DATA ANALYTICS FOR DHL LOGISTICS

NALAIYA THIRAN PROJECT BASED LEARNING

On

PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

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A PROJECT REPORT

November 2022

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CHAPTER-1
INTRODUCTION

1.1 Project Overview

DHL Logistics Facilities is concerned with getting the products and services where they are needed and when they are desiredwith the help of Data Analytics. It is difficult to accomplish any marketing or manufacturing without logistical support. It involves the integration of information, transportation, inventory, warehousing, material handling, and packaging. The operating responsibility of logistics is the geographical repositioning of raw materials, work in process, and finished inventories where required at the lowest cost possible. Logistics is practicedfor ages since organized activitybegan. Without logistics support no activitycan be performed to meet defined goal. The current challenge is to perform logistics scientifically in order to optimize benefits to the organization. Logistics is a planning function of management. Logistics function is concerned with taking products and services where they are needed and when they are needed. Logistics is being transformed through the power of data-driven insights. Thanks to the vast degree of digital transformation and the Internet of Things, unprecedented amounts of data can be captured from various supply chain sources.Capitalizing on its value offers massive potential to increase operational efficiency, improve customer experience, reduce risk, and create new business models.Real-time process optimization and simulation are becoming increasingly important tools for supply chainmanagement. As worldwide complexity grows, the abilityto run global supply chainsat peak efficiency becomes more and more challenging.

Warehouse operators and supply chain managerscan make better decisions with granular visibility of processes like order management, and inventory levels and resourceutilization become transparent in live dashboards. we understand that dynamic technology markets demand dynamic solutions. So we seek strong partnerships with every customer, envisaging and creating the connections to achieve business success. You can rely on our unrivalled global reach, experience and engagement. We'll help you to imagine and enable new approaches and solutions. Together we will push the pace of change. And always we will enrich your experience with our industry- leading logistics services.

1.2 Purpose

The DHL family of specialized Business Units offers an unrivalled portfolio of logistics products and solutions ranging from domestic and international parcel delivery to international express, road, air and ocean freight to end-to-end supply chain management.

As a logistics company, we are the backbone of trading by providing everything that needs to be delivered. We not only deliver packages: we deliver prosperity, transport health, feed development and bring joy. Every day we connect people to improve their lives.

In the Supply Chain business, DHL Supply Chain provides customers in many industry sectors with logistics services along the entire supply chain – from planning, sourcing, production, storage and delivery to returns logistics and value-added services – in order to ensure logistics flow.

It is the physical movement of goods from one point to another, such as the moving merchandise from the warehouse to the customer. The shipping process follows the manufacturing and the packing of goods and is controlled and overseen by a shipping or logistics company.

CHAPTER-2
LITERATURE SURVEY

2.1 Existing Problem

DHL is a global expertisein express, air and ocean freight, overlandtransport and logisticssolutions; DHL combinesworldwide coverage with an in-depthunderstanding of local markets. DHL India has an outstanding reputation in the market for providing a reliable, fast and easy-to-use service. DHL offers Highly trainedand professional staff,committed to being responsive to all customers' needs Customer Service Agents, available round-the-clock, 365 days of the year, to serve customers whenever and wherever they need them. Electronic pre-clearance of shipments throughCustoms Five international gateways proving direct-to-air networks and faster sorting of inbound and outbound shipments.

DHL India is a proven facilitator of trade, across the globe. His strength lies in our global networkand the know-how of our people. Backedby strategic alliances with world-class partners and the innovative use of technology, they strive to continuously improve the quality of our service. Our services range from fast, responsive and cost-effective expressdeliveries toe-commerce fulfillment and intelligent logisticssolutions. DHL Core Services consistof door-to-door air express delivery of documents and parcels of all sizes (and weight), both into and out of thecountry.
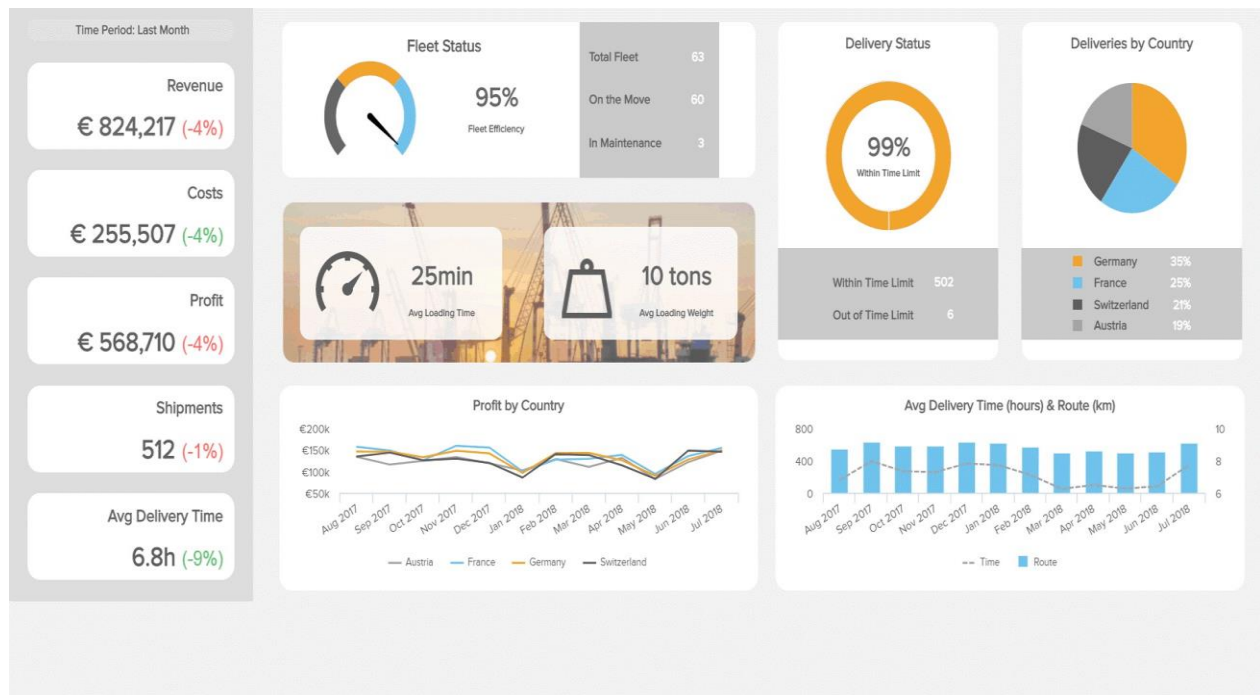
Other value-added services are a. Kitting/Pre-Assembling

Kitting is the addition of items such as accessories and batteries to the productpack. Pre-assembling is completion of a finished product from component parts or pre-programming of products. b. Re-Working/Re-Packing

Repacking for a specific customer can include repalletization. Reworking is the modification of products to suit a local market. c. Packaging/Bundling

Packaging includes packingof products into suitable mediafor transportation and retail display. Bundling is the assembly of a number of pre-packaged productsto make up an integrated product offering d. QA Control

Quality control ensures that product is received into and dispatched from the warehouse in a suitablecondition, free from faults and defects. e. Labeling/Merchandising.

