IMAGE RECOGNITION WITH IBM CLOUD VISUAL RECOGNITION

OBJECTIVE:

The project involves creating a chatbot using IBM Cloud Watson Assistant. The goal is to develop a virtual guide that assists users on messaging platforms like Facebook Messenger and Slack.

The project includes designing the chatbot's persona, configuring responses, integrating with messaging platforms, and ensuring a seamless user experience..

Image recognition is a mechanism used to identify an object within an image and to classify it in a specific category, based on the way human people recognize objects within different sets of images.

When we see an object or an image, we, as human people, are able to know immediately and precisely what it is. People class everything they see on different sorts of categories based on attributes we identify on the set of objects.

That way, even though we don’t know exactly what an object is, we are usually able to compare it to different categories of objects we have already seen in the past and classify it based on its attributes. Let’s take the example of an animal that is unknown to us. Even if we cannot clearly identify what animal it is, we are still able to identify it as an animal.

People rarely think about what they are observing and how they can identify objects, it completely happens subconsciously. People aren’t focused on everything that surrounds them all the time. Our brain has been trained to identify objects quite easily, based on our previous experiences, that is to say, objects we have already encountered in the past.

We do have an extraordinary power of deduction: when we see something that resembles an object we have already seen before, we are able *to deduce that it belongs to a certain category of items. We don't necessarily need to look at every part of an image to identify the objects in it. As soon as you see a part of the item that you recognized, you know what it is. We usually use colours and contrasts to identify items.*

For humans, most image recognition works subconsciously. But it is a lot more complicated when it comes to image recognition with machines.

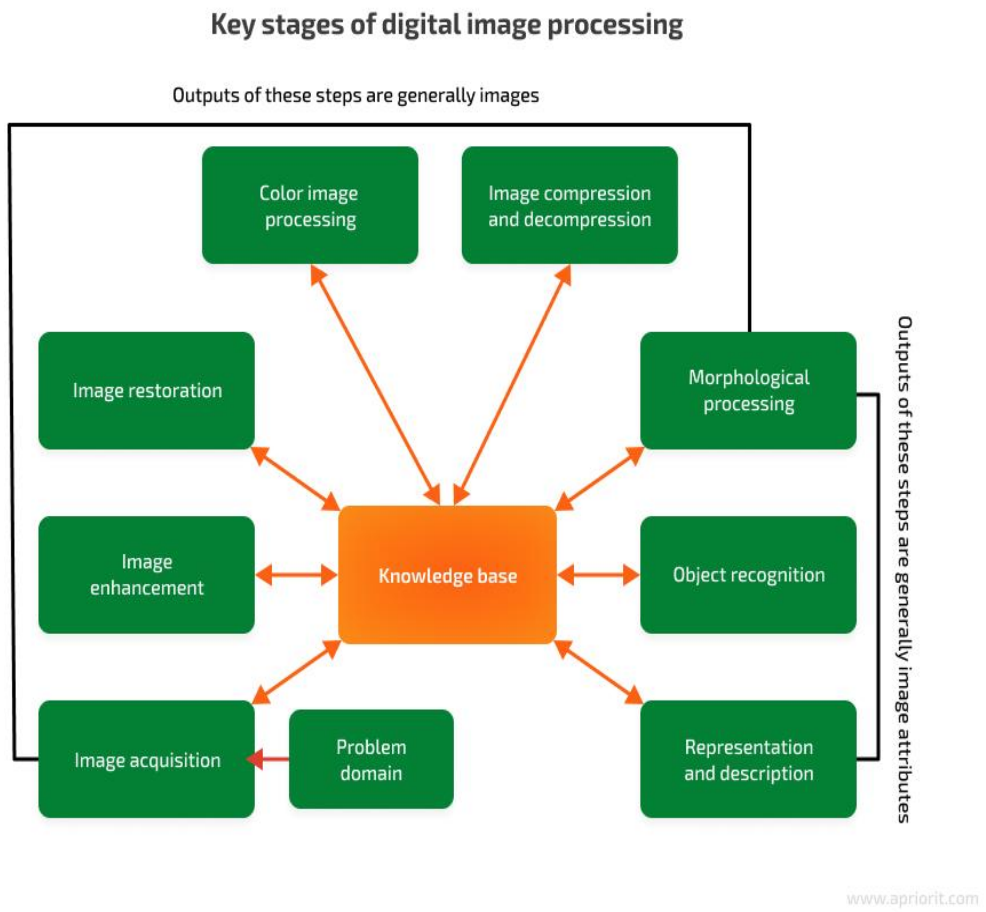
DESIGN THINKING PROCESS:

