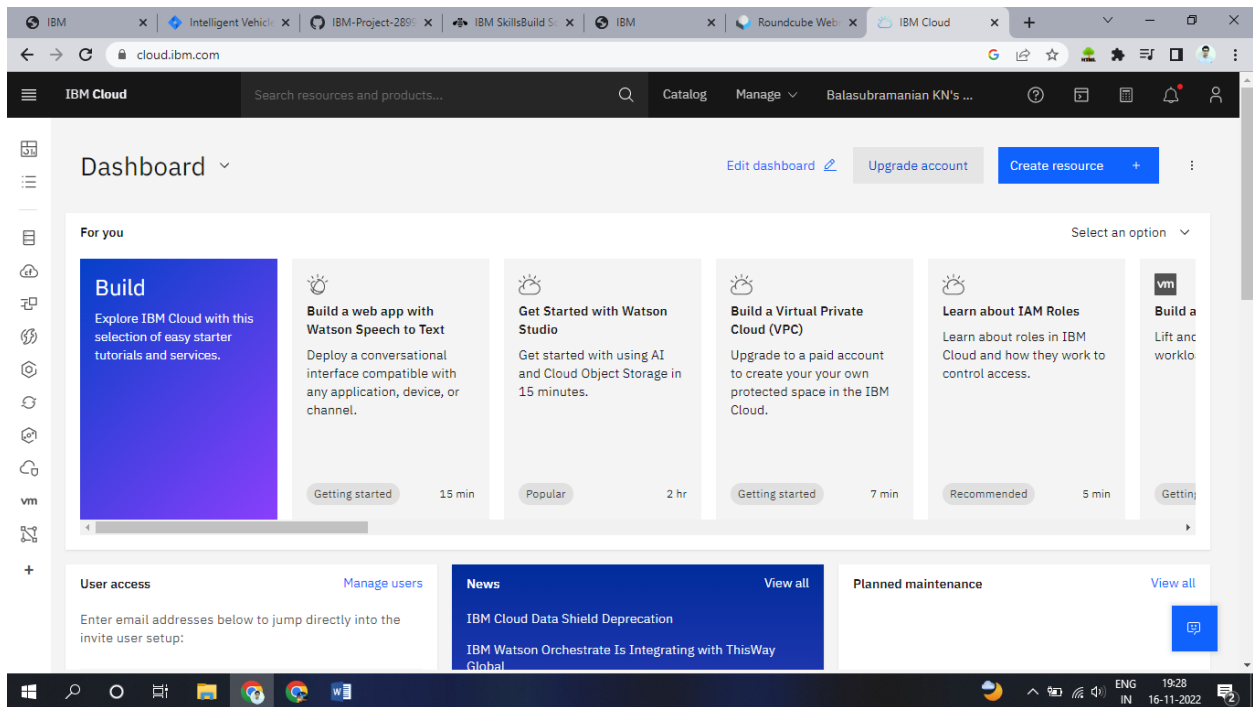


Project Development Phase

Sprint – 4

Train on IBM Cloud

Register for IBM Accounts:



Applying Feature Code:

The screenshot shows the IBM Cloud account settings page. The left sidebar contains navigation links: Account, Account resources, Resource groups, Cloud Foundry orgs, Licenses and entitlements, Tags, Dashboards, Account settings (selected), IBM Cloud Shell settings, Notification distribution list, Classic infrastructure, Subscriptions, Audit log, and Company information. The main content area is titled 'Subscription and feature codes' and includes a description: 'Subscription codes add platform and support credit for your purchased subscriptions. Feature codes unlock additional IBM Cloud capabilities for your account. Each code can be applied only once. [Learn more](#)'. Below this is an 'Apply code' button. A table lists the applied codes:

CODE	DESCRIPTION	STATUS	CREATION DATE
0fd1a8322024a3abc4fb057d4483e191	IBM Academic Initiative	Applied	4/11/2022

Below the table, it states 'Financial Services Validated: Off' and 'Enable your account to use Cloud services designated as IBM Cloud for Financial'.

Watson Studio Creation:

The screenshot shows the IBM Cloud Watson Studio page. The left sidebar contains navigation links: Manage, Plan, and Watson Studio in Cloud Pak for Data. The main content area is titled 'Watson Studio in Cloud Pak for Data' and includes a description: 'Watson Studio is one of the core services in Cloud Pak for Data as a Service. Build, deploy and manage AI models, and optimize decisions on IBM Cloud Pak for Data.' Below this is a 'Launch in IBM Cloud Pak for Data' button. A diagram illustrates the architecture: IBM Watson Studio in Cloud Pak for Data, IBM Cloud Pak for Data Unifying platform, and IBM Cloud Base cloud infrastructure. Below the diagram, it states: 'IBM Watson Studio is part of IBM Cloud Pak for Data and serves as the data science capability of the data fabric architecture.' At the bottom, there are three sections: 'Documentation' (Learn about tools, features, and how to), 'Learning path' (Start a step-by-step tutorial to get up and), and 'Videos' (Watch videos to learn about Watson Studio).