DISADVANTAGES OF EXISTINGSYSTEM

1. Logistics industryrequires huge investment to set up operations and grows. DHL also require heavy investment to grow its business and to generate return on investment.

2. DHL is expected to act in compliance with regulatory guidelines and local authorities. Regulations can be different in the source and destination locations, and so it can be impossible to obey different rules.

3. Logistic Market is filled with many local and international players and the market growth is distributed among all the players and due to high pricing strategy DHL market share is restricted in developed and developingeconomies.

4. Due to a very large market and a large network of delivery partners are required. DHL also depends on small and local entities for delivery. And this has a directinfluence on DHL efficacy, and so teamworkbecomes verynecessary.

5. DHL has less marketing cost as compared to FedEx or UPS and does not spend much on advertisement and branding practices. This impacts the success and recognition of brands.

2.2 References

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2.3 Problem Statement Defination

DHL is an international umbrella brand and trademark for the courier, package delivery, and express mail service which is a division of the German logistics firm Deutsche Post. The company group delivers over 1.6 billion parcels per year.

The company DHL itself was founded in San Francisco, USA, in 1969 and expanded its service throughout the world by the late 1970s. In 1979, under the name of DHL Air Cargo, the company entered the Hawaiian Islands with an inter-island cargo service using two DC-3 and four DC-6 aircraft. Adrian Dalsey and Larry Hillblom personally oversaw the daily operations until its eventual bankruptcy closed the doors in 1983. At its peak, DHL Air Cargo employed just over 100 workers, management, and pilots.

Logistics is being transformed through the power of data-driven insights. Thanks to the vast degree of digital transformation and the Internet of Things, unprecedented amounts of data can be captured from various supply chain sources. Capitalizing on its value offers massive potential to increase operational efficiency, improve customer experience, reduce risk, and create new business models.

CHAPTER-3
IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solutionrequires understanding the true problemand the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with hisor her goals and challenges.
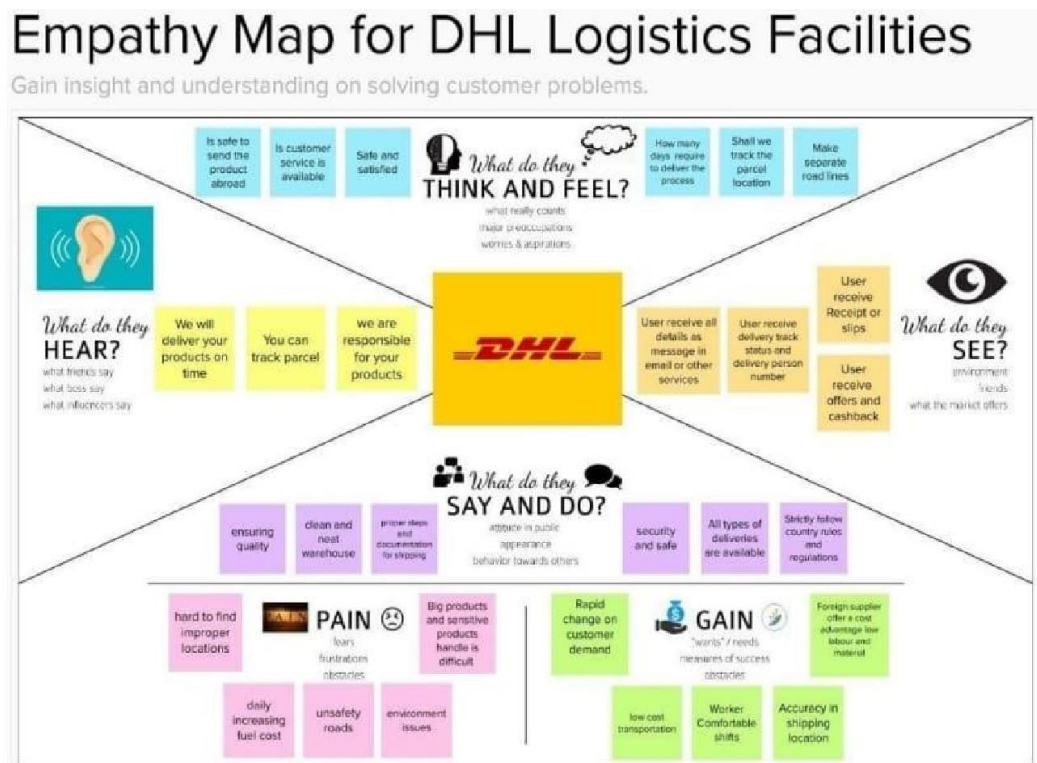
3.2 Ideation & Brainstorming

Brainstorm & Idea Prioritization Template

Brainstorming provides a free and open environment that encourages everyone within a teamto participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants areencouraged to collaborate, helping each other develop a rich amount of creativesolutions.

Use this template in your own brainstorming sessions so your team can unleash theirimagination and start shaping concepts even if you're not sitting in the same room.

Step-1:Team Gathering, Collaboration and Select the Problem Statement

Step-2: Idea Prioritization

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

⏱ **20 minutes**

Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

- What Do Belive
- Make a separate Roadline
- Ensuring Quality
- Door Step Delivery
- Shall we Track Parcel Current Location
- Deliver Your Product ON Time
- World-class shipping services
- Safe and satisfaction
- Provide All Type of Employer
- Fair Responsible for logistics
- Demand Fluctuation
- Pollution of Environment

⚑

Feasibility

Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

A **Share the mural**
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

B **Export the mural**
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.
Open the template →

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template →

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template →

▣ Share template feedback

3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	A company's profitability may be severely impacted by continually shifting dynamics brought about by the global natureof the supplychain. The enormous burdenthat the COVID pandemic placed on logistics made thisclear. As a result, manufacturers, shippers, andretailers are using data analytics to better understand their processes and optimise themin order to be more prepared for unforeseen events. Data-driven businesses are growing their profit margins and customer satisfactionlevels asa result.