1. *Persona Design: Define the chatbot's persona, including its name, tone, and style of communication.*
2. *User Scenarios: Identify common user scenarios and FAQs that the chatbot should be able to address.*
3. *Conversation Flow: Design the conversation flow, outlining how the chatbot responds to user queries and prompts.*
4. *Response Configuration: Configure the chatbot's responses using Watson Assistant's intents, entities, and dialog nodes*
5. *Platform Integration: Integrate the chatbot with popular messaging platforms like Facebook Messenger and Slack.*
6. *User Experience: Ensure a seamless and user-friendly experience, with clear prompts and informative responses.*

DEVELOPMENT PHASES:

1. *Image acquisition: This involves capturing an image using a digital camera or scanner, or importing an existing image into a computer.*
2. *Image enhancement: This involves improving the visual quality of an image, such as increasing contrast, reducing noise, and removing artifacts.*
3. *Image restoration: This involves removing degradation from an image, such as blurring, noise, and distortion.*
4. *Image segmentation: This involves dividing an image into regions or segments, each of which corresponds to a specific object or feature in the image.*
5. *Image representation and description: This involves representing an image in a way that can be analyzed and manipulated by a computer, and describing the features of an image in a compact and meaningful way.*

6. *Image analysis: This involves using algorithms and mathematical models to extract information from an image, such as recognizing objects, detecting patterns, and quantifying features.*
7. *Image synthesis and compression: This involves generating new images or compressing existing images to reduce storage and transmission requirements.*
8. *Digital image processing is widely used in a variety of applications, including medical imaging, remote sensing, computer vision, and multimedia.*
9. ACQUISITION– *It could be as simple as being given an image which is in digital form. The main work involves:*
   a) Scaling
   b) Color conversion(RGB to Gray or vice-versa) .
10. IMAGE ENHANCEMENT– It is amongst the simplest and most appealing in areas of Image Processing it is also used to extract some hidden details from an image and is subjective.
11. IMAGE RESTORATION– It also deals with appealing of an image but it is objective(Restoration is based on mathematical or probabilistic model or image degradation).
12. COLOR IMAGE PROCESSING– It deals with pseudocolor and full color image processing color models are applicable to digital image processing.
13. WAVELETS AND MULTI-RESOLUTION PROCESSING– It is foundation of representing images in various degrees.
14. IMAGE COMPRESSION-It involves in developing some functions to perform this operation. It mainly deals with image size or resolution.
15. MORPHOLOGICAL PROCESSING-It deals with tools for extracting image components that are useful in the representation & description of shape.
16. SEGMENTATION PROCEDURE-It includes partitioning an image into its constituent parts or objects. Autonomous segmentation is the most difficult task in Image Processing.
17. REPRESENTATION & DESCRIPTION-It follows output of segmentation stage, choosing a representation is only the part of solution for transforming raw data into processed data.
18. OBJECT DETECTION AND RECOGNITION-It is a process that assigns a label to an object based on its descriptor.



FEATURES:

Education System:

The image recognition technology adds significant value to the educational industry by allowing students with learning difficulties to register knowledge in a method that is more convenient for them. Text-to-speech tools, for example, are available in apps that rely on computer vision. These considerable aids visually challenged or dyslexic pupils in reading the information. This is not a restriction of image recognition technology's contribution to student bodies.

Healthcare Sector :

Image recognition technology is a huge aid in the healthcare profession. It aids in driving significant improvements throughout a patient's journey. Computer vision and image recognition techniques are used in microsurgical operations in the healthcare business that are driven by robots. Because of developments in machine learning and artificial intelligence, the application of this technology has increased over the previous decade.

Retail Industry:

This game-changing strategy is in high demand in the retail business. An image recognition approach may be used to compare the quality and pricing of a product. Tesco, Bengaluru, is collaborating with biometrics and image recognition technologies, which include a variety of engines for recognition, geometry, quality grading, and product range planning, among other things.

Security Industry:

Security is an essential component of every platform, whether it is an office, a smartphone, a bank, or a home. Drones, security cameras, biometric facial recognition technologies, and other security equipment have all been developed. SimCam home security and home automation cameras will be on show at CES 2019 with artificial intelligence for facial recognition, pet monitoring, and much more via location training.