Creation of new Project:

The screenshot shows the IBM Cloud Pak for Data web interface. The browser address bar displays the URL: `dataplatfom.cloud.ibm.com/projects/bc07dfd2-eb07-41eb-8ca3-eae16f1b52e3?context=cpdaas`. The page header includes the IBM Cloud Pak for Data logo, a search bar, and user information for Balasubramanian KN's Account. The main content area is titled "Projects / Insurance_Cost_Estimation" and features a navigation bar with "Overview", "Assets", "Jobs", and "Manage". The "Overview" tab is active, showing a "Resource usage" section with a "0 CUH" value and a "Project history" section with a message: "You created project Insurance_Cost_Estimation Today at 07:47 PM". A "Readme" section is also visible, prompting the user to "Type project notes, reminders, or instructions". The Windows taskbar at the bottom shows the system time as 19:47 on 16-11-2022.

New Asset Creation:

The screenshot displays the IBM Cloud Pak for Data notebook interface. The browser address bar shows the URL: `dataplatfom.cloud.ibm.com/analytics/notebooks/v2/6a54aee6-4991-4512-a8d6-9a2a67d1d443?projectId=bc07dfd2-eb07-41eb-8ca3-eae16f1b52e3&c...`. The page header includes the IBM Cloud Pak for Data logo, a search bar, and user information for Balasubramanian KN's Account. The main content area is titled "Projects / Insurance_Cost_Estimation / damage-area-v2" and features a navigation bar with "File", "Edit", "View", "Insert", "Cell", "Kernel", and "Help". The "File" tab is active, showing a code editor with the following code:

```
In [1]: from tensorflow.keras.layers import Input,Dense,Flatten, Dropout
from tensorflow.keras.models import Model,Sequential
from tensorflow.keras.applications.vgg16 import VGG16,preprocess_input
from matplotlib import pyplot as plt
import numpy as np
from tensorflow.keras.preprocessing import image
from tensorflow.keras.preprocessing.image import ImageDataGenerator
import os
from tensorflow.keras.preprocessing.image import img_to_array
from tensorflow.keras.preprocessing.image import load_img
import cv2
import shutil
import random
```

The code is executed, and the output shows a message: "2022-11-06 15:59:03.753415: I tensorflow/stream_executor/platform/default/dso_loader.cc:49] Successfully opened dynamic library libcudart.so.11.0". Below the code, the "Directory Creation" section is visible, showing the command: `os.mkdir('./body')`. The Windows taskbar at the bottom shows the system time as 20:11 on 16-11-2022.

Working on IBM notebook

```
In [2]: pwd
Out[2]: '/home/wsuser/work'

In [4]: pip install keras
pip install tensorflow

Requirement already satisfied: keras in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (2.2.4)
Requirement already satisfied: h5py in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from keras) (3.2.1)
Requirement already satisfied: scipy<=0.14 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from keras) (1.7.3)
Requirement already satisfied: numpy>=1.9.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from keras) (1.20.3)
Requirement already satisfied: six>=1.9.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from keras) (1.16.0)
Requirement already satisfied: keras-preprocessing>=1.0.5 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from keras) (1.1.2)
Requirement already satisfied: pyyaml in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from keras) (5.4.1)
Requirement already satisfied: keras-applications>=1.0.6 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from keras) (1.0.8)
Requirement already satisfied: tensorflow in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (2.7.2)
Requirement already satisfied: h5py>=2.9.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (3.2.1)
Collecting keras<2.8.0>=2.7.0
```