2.	Idea / Solution description	New technology plays a vital part in improving operations, removing costs and improving customer service. With DHL you like technologyadvances and investments as we constantly review, evaluate and adoptnew technological solutions. Augmented Reality , for instance, is already getting used to optimize warehouse processes, while a spread of automated guided vehiclesand robots are being testedand assessed for future deployment.

3.	Social Impact / Customer Satisfaction	Customers want to understand when their items are delivered and whether a package's expected arrival date are later than expected. Customers are often happieras they get more knowledgeable. Real-time or nearly real-time status updates are now possible, and businessesthat make it simple for purchasers to urge theselogistics updates will enjoy higher customer satisfaction. Additionally, data can improve customer satisfaction in ways asidefrom just

		shipping monitoring.
4.	BusinessModel (Revenue Model)	1 – Broker modelThis is the most common way 3PL works, and theone most organizations are probably familiar with. In the broker model, a 3PL buys cargo space in bulk from carriers and resells the space to its own customers at a premium. Oversized, his 3PL can afford to purchase large amounts of cargo space without delay, and can take advantage of economies of scale to significantly reduce costs. Even with a premium, they're still dealing with less than mostsole proprietors could die for outright. 2 – Profit sharing With a profit-sharing model , 3PL works directly with customers to reduce costs. 3 – Fee model In the commission model , the 3PL"works" for the carrier and acts as an intermediary between the carrier and the buyer. From there, it works like some standardcommission-based

		system. Fee models offer a lot of transparency within the process, and in many cases 3PLs can rely on carrier proprietarytechnology, whichrarely leads to the most effective technical solutions.

3.4 Problem Solution Fit

Project Title: Data Analytics for DHL Logistics Facilities

Team ID: PNT2022TMID10429

1. CUSTOMER (CS)	6. CUSTOMER (L)	5. AVAILABLE (AS)
Our customers are mostly middle-class parents and people living in different environment.	The main constraint is MONEY. We need of a huge investment to process logistics. Another constraint is the customer changes.	1. Transport - When consumer is at long distance our tranport solution may be ofuse. 2. Warehouse - Storing of products is main problem. So, our warehousing solution solves that problem.

Define CS, fit into CC   **Explore AS, differentiate**

2. JOBS-TO-BE-DONE / PROBLEMS (J&P)	9. PROBLEM ROOT CAUSE (RC)	7. BEHAVIOUR (BE)
1. Frequent changing of their changes	Many customers alter their changes in different products.	They need to be constant at their decisions

Focus on J&P, tap into BE,   **Focus on J&P, tap into BE,**

3. TRIGGERS	10. YOUR SOLUTION	8. CHANNELS of BEHAVIOUR
Due to the various changes made in the environment it triggers the customers to act.	The main and foremost solution in a DHL logistics is to build the customer trust about their product, process and infrastructure. Because a good atmosphere will definitely develop a good and trustworthy relationships between customer and supplier.	**8.1 ONLINE** Customers mostly verify their dealers before making a final change. They visit some websites about their dealers. **8.2 OFFLINE** To verify about their dealers, they will see if their neighbors has done the same action and they will know what is their confident level.

4. EMOTIONS: BEFORE / AFTER (EM)
Definitely customers will feel a lack of confidence and trust before acting upon their will. But after they see it with their own eyes they will start to trust and their confidence level will get increased.

Identify strong TM & ER

CHAPTER-4
REQUIREMENT ANALYSIS

4.1 Functional Requirements

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story/ Sub-Task)
FR-1	User Registration	Registration throughany google account or social media accounts.
FR-2	User Confirmation	Confirmation via Email Confirmation viaOTP
FR-3	Dataset	The DHL_Facilities.csv recordare collected as a dataset andupload to Cognosanalytics
FR-4	Prepare/Analyse	The dataset is moved aroundtoprepare and analyse usingCognos
FR-5	Exploration	The dataare explored usinglogistics dataset byCognos
FR-6	Dashboard	The Prepared and Explored data are Visualize and created in different typeof dashboards. i.e.,charts, graphs, tree,reports, summary, etc..

4.2 Non-Functional Requirements

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	No priorexperience required to use the dashboard. Peoplewith basic understandingcan use the system.
NFR-2	**Security**	Only registered user can use this application.
NFR-3	**Reliability**	The Analytics system ensures the reliability
NFR-4	**Performance**	Gets updated regularly to improve the performance of the application.
NFR-5	**Availability**	The availability of dataset mustbe constrained for accurate data
NFR-6	**Scalability**	Any kind of datacan be explored and thesystem is quiet expandable