Social Media Platform:

Image recognition is doing well in this field since it has made it easier for marketers to locate graphics on social media. Image recognition algorithms can scan social media sites for photographs and compare them to huge libraries to find the relevant images at unprecedented speed and scale. As a result, it provides significant benefits to businesses in terms of customer service. In 2016, Facebook introduced a service for visually challenged persons that combines face recognition and artificial text technology to create an accurate description of the photo content as well as stating who is in the photo without being tagged.

Marketing and Campaigns:

Image recognition applications are not confined to consumer services. Advertising and marketing firms are already investigating its possibilities for innovative and interactive campaigns. It gives up new avenues for knowing more about target audiences and providing them with compelling branded content. Today, social intelligence is mostly built on social listening. It entails monitoring social media conversations to learn more about possibilities.

Merged Reality:

This is a hybrid of virtual reality and augmented reality. To address the drawbacks of VR and AR, merged reality is being developed, which provides virtual-world experiences more dynamically and intuitively. For example, Intel's Project Alloy or Microsoft's Windows Holographic Shell, a wireless headgear that uses 3D cameras to bring actual items into the virtual environment.

Detecting human skeletal structure and posture:

This technology detects the skeletal structure and posture of the human body by recognizing information about the head, neck, hands, and other parts of the human body. Deep learning technology is used to detect not only parts of the human body, but also optimal connections between them. In the past, skeletal structure and posture detection required expensive cameras that could estimate depth, but advances in AI technology have made detection possible even with ordinary monocular cameras.

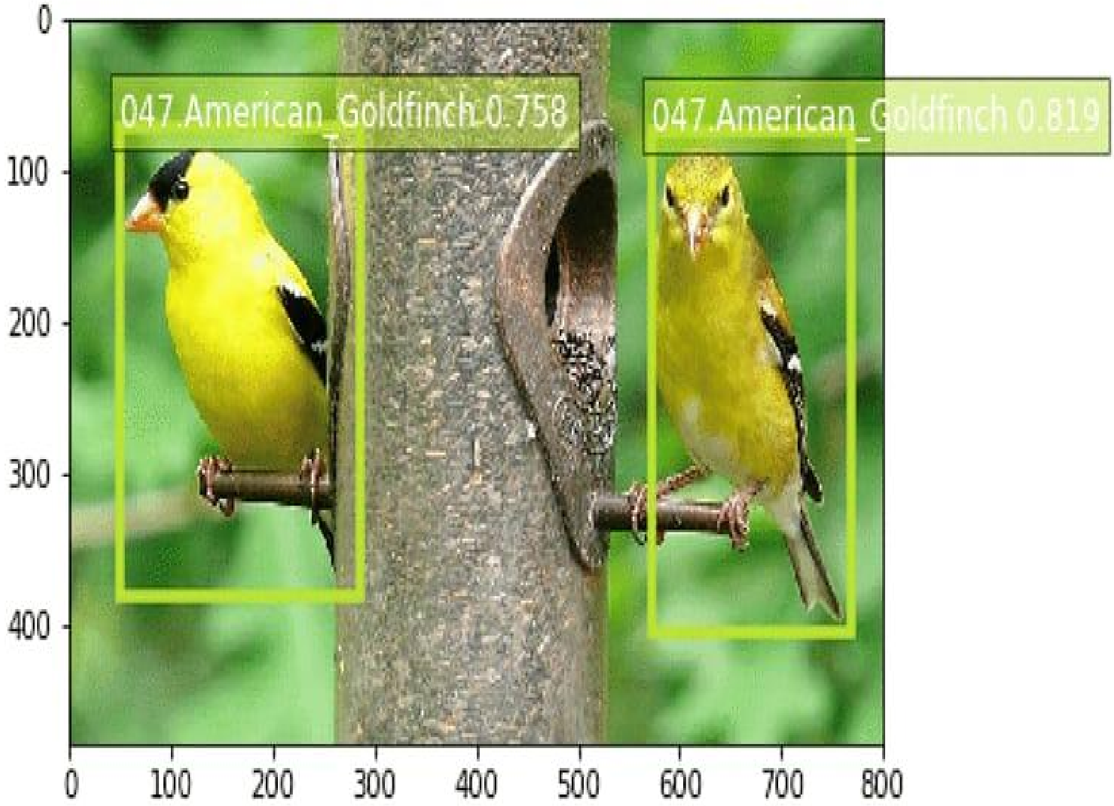
Facial recognition:

This technology recognizes the eyes, nose, mouth, and other information from 2D or 3D image information and checks against a database of pre-registered facial information to authenticate a specific person. Since the outbreak of the COVID-19 disaster, some products can now recognize people even with their masks on, while others can measure temperature.

