape interpreted by

an edge detection technique. Image by Kateryna Kononenko, Andreas Gehrke and Christoph

KohlschutterIf we look closer at the image, there is part of the person in front of the edge

detection boundary that is not captured. The figure illustrates that the edge detection boundary

becomes very fine and is not able to capture all the shapes.8. Conclusion This paper analysed

how Al techniques facilitate new methods for analysing complex geometries, based on a

combination of grayscale images with mathematical algorithms or representations. We found

that Al is a technique that has been used for such methods since its inception, and we also

found that it is a useful tool for the understanding of complex images. The paper concluded

that Al techniques have been used in various fields of work, including 3D visualizations and

design., and it is a useful tool for the understanding of complex images.

Here we performed augmentation only on One Image from Dataset.

In the above figure, it created enhanced image using the initial image.

We can see that the original Image have been enhanced using the left to right

transform API.

From this transformation, we created extra image in the dataset.

Here we performed augmentation only on One Image from Dataset.

In the above figure, it created enhanced image using the initial image.

We can see that the original Image have been enhanced using the cast trans form

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We can see that the original Image have been enhanced using the left to right

transform API.

From this transformation, we created extra image in the dataset.

Here we performed six augmentations only on One Image from Dataset.

After performing six augmentation APIs on one image.

By using one image, we created six images which means we are increasing the

size of the dataset

We can see that the output Image have been enhanced using the six different

transform API.

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From these trans formations, we created extra images in the dataset.

3.3) KERAS IMAGE AUGMENTATION USING MULTIPLE API'S ON WHOLE DATASET:

Observations:

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Here we performed Rotation Range, Shear Range, Zoom Range, Horizontal

Flip, Brightness Range augmentations whole Dataset.

After performing all these augmentation APIs on whole image dataset.

After augmentation, we saved all the augmented images to local directory.

Now, we have more images compared to actual images.

From these transformations, we created extra images in the dataset.

Advantage of using TensorFlow and Keras for Image Augmentation.

Image augmentation invokes the need for more diverse and richer images. This is easier

said than done, because although there is an abundance of freely available images from

the web, it would also involve manually getting them resized and sorted. With

TensorFlow's efficient random pipeline for image augmentation, this really becomes a

walk in the park. Conclusion Image augmentation is an important component of many

deep learning models. It helps to improve the quality and diversity of input data, which

in turn improves model accuracy. TensorFlow's random framework provides a robust

foundation for image augmentation that can be easily extended with custom code or

existing libraries.

The web page has many advantages of using it over previous frameworks, such as

speed, the latest version of TensorFlow processes images at an impressive 50 times

faster than Google's framework Caffe since it doesn't rely on convolutional methods or

their related processing routines.

It's compatibility-TensorFlow Framework is compatible with Python code which can

be utilized to make complex neural networks demand less resources to process high

resolution graphics and produce far more accurate results. In addition, the framework

is compatible with several programming languages such as C, JavaScript, and R.

TensorFlow is a platform for machine learning research that's available on all major

operating systems, and it has been used by companies such as Google to design their

machine learning applications. The TensorFlow development team developed the

framework to make machine learning easier to deploy, train and operate.

Observations:

Laterally rotate any inputs about y-axis.

We can see that the original Image have been enhanced using the Horizontal

Flip trans form API.

From this transformation, we created extra image in the dataset.

4. Technical Specification

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TensorFlow, an open-source software library for numerical computation using data flow

graphs, is a powerful tool for Machine Learning and Deep Learning

This API is best used to implement a neural net to perform classification tasks on images. It

can also be used to do machine translation and speech recognition. TensorFlow provides

support for large systems with multiple GPs and CPUs by enabling fast execution speed on

all of them.

Keras is a high-level neural networks API, written in Python and capable of running on top of

either TensorFlow or Theano.

The purpose of Keras is to provide a higher-level interf\*25) for developing deep learning models

than what those lower-level libraries offer. It provides a simple way to define neural networks

as a series of layers, and automatically handles the optimization and derivation process

The API can be used either by supplying pre-trained models, or training ones from scratch.

It also provides user-friendly ways to define both convolutional and recurrent neural networks

in addition to standard feedforward nets.

5. Requirements Evaluation Plan

In this section, I will talk about the requirements for data augmentation to be effective and

useful in each task. The following are the criteria that are worth considering when we start

looking at dataset augmentation.

Image data augmentation is an important technique in image classification that aims to tackle

the issue of low-quality dataset. The aim is to create modified versions of training datasets to

create new images that would be imperfectly classifiable by a neural network model.

There are some constraints on which criteria should be used when judging if they should

consider data augmentation or not. Different algorithms face different issues and have different

sets of constraints, so it would be unrealistic to pick out any one factor as reliable or sufficient

for evaluating whether it could augment data effectively in each task.

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What criteria to use to evaluate your system or experimental results? Who will be involved in

the evaluation? What type of testing will you do to verify the quality of your software? In

short, how will you verify that your project achieves what it sets out to do?