CHAPTER-5
PROJECT DESIGN

5.1 Data Flow Diagram

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the rightamount of the system requirement graphically. It shows how data enters andleaves the system, what changes the information, and wheredata is stored.
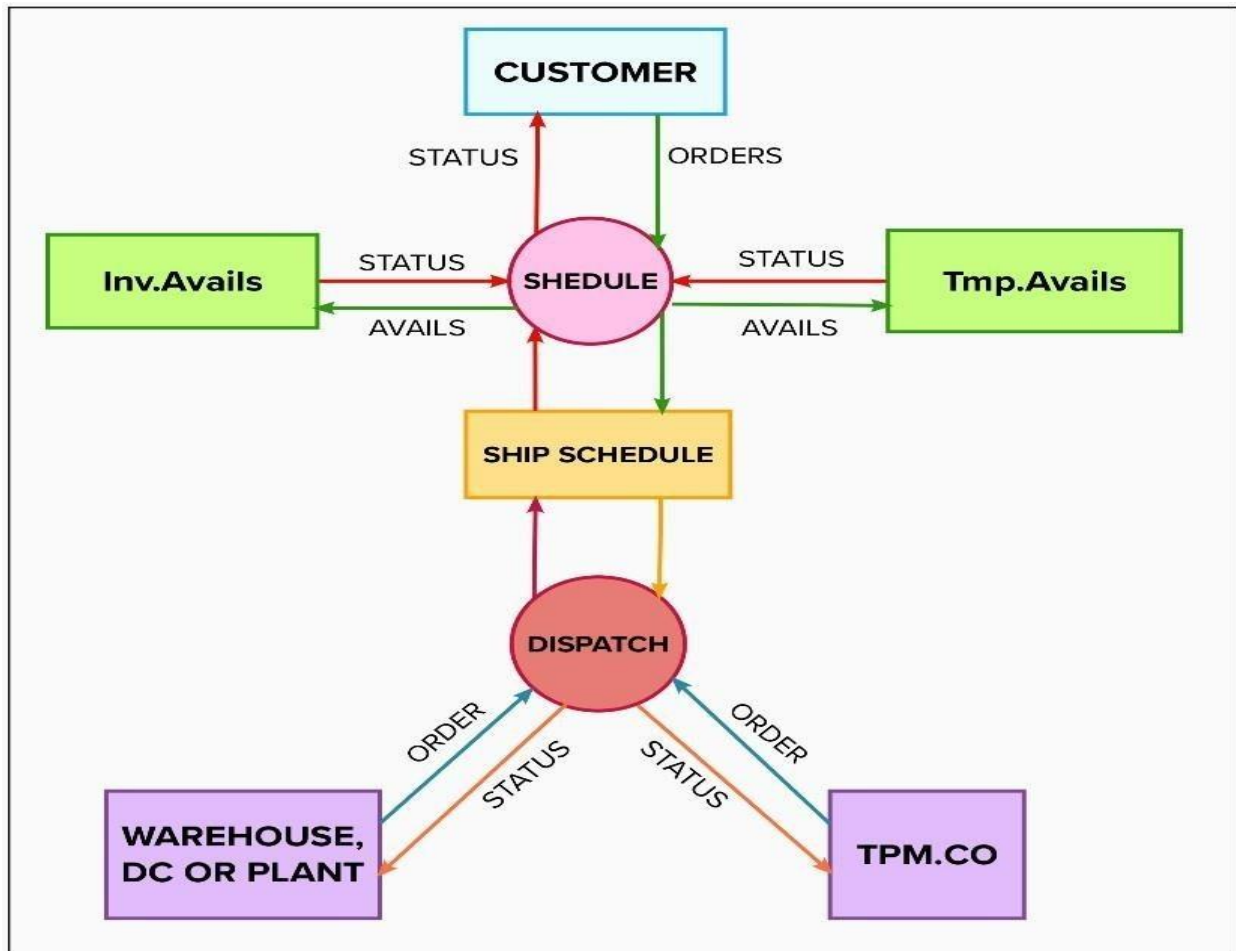
5.2 Solution & Technical Architecture

A Solution architecture (SA) is an architectural description of a specific solution. SAs combine guidancefrom different enterprise architecture viewpoints (business, information and technical), as well as from the enterprise solution architecture (ESA). Ultimately, solutionarchitecture is aimed at the following overarching goals:

i. Streamlining of day-to-day activities
ii. Providing a more efficientproduction environment
iii. Lowering costs and gainingcost-effectiveness
iv. Providing a secure, stable,and supportable environment

Project - Data Analyticsfor DHL Logistics Facilities- Solution ArchitectureDiagram
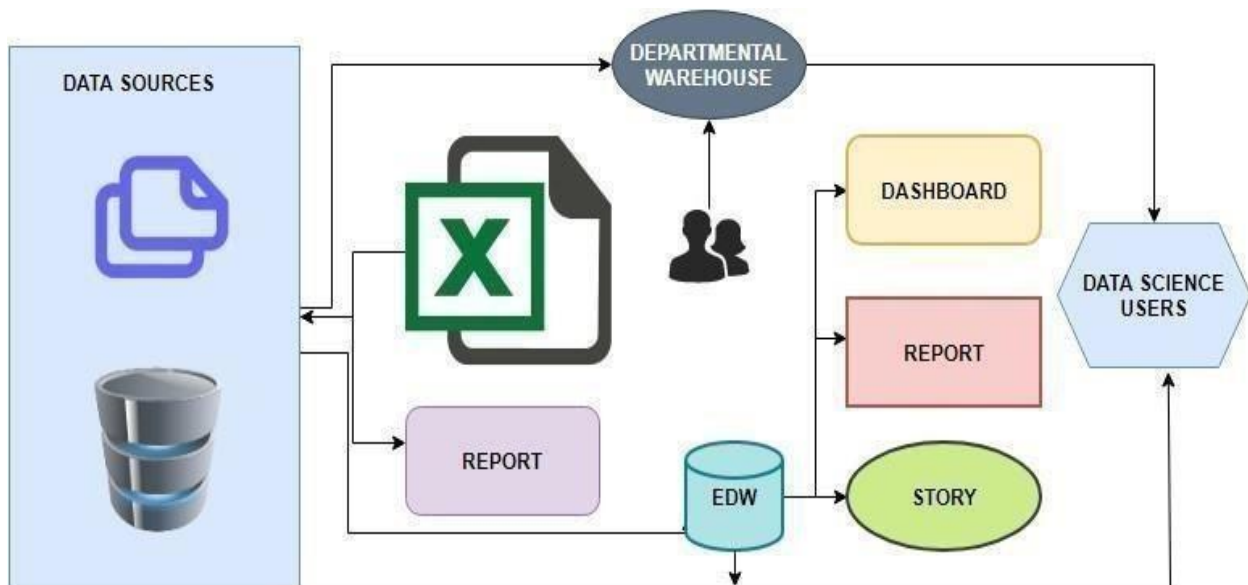
Technical Architecture
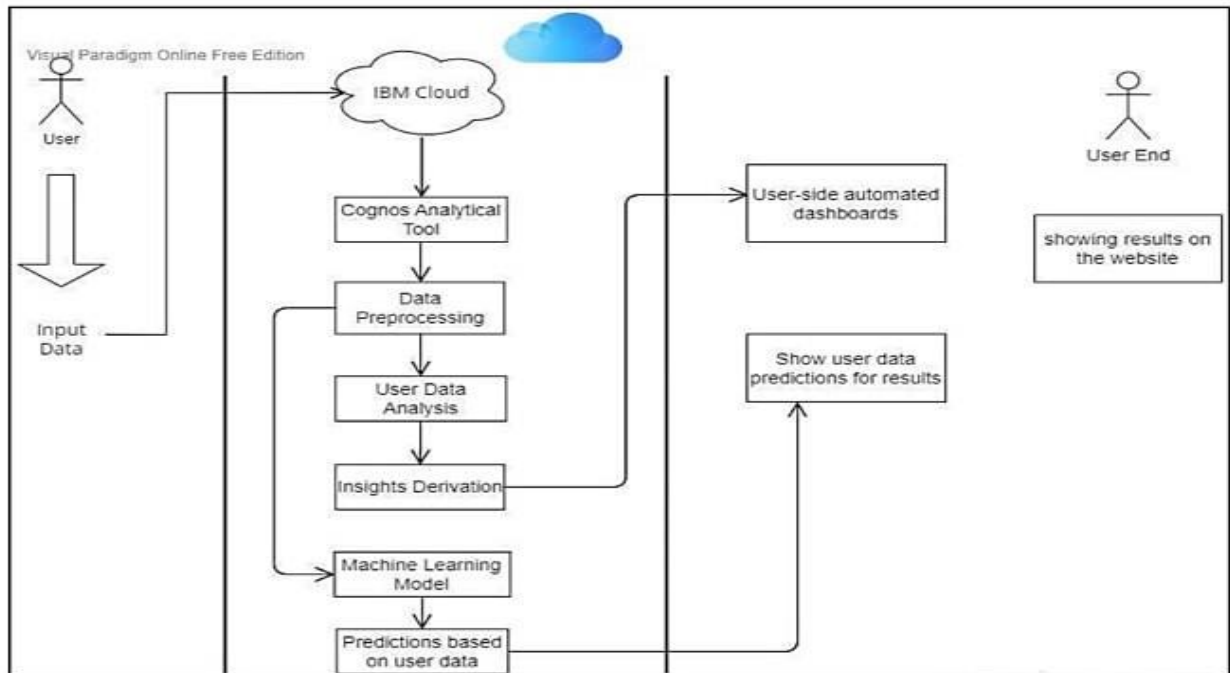
5.3 User Stories