Program:

```
import tensorflow as tf
import matplotlib.pyplot as plt
model = tf.keras.applications.MobileNetV2(weights='imagenet')
img_paths = ['cats.jpg','dog.jpg','bird.jpg','umbrella.jpg']

for image_path in img_paths:
    img = tf.keras.preprocessing.image.load_img(image_path, target_size=(224,224))
    input_image = tf.keras.preprocessing.image.img_to_array(img)
    input_image = tf.keras.applications.mobilenet_v2.preprocess_input(input_image)
    input_image = tf.expand_dims(input_image, axis=0)
    predictions = model.predict(input_image)
    predicted_classes=
      tf.keras.applications.mobilenet_v2.decode_predictions(predictions, top=10)[0]
    plt.imshow(img,interpolation='bicubic')
    plt.axis('off')
    plt.show()
    print("Predictions:")
    first_prediction = True
    for _, class_name, probability in predicted_classes:
        if first_prediction:
            print(f"{class_name}: {probability}")
            first_prediction = False
        else:
            print(f"{class_name}: {probability}")
    print()
```

Output:



Visual search:

Image search using keywords or visual features uses image recognition technology. For instance, Google Lens enables users to conduct image-based searches and Google's Translate app offers real-time translation by scanning text from photographs. These technological advancements enable consumers to conduct real-time searches. For instance, if someone finds a flower at a picnic and is interested in learning more about it, they can simply take a photo of the flower and use the internet to look up information on it right away.

Quality control:

Traditional manual quality inspection is labor-intensive, time-consuming and error prone. However, using a set of annotated photos of a product of interest, an artificial intelligence model or neural network can be trained to automatically spot patterns of malfunctioning equipment. As a result, it's possible to identify and isolate items that don't meet the standards, thus improving overall quality of the product.