6. Background Research and Reading list

In recent years, the use of deep learning technique for image processing becomes more and

more widespread. Much recent research about Deep Convolutional Generative Adversarial

Networks applied to image generation, it improves significantly.

- Background research of auto augmentation.

This background research presents the infrastructural and computational challenges involved

with data augmentation, necessary pre-processing, and post-processing to maximize the

likelihood of success during flight. Additionally, advantages and limits of Al-aided engineering

are related as well as potential future applications in human/machine partnerships and our daily

lives. The problem at hand is how to maximize the likelihood of success for an automated take-

off during flight. The task of increasing the probability that a vehicle can take off successfully

involves several different infrastructural and computational aspects. These challenges are listed

below in order from pre-processing to post-processing. Pre-processing: Before data

augmentation, the data needs to be pre-processed. Examples of pre-processing include creating

a dictionary for classifying words that are not recognized by the model, removing stop words,

and filtering out irrelevant parts of text. There may also be additional processing necessary

before the data can be used as input to a machine learning algorithm such as tokenization.

Stemming: The term stemming refers to a process of reducing words to their stems.

- Deep Neural Network used as a generator

Deep Neural Networks are proving to be an excellent use case in the field of generative

modelling. With GDs, it's ensured that training data is the same as testing data, which one of

the biggest issues with Deep Neural Networks. The benefit of GDs is that they are much simpler

to implement. They also can work with many parameters. The downside is that their accuracy

is only as good as pre-trained networks are, so you can only use one type of neural architecture.

What Can I Do with Generative Models? Generative modelling is most used for image

generation. It is often used to generate a set of images from one, such as an album cover or bird

species. In addition, it can be applied to text generation, speech synthesis and natural language

processing.

- Enhancing colour balance of an inputted picture

Towards the end of this section, we will hopefully be able to improve the colour balance on a

photo by inputting an image and enhancing its autonomous parameters. Data augmentation is

generally used for generating data points for use in modelling or creating a predictive

algorithm. The extension of "data" also refers to software code, as data augmentation does not

necessarily care about the content of an original dataset to reflect missing values when it is

represented differently or when data exists within different datasets. The goal of data

augmentation is to generate new data points that are closer in shape, size, and contrast to the

original dataset. Data augmentation is often used when it is not feasible or desired to input new

data points manually. Data augmentation can happen at several different levels to achieve

optimal results. The most basic level of modification is simply adding new data points, but

other examples of data augmentation include:

- Adding a metric to an existing set of metrics.

re to search

- Creating a unique set of metrics.

- Simplifying the input process by choosing to accept specific types of inputs (e.g., yes/no,

short responses).

So why do ML algorithms require additional info?

Data augmentation techniques allow an ML model to get more training data to refine a

predictive algorithm and the accuracy of the model's predictions. The following table

summarizes the various augmentation techniques for linear, logistic, and neural networks.

Data augmentation is one of the most common techniques in ML. A technique where ML

models are trained with noise or additional images are considered as augmentations because

they lead to better results in generating new predictions from existing datasets. In other words,

adding noise to the input leads to a more robust model. This is done by adding randomly drawn

objects into the original dataset. These additional images are also referred to as noise samples

or augmentation variables and they can be anything from humans, animals, or physical shapes

that are not present in the original dataset. With this approach, new features are generated from

the noise samples. A strict subset of an Artificial Neural Network, a convolutional layer is a

neural network that consists only of one or more convolutional layers. Convolutional layers are

particularly efficient at feature extraction in images and other data sets with similar

characteristics like text, where they detect and respond to patterns in the data by performing

convolutions. Cognitive Computing In cognitive computing, artificial intelligence (AI) is

applied to both human and computer systems. It has a broad range of potential applications

ranging from individual advice automation to the automating of the very process of cognition,

meaning it can be applied in any field where information or knowledge is used or gained. The

future application fields are endless and only limited by the application of Al. Cognitive

Computing in Cognitive Computing, artificial intelligence (Al) is applied to both human and

computer systems, It has a broad range of potential applications ranging from individual advice,

automation to the automating of the very process of cognition, meaning it can be applied in any

field where information or knowledge is used or gained. The future application fields are

endless and only limited by the application of Al. Networking Principles Networking is the

process of using interconnected devices to exchange and share information. Networking

principles can be applied in a variety of industries, including business, education,

entertainment, design, and construction. The future application fields are endless and only

limited by the many possible applications of networking principles. Society is all about the

collective group of people coming together, sharing ideas and beliefs, and contributing to a

collective social fabric. Societies can be defined by their values and how they interact with

each other. The future application fields are endless and only limited by the society itself. This

is just a few examples of what Al principles can be applied to in the future. "I believe that Al

will change everything. I'm a big believer in the singularity, when artificial intelligence exceeds

and then intermediates the capability of humans."

7. Future Scope

The scope of this project is to create additional image data using the Augmentation

APIs and make sure that Al can be trained on these images to identify any flowers

from this data set that we used.

We shall discuss the evaluation results from the comparisons we did in all the earlier

sections and propose a future plan that can be used to improve these augmentation

techniques.

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