Use the below templateto list all the user stories for the product

User Type	Functional Requireme nt (Epic)	User StoryNu mber	User Story/ Task	Acceptance criteria	Priori ty	Relea se
Customer	Registration	USN-1	As a user, I can register for the application byentering my email, password, and confirming my	I can access my account / dashboard	High	Sprint-1

			password.			
		USN-2	As a user,I will receive confirmation email onceIhave registered for the application	I can receive confirmati onemail & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the applicationt hrough Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the applicationt hrough Gmail	I can register &access the dashboard withGmail Login	Medi um	Sprint-1
	Login	USN-5	As a user,I can log into the application byentering email& password	I can login into the application with Gmaillogin	High	Sprint-1
	Dashboard	USN-6	As a user I can use the methods provided in theDashboard.	I can accessthe dashboard with various methods	High	Sprint-2

Customer CareExecutive	Login	USN-7	As a Customer Care Executive, I can log into the application by entering my Executive emailId & password	I can login with my credentials	Medium	Sprint-1
	Service	USN-8	As a Customer CareExecutive, I canansweruser's queries	I can give thesolutions to theuser's queries	High	Sprint-3
Administrator	Login	USN-9	As an Administration, I can log into the application by entering my Administer emailId & password	I can login with my credentials	High	Sprint-1
	Access	USN-10	As an admin, I can makechanges to theinterface accordi	I have a full accessto the application	High	Sprint-3

			ng thenee ds			
Custo merto ols	Tools	USN-11	I can perform analysis by tools (Cognos andwith ML)	I have an ease of Acce ssi ng tool s.	High	Sprint 1

CHAPTER-6
PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login	USN-1	As a user, I can register & log into the application by entering email& password	10	High	S.V.Balaji
Sprint-1	Verify	USN-2	As a user, I can verify the email with given otp andcheck for correct subscription access	10	High	P.Naveen
Sprint-2	Collect Data	USN-3	As an admin I can define questions & goals thencollect data &provide the dataset in IBMCognos analytics	10	High	N.Aneel

Sprint		USN				
Sprint-2	Prepare &Explore	USN-4	As an adminI can prepare, explore & present thedataset in IBM Cognosanalytics	10	High	N.Jagadeesh
Sprint-3	Analyze	USN-5	As an admin, I will analyze the given dataset (Data pre-processing)	10	High	S.V.Balaji
Sprint-3	Predict	USN-6	As an admin, I will predict the length ofstay (Prediction)	10	High	P.Naveen
Sprint-4	Visualization	USN-7	As a user, I can select the visualization type likeReport, Dashboard and story (Creating visualization)	7	Medium	N.Aneel

Sprint-4	Dashboard	USN-8	As a user, I can upload the datasets to the dashboard and view visualizations	8	High	N.Jagadeesh
Sprint-4	Communicate	USN-9	As an admin, I can communicate to the client foruser queries and visualize the best dashboards in any platform as a userexpected	5	Low	S.V.Balaji

6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct	05 Nov 2022	20	05 Nov 2022

			2022			
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

we have a 6-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iterationunit (story points per day).

$$AV = \text{Sprint duration} / \text{Velocity} = 20/6 = 3.33$$

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any projectcontaining measurable progress over time.

6.3 Reports From JIRA

Sprints

DAFDLF Sprint 2

> ⚡ ~~DAFDLF-1~~ LOGIN — DONE

t @ VERIFY — DONE

› @ - COLLECT DATA — DONE

s @ PREPARE & EXPLORE — DONE

Data Anal/tcsIgrDHL..,

Projects / Data Analgiu for DHL fog's its Facilibes

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l{j BOad

Reports

Issues

y Code

DAFDLF Sprint 3 7 Nov – 12 Nov (2 issues) — 0 20 0 Complete sprint

g DAfDLf 9 As zn Admin. I •iii aralyc the **given data** et (Data qre-proceisingl wnz. — 10 IN PROGRESS ⌄ S

0 DAfOLP 0 Asaoadminlñttpedcttfielengttofsay(Sedmco FNDKi — 10 IN PROGRESS ⌄ K

Data Analytics for DHL...
Software project

Roadmap

Backlog

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g6CltI0g

Q | K SR SK S | Epic ⌄ — Insights

+ Create issue

DAFDLF Sprint 4 14 Nov – 19 Nov (3 issues) — 20 Com#de;pdft

0 DAFDLF-\3 As an admin, I can communicate to the cli t and visualize the best dashboards in any platfom as a usei expected. conuuñzarr — TO DO ⌄ SR

