Phase 1 : Problem Definition and Design Thinking

Project title : Machine learning model deployment with IBM Cloud Watson studio.

Problem statement :

Become a wizard of predictive analytics with IBM Cloud Watson Studio. Train machine learning models to predict outcomes in real-time. Deploy the models as web services and integrate them into your applications. Unlock the magic of data-driven insights and make informed decisions like never before!

Problem definition :

The project involves training a machine learning model using IBM Cloud Watson Studio and deploying it as a web service. The goal is to become proficient in predictive analytics by creating a model that can predict outcomes in real-time. The project encompasses defining the predictive use case, selecting a suitable dataset, training a machine learning model, deploying the model as a web service, and integrating it into applications.

Design thinking :

1.Predictive use case :

Description:

Object recognition and classification involve developing a machine learning model that can identify and categorize objects within images. This technology has a wide range of practical applications across various industries, making it a valuable use case for predictive analytics.

Key Components :

- **Data Collection**: Collect a diverse dataset of images containing objects that want to recognise and classify. The dataset includes various angles, lighting conditions, and backgrounds to ensure robust model training.
- **Data Preprocessing**: Prepare the image data by resizing, normalizing, and augmenting it as needed. Data augmentation techniques may include rotation, flipping, and adding noise to increase dataset diversity.
- **Model Selection**: An appropriate deep learning model architecture for object recognition and classification has been chosen. Convolutional Neural Networks (CNNs) are commonly used for this purpose due to their effectiveness in handling image data.
- **Model Training**: The selected model has been trained using the preprocessed dataset. During training, the model learns to identify and classify objects by adjusting its internal parameters.
- **Validation and Evaluation**: The trained model's performance has to be evaluated using a separate validation dataset. Common evaluation metrics include accuracy, precision, recall, F1-score, and confusion matrices.
- **Fine-tuning**: If the initial model performance is not satisfactory, fine-tune the model by adjusting hyper-parameters, changing the model architecture, or increasing training data.

2.Dataset selection :

➢ Data collection for an image dataset with labels is a critical step in building a machine learning model for tasks like image classification or object recognition.

➢ Source of our images to train our model can be obtained from :

- Publicly available datasets: Many datasets are already available for various domains, such as ImageNet for general object recognition or CIFAR-10 for small object recognition.
- Custom image capture: If we need specific images not available elsewhere, we may need to capture them using cameras or smartphones.

3.Model Training:

➢ **Faster R-CNN**: Faster R-CNN is a widely used model for object detection tasks. It combines a Region Proposal Network (RPN) with a CNN for accurate object localisation.

➢ Performing object detection using the Faster R-CNN (Region-based Convolutional Neural Network) model involves several key steps, including setting up the model, preprocessing images, and post-processing the model's output.

4.Model Deployment :

Deploying a trained Faster R-CNN model as a web service on IBM Cloud Watson Studio typically involves the following steps:

1. Prepare the Model
2. Create a Watson Machine Learning (WML) Instance
3. Package Dependencies
4. Deployment Configuration
5. Deploy the Model
6. Endpoint Testing

5.Integration:

The deployed model has to be integrated into web applications or other systems that need to use the object detection service. We can make HTTP requests to the endpoint to get predictions for new images.