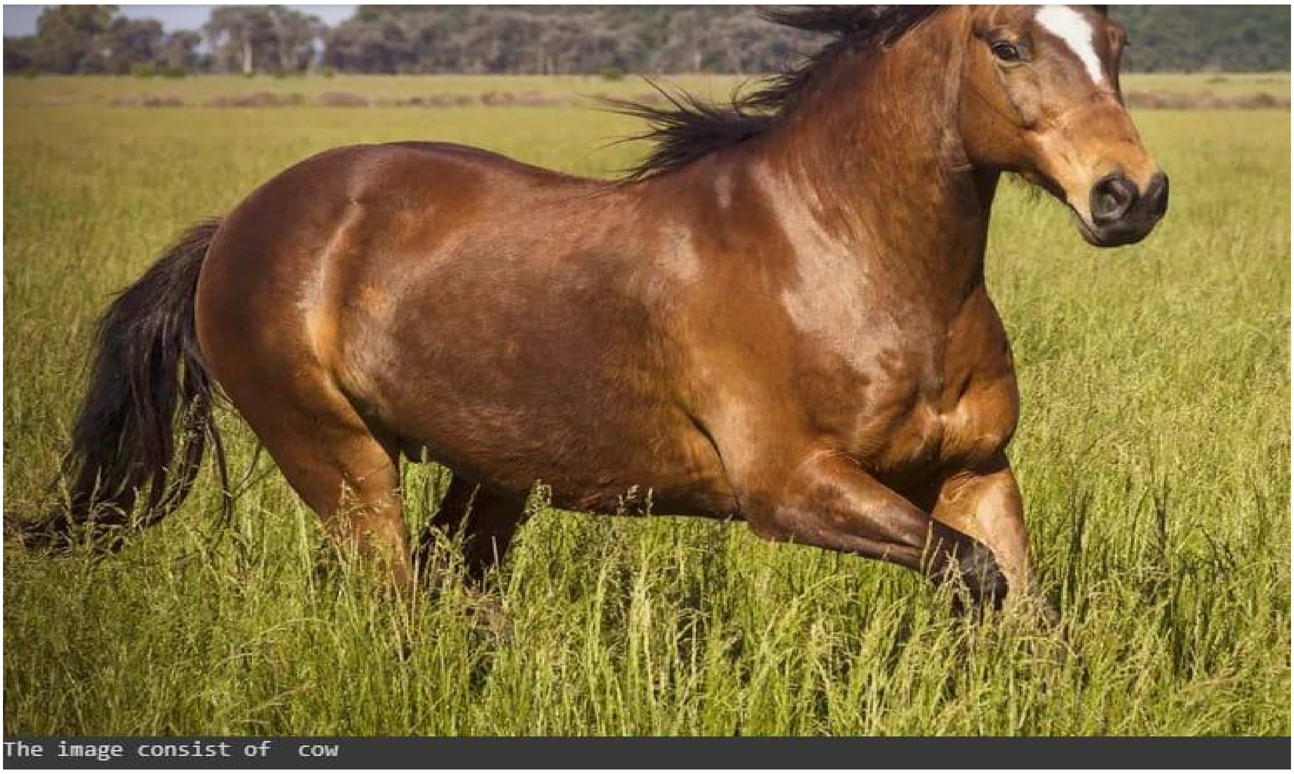
Source Code:

```
import tensorflow as tf
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.layers import Input, Dense
from tensorflow.keras import Sequential,Model
from tensorflow.keras.layers import BatchNormalization,Dropout,Flatten
from tensorflow.keras.layers import Conv2D
from tensorflow.keras.layers import MaxPooling2D
from tensorflow.keras.layers import GlobalAveragePooling2D
from tensorflow.keras.preprocessing import image
from tensorflow.keras .layers import GlobalAveragePooling2D
import numpy as np
import os
import cv2

train_data_dir='/kaggle/input/animals10/raw-img/'
img_height=299
img_width=299
batch_size=64
nb_epochs=20
train_datagen = ImageDataGenerator(rescale=1./255,
    shear_range=0.2,
    zoom_range=0.2,
    horizontal_flip=True,
    validation_split=0.2) # set validation split

train_generator = train_datagen.flow_from_directory(
    train_data_dir,
    target_size=(img_height, img_width),
    batch_size=batch_size,
    class_mode='categorical',
    subset='training') # set as training data
```

```
validation_generator = train_datagen.flow_from_directory(
    train_data_dir, # same directory as training data
    target_size=(img_height, img_width),
    batch_size=batch_size,
    class_mode='categorical',
    subset='validation') # set as validation data

#import a pre-trained model, without the top layers.We will customise
#the top layers for our problem
base_model = tf.keras.applications.Xception(include_top=False,
input_shape=(299,299,3))
#For now freeze the initial layers and do not train them
for layer in base_model.layers:
    layer.trainable = False
# create a custom top classifier
x = base_model.output
x = GlobalAveragePooling2D()(x)
x = Dense(516, activation='relu')(x)
#since our problem has 10 differnt animals we have 10 classes
#thus we keep 10 nodes in the last layer
predictions = Dense(10, activation='softmax')(x)
model = Model(inputs=base_model.inputs, outputs=predictions)
model.summary()

model.compile(optimizer="adam", loss="categorical_crossentropy",
metrics=["accuracy"])

generator(
    train_generator,
    steps_per_epoch = train_generator.samples // batch_size,
    validation_data = validation_generator,
    validation_steps = validation_generator.samples // batch_size,
    epochs = nb_epochs)



#Now unfreeze the layers and train the whole model
for layer in base_model.layers:
    layer.trainable = True
history =generator(
    train_generator,
    steps_per_epoch = train_generator.samples // batch_size,
```

```
    validation_data = validation_generator,
    validation_steps = validation_generator.samples // batch_size,
    epochs = nb_epochs)



model.save('path\name of model')
#order of the animals array is important
#animals=["dog", "horse","elephant", "butterfly",  "chicken",  "cat", "cow",
"sheep","spider", "squirrel"]
bio_animals=sorted(os.listdir('/content/raw-img'))
categories = {'cane': 'dog', "cavallo": "horse", "elefante": "elephant", "farfalla":
"butterfly", "gallina": "chicken", "gatto": "cat", "mucca": "cow", "pecora": "sheep",
"scoiattolo": "squirrel","ragno":"spider"}
def recognise(pred):
  animals=[categories.get(item,item)  for item in bio_animals]
  print("The image consist of ",animals[pred])

from tensorflow.keras.preprocessing import image
import numpy as np
img = image.load_img(target_size=(299, 299))
x = image.img_to_array(img)
x = np.expand_dims(x, axis=0)
prediction=model.predict(x)
# prediction

recognise(np.argmax(prediction))

test_data_path="/content/test data/test_animals"
files=sorted(os.listdir(test_data_path))
files=files[1:]
for img in files:
  x=cv2.imread(os.path.join(test_data_path,img))
  cv2_imshow(x)
  recognise(np.argmax(predict[files.index(img)]))
  print("")
```

Output:



GitHub link:

https://github.com/users/Gayathri7890/emails/283528402/confirm_verification/98017478?via_launch_code_email=true

Thank you !