‹/› Code

0 DAFDLF-JS H a user. I can upload Me dataset to the dashboard and yw visual o«s oxsmazeo — TO DO ⌄ SK

Complete sprint

Roadmap

Backlog

Board

Reports

Epic ∨   Sprint ∨

As an admin, I can communicate to the client and visualize the

As an admin, I will analyze the given dataset (Data pre-

As a user, I can register & log into the application by entering

datasets to the dashboard and

IBM Cognos analytics

As a user, I en uplaad the datasets to the dashboard and view visualisations

questions Bgoals then collect data BIprovide the daBset in IBM Eognos analyfio

COLLECT DATA

QDAf01f-6   ✓ 10 SR

As an admin I can prepare, explore k proent tle dataset in IBM Cognos analytics,

› ⚡ c.Af0Lf 1° L0GIh   DONE

› ⚡ DAfLLf-4 VERIFY   DONE

› $$ COLLECT DATA   Dgw5

T @   PREPARE 8 EXPLORE DONE

› $$ DAf0Lf-1\ ANALYZE

^ @ DA^0Lf-12 PREDICT

› ⚡ DAFDLf-16 VISUALIZATION

› $g D IT-j7 DÉSHBOARO

@ DAFOLf-19 COMMUNICATE

CHAPTER-7
CODING & SOLUTIONING

7.1 Feature 1

RELATIONSHIPS BY OBJECT ID

SUMMARY BY STATE

SUMMARY BY CITY

7.2 Feature 2

<u>EXPORT THE ANALYTICS</u>

Finally, it's to share your work eitherthrough email or embedded toweb or pdf to Showcase your work to other.
See the belowsnapshots for understanding about sharing the work as pdf doc.

Building PDF...   Cancel

7.3 Database Schema

Test Data Images

```
In [ ]:  sign_img = cv2.imread(test_data_path+'S/S_15.jpeg')
         display(sign_img,'S')
```

```
In [ ]:  sign_img = cv2.imread(test_data_path+'Z/Z_1.jpeg')
         display(sign_img,'Z')
```

```
In [ ]:  sign_img = cv2.imread(test_data_path+'7/7_8.jpeg')
         display(sign_img,'7')
```