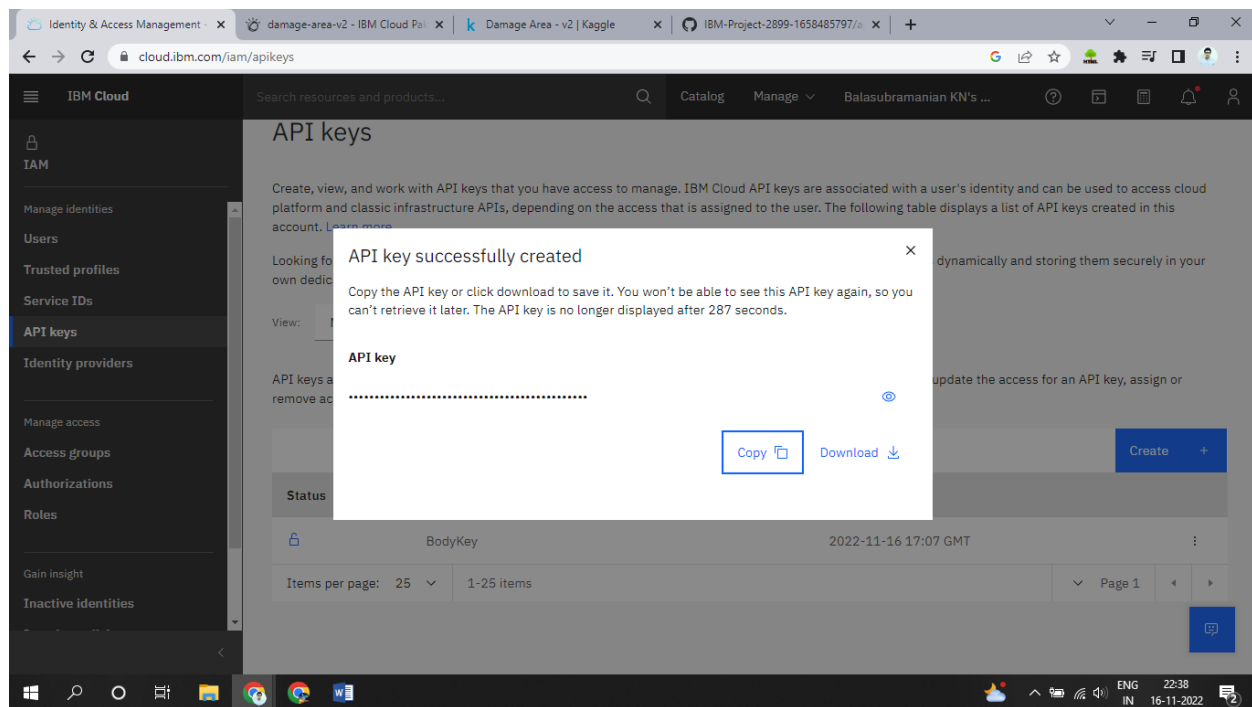
Installing the required packages

```
In [78]: ls -l
body/
'Car damage'/
cost_estimation.tgz
vggmodelfinalbody.h5

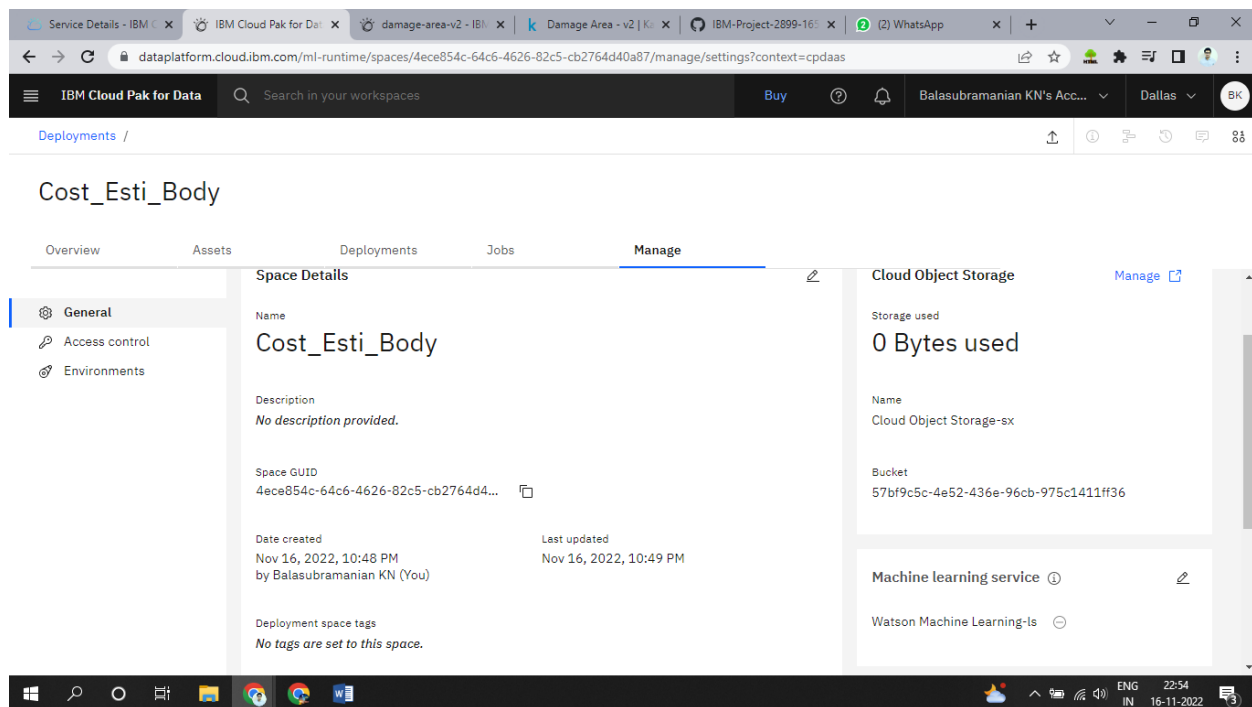
In [77]: tar -zxvf cost_estimation.tgz vggmodelfinalbody.h5
vggmodelfinalbody.h5

In [80]: pip install watson-machine-learning-client --upgrade
Collecting watson-machine-learning-client
  Downloading watson-machine-learning-client-1.0.391-py3-none-any.whl (538 kB)
    538 kB 21.5 MB/s eta 0:00:01
Requirement already satisfied: tqdm in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (4.62.3)
Requirement already satisfied: boto3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (1.18.21)
Requirement already satisfied: pandas in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (1.3.4)
Requirement already satisfied: lomond in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (0.3.3)
Requirement already satisfied: tabulate in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (0.8.9)
```