AUGMENTATION AND PREPROCESSING THE DATASET

Creating ImageDataGenerator

```
In [ ]:  image_gen = ImageDataGenerator(rotation_range=30,
                                        width_shift_range=0.1,
                                        height_shift_range=0.1,
                                        shear_range=0.2,
                                        zoom_range=0.2,
                                        rescale=1/255,
                                        horizontal_flip=True,
                                        fill_mode='nearest',
                                        validation_split=0.25)
```
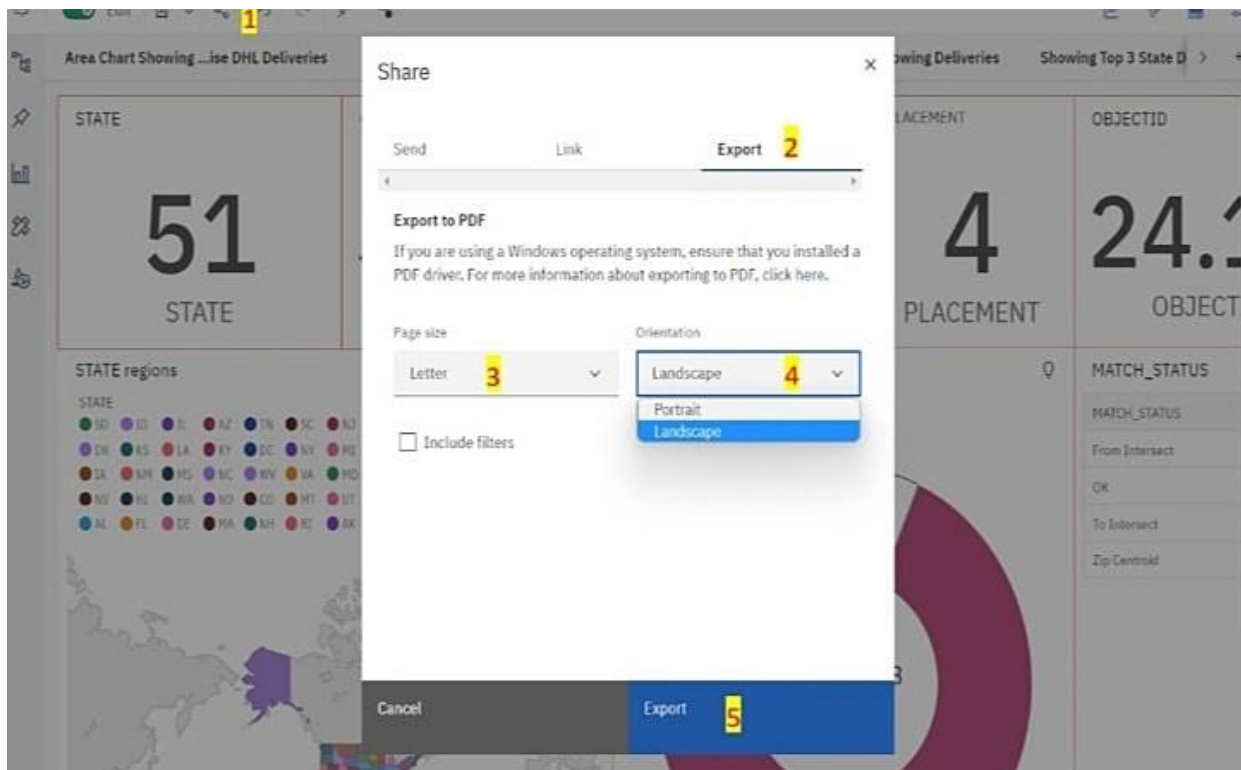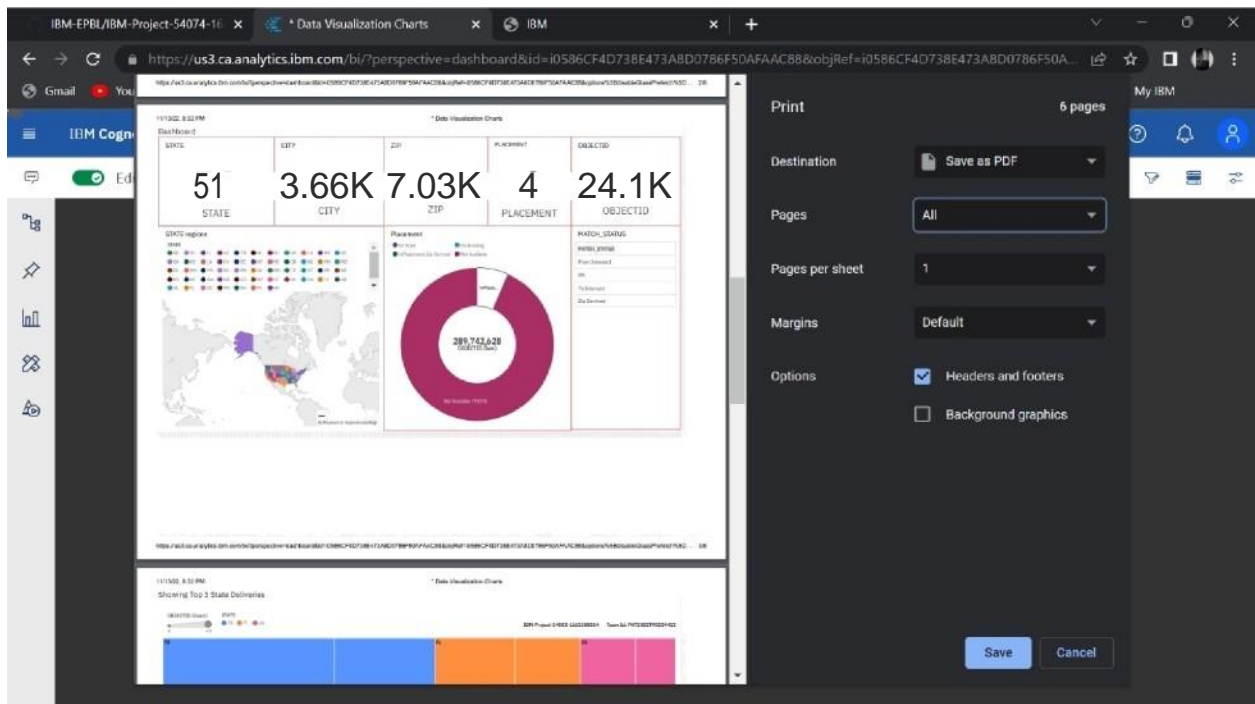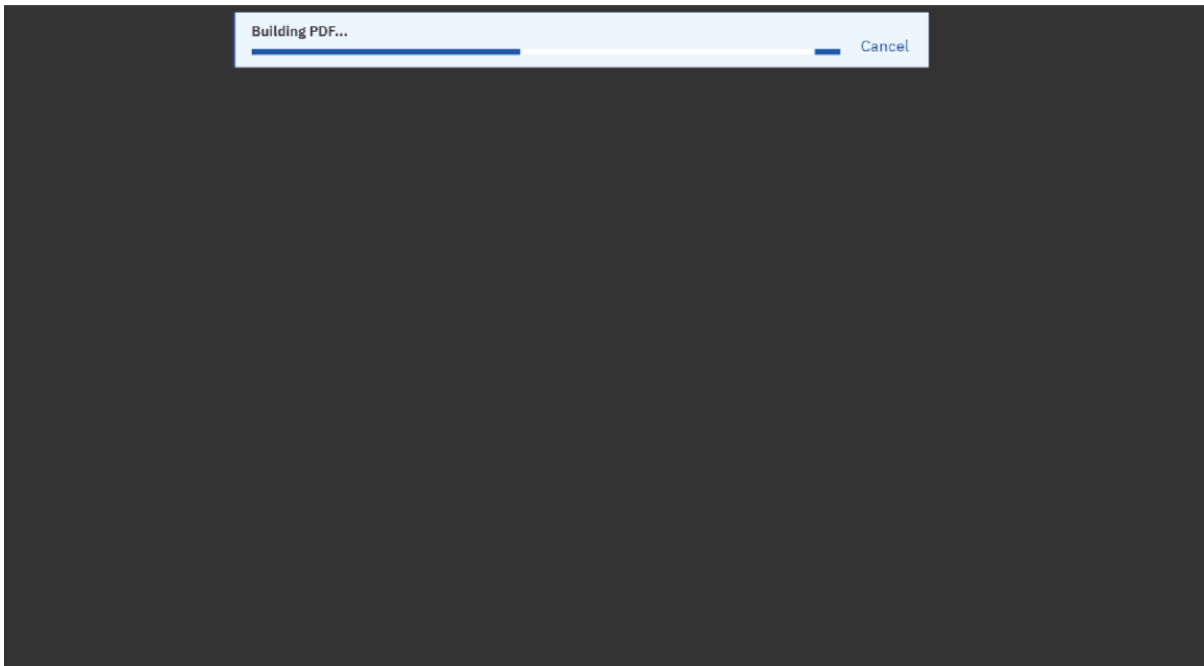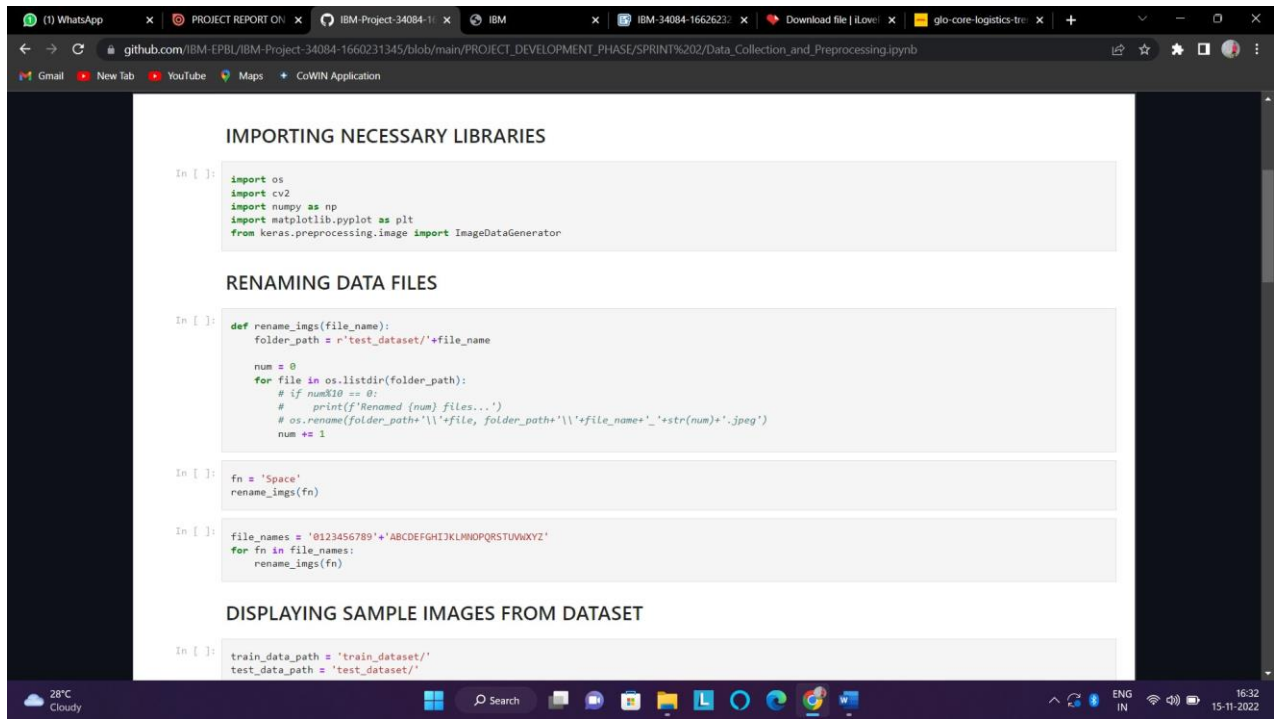
Original Image

```
In [ ]:  sign_img = cv2.imread(train_data_path+'3/3_100.jpeg')
         display(sign_img,'3')
```