Creating IAM Access Key



Creating Deployments:



Model Deployed:

The screenshot shows the IBM Cloud Pak for Data interface. The top navigation bar includes the IBM logo, a search bar, and user information. The main content area is titled 'Cost_Esti_Body' and has tabs for Overview, Assets, Deployments, Jobs, and Manage. The 'Assets' tab is selected, showing a list of assets. A sidebar on the left contains a search bar and filters for 'All assets' and 'Asset types' (Models). The main table lists assets with columns for Name and Last modified. One asset is listed: 'CarBody Model' with a last modified time of '7 minutes ago Service'. A right-hand panel contains a file upload instruction: 'Drop files here or browse for files to upload.' and a note: 'Stay on the page until upload completes. Incomplete uploads are cancelled.'

Name	Last modified
CarBody Model	7 minutes ago Service

Model Downloaded:

The screenshot shows the IBM Cloud Pak for Data interface. The top navigation bar includes the IBM logo, a search bar, and user information. The main content area is titled 'Projects / Insurance_Cost_Estimation / damage-area-v2 copy'. The 'Assets' tab is selected, showing a list of assets. A sidebar on the left contains a search bar and filters for 'All assets' and 'Asset types' (Models). The main table lists assets with columns for Name and Last modified. One asset is listed: 'CarBody Model' with a last modified time of '7 minutes ago Service'. A right-hand panel contains a file upload instruction: 'Drop files here or browse for files to upload.' and a note: 'Stay on the page until upload completes. Incomplete uploads are cancelled.'

```
In [14]: model_details = client.repository.store_model(model='cost_estimation.tgz', meta_props={
        client.repository.ModelMetaNames.NAME: "CarBody",
        client.repository.ModelMetaNames.TYPE: "tensorflow_rt2.2",
        client.repository.ModelMetaNames.SOFTWARE_SPEC_UID: software_spec_uid
    })

model_id = client.repository.get_model_uid(model_details)

This method is deprecated, please use get_model_id()

/opt/conda/envs/Python-3.10/lib/python3.10/site-packages/ibm_watson_machine_learning/repository.py:1453: UserWarning: This method is deprecated, please use get_model_id()
warn("This method is deprecated, please use get_model_id()")

In [15]: model_id

Out[15]: '7fa13b12-aa6f-4a27-ae5-39bf495047a1'

In [16]: client.repository.download(model_id, 'body_model.tar.gz')

Successfully saved model content to file: 'body_model.tar.gz'

Out[16]: '/home/wsuser/work/body_model.tar.gz'
```

Model Testing

Testing:

The screenshot shows the IBM Cloud Pak for Data notebook interface. The browser tabs include WhatsApp, Service Details - IBM Cloud, IBM Cloud Pak for Data, damage-area-v2 copy - IBM, and IBM. The URL is `datapatform.cloud.ibm.com/analitics/notebooks/v2/Ba8bb99d-f493-4cc1-8036-fe023c5fc822?projectId=bc07dfd2-eb...`. The notebook title is "Insurance_Cost_Estimation / damage-area-v2 copy". The code in the cell is as follows:

```
from tensorflow.keras.preprocessing import image

In [28]: model = load_model('vggmodelfinalbody.h5')

In [31]: import os, types
import pandas as pd
from boto3.client import Config
import boto3

def __iter__(self): return 0

# @hidden_cell
# The following code accesses a file in your IBM Cloud Object Storage. It includes your credentials.
# You might want to remove those credentials before you share the notebook.
cos_client = boto3.client(service_name='s3',
    ibm_api_key_id='iysnhdHfYvugfK4P4T34gy5msZruELT_ckuHJL3ONt0t',
    ibm_auth_endpoint='https://iam.cloud.ibm.com/oidc/token',
    config=Config(signature_version='oauth'),
    endpoint_url='https://s3.private.us.cloud-object-storage.appdomain.cloud')

bucket = 'insurancecostestimation-donotdelete-pr-jrc2okoxtnzju1'
object_key = 't1.jpg'

streaming_body_3 = cos_client.get_object(Bucket=bucket, Key=object_key)['Body']

# Your data file was loaded into a boto3.response.StreamingBody object.
# Please read the documentation of boto3 and pandas to learn more about the possibilities to load the data.
# boto3 documentation: https://boto3.amazonaws.com/v1/documentation/api/latest/guide/quickstart.html#python
# pandas documentation: http://pandas.pydata.org/
img = image.load_img(BytesIO(streaming_body_3.read()), target_size=(224,224))
```

The right sidebar shows a list of files: "upload.", "Car damage-202...TO90419Z-001.zip", "bodyh5.zip", "t1.jpg", and "vggmodelfinalbody.h5", each with an "Insert to code" button. The bottom status bar shows "ENG IN 23:38 17-11-2022".

The screenshot shows the same IBM Cloud Pak for Data notebook interface. The code in the cell is as follows:

```
In [32]: import numpy as np
x = image.img_to_array(img)
np.expand_dims(x,axis=0)

Out[32]: array([[[[198., 201., 232.],
[186., 187., 217.],
[199., 199., 225.],
...,
[ 90., 112., 126.],
[ 90., 112., 126.],
[ 89., 111., 125.]],

[[198., 201., 232.],
[186., 187., 217.],
[199., 199., 225.],
...,
[ 90., 112., 126.],
[ 90., 112., 126.],
[ 89., 111., 125.]],

[[188., 192., 221.],
[203., 204., 232.],
[203., 201., 225.],
...,
[ 93., 115., 128.],
[ 92., 114., 127.],
[ 92., 114., 127.]],

...,

[[ 25.,  25.,  25.],
[ 27.,  27.,  27.],
[ 24.,  24.,  24.]]]])
```

The right sidebar shows the same list of files as the previous screenshot. The bottom status bar shows "ENG IN 23:38 17-11-2022".

WhatsApp | Service Details - IBM Cloud | IBM Cloud Pak for Data | damage-area-v2 copy - IBM | IBM

datapatform.cloud.ibm.com/analitics/notebooks/v2/8a8bb99d-f493-4cc1-8036-fe023c5fc822?projectid=bc07dfd2-eb07-41eb-8ca3-eae16f1b52e3...

IBM Cloud Pak for Data | Search in your workspaces | Buy | Balasubramanian KN's Acc... | Dallas | BK

Projects / Insurance_Cost_Estimation / damage-area-v2 copy

File Edit View Insert Cell Kernel Help | Not Trusted | Python 3.10

Run | Format Code

```
[ 10., 10., 10.],
[ 12., 12., 12.]],

[[ 24., 26., 25.],
[ 23., 25., 24.],
[ 26., 26., 26.],
...,
[ 14., 14., 14.],
[ 17., 17., 17.],
[ 18., 18., 18.]],

[[ 24., 26., 25.],
[ 23., 25., 24.],
[ 26., 26., 26.],
...,
[ 14., 14., 14.],
[ 17., 17., 17.],
[ 18., 18., 18.]]], dtype=float32)

In [37]: import cv2
x = cv2.resize(x,(224,224)) # resize image to match model's expected sizing
x = x.reshape(1,224,224,3)
pred1 = model.predict(x)
pred1 = np.argmax(pred1,axis=1)

1/1 [=====] - 0s 376ms/step

In [39]: index = ['front','rear','side']
index[pred1[0]]

Out[39]: 'side'
```

Data

Files Connections

upload.

Car damage-202...T090419Z-001.zip
Insert to code

bodyh5.zip
Insert to code

t1.jpg
Insert to code

vggmodelfinalbody.h5
Insert to code

Windows | Taskbar | ENG IN | 23:39 | 17-11-2022