Augmented Images

```
In [ ]:  display(image_gen.random_transform(sign_img))
```

```
In [ ]:  display(image_gen.random_transform(sign_img))
```

SPLITTING INTO TRAIN AND VALIDATION DATASET

Train Data Generator

```
In [ ]:  train_data_gen = image_gen.flow_from_directory(train_data_path,
                                        target_size=(250,250),
                                        batch_size=16,
                                        shuffle=True,
                                        class_mode='binary',
                                        subset='training')
```

Validation Data Generator

```
In [ ]:  validation_data_gen = image_gen.flow_from_directory(train_data_path,
                                        target_size=(250,250),
                                        batch_size=16,
                                        shuffle=True,
                                        class_mode='binary',
                                        subset='validation')
```

Test Data Generator

```
In [ ]:  test_data_gen = image_gen.flow_from_directory(test_data_path,
                                        target_size=(250,250),
                                        batch_size=8,
```

```
In [ ]:  validation_data_gen = image_gen.flow_from_directory(train_data_path,
                                                            target_size=(250,250),
                                                            batch_size=16,
                                                            shuffle=True,
                                                            class_mode='binary',
                                                            subset='validation')
```

Test Data Generator

```
In [ ]:  test_data_gen = image_gen.flow_from_directory(test_data_path,
                                                      target_size=(250,250),
                                                      batch_size=8,
                                                      shuffle=True,
                                                      class_mode='categorical',
                                                      )
```

```
In [ ]:  train_data_gen.class_indices
```

```
In [ ]:  test_data_gen.classes
```

```
In [ ]:  len(train_data_gen.classes)
```

```
In [ ]:  len(test_data_gen.classes)
```

CHAPTER-8
TESTING

8.1 Test Cases

8.2 User Acceptance Testing

Testing

Import The Required Model Building Libraries

In [9]:
```python
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import Convolution2D
from keras.layers import MaxPooling2D
from keras.layers import Dropout
from keras.layers import Flatten
```

Initialize The Model

In [11]:
```python
model=Sequential()
```

Add The Convolution Layer

In [12]:
```python
model.add(Convolution2D(32, (3,3), input_shape=(64,64,1), activation= 'relu'))
#no. of feature detectors, size of featuredetector, image size, activation function
```

Add The Pooling Layer

In [14]:
```python
model.add(MaxPooling2D(pool_size=(2,2)))
```

Add The Flatten Layer

Add The Flatten Layer

In [15]:
```python
model.add(Flatten())
```

Adding The Dense Layers

In [16]:
```python
model.add(Dense(units=512, activation='relu'))
model.add(Dense(units=9, activation='softmax'))
```

Compile The Model

In [17]:
```python
model.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['accuracy'])
```

Fit And Save The Model

In [18]:
```python
model.fit_generator(x_train, steps_per_epoch=24, epochs=10, validation_data=x_test, validation_steps=40)
#steps_per_epoch = no.of train images//batch size
```
```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future versio
n. Please use `Model.fit`, which supports generators.
  """Entry point for launching an IPython kernel.
Epoch 1/10
24/24 [==============================] - ETA: 0s - loss: 0.8270 - accuracy: 0.7379
WARNING:tensorflow:Your input ran out of data; interrupting training. Make sure that your dataset or generator can generate at least `steps_per_epoch *
epochs` batches (in this case, 40 batches). You may need to use the repeat() function when building your dataset.
24/24 [==============================] - 193s 81s/step - loss: 0.8270 - accuracy: 0.7379 - val_loss: 0.3614 - val_accuracy: 0.9129
Epoch 2/10
24/24 [==============================] - 711s 30s/step - loss: 0.2278 - accuracy: 0.9357
```

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github.com/IBM-EPBL/IBM-Project-34084-1660231345/blob/main/PROJECT_DEVELOPMENT_PHASE/SPRINT%203/Model%20Building%20and%20Testing.ipynb

Gmail   New Tab   YouTube   Maps   CoWIN Application

```
Epoch 1/10
24/24 [==============================] - ETA: 0s - loss: 0.8270 - accuracy: 0.7379
WARNING:tensorflow:Your input ran out of data; interrupting training. Make sure that your dataset or generator can generate at least `steps_per_epoch *
epochs` batches (in this case, 40 batches). You may need to use the repeat() function when building your dataset.
24/24 [==============================] - 1931s 81s/step - loss: 0.8270 - accuracy: 0.7379 - val_loss: 0.3614 - val_accuracy: 0.9129
Epoch 2/10
24/24 [==============================] - 711s 30s/step - loss: 0.2278 - accuracy: 0.9357
Epoch 3/10
24/24 [==============================] - 366s 15s/step - loss: 0.1275 - accuracy: 0.9661
Epoch 4/10
24/24 [==============================] - 208s 9s/step - loss: 0.0911 - accuracy: 0.9761
Epoch 5/10
24/24 [==============================] - 114s 5s/step - loss: 0.0641 - accuracy: 0.9840
Epoch 6/10
24/24 [==============================] - 78s 3s/step - loss: 0.0514 - accuracy: 0.9864
Epoch 7/10
24/24 [==============================] - 52s 2s/step - loss: 0.0409 - accuracy: 0.9900
Epoch 8/10
24/24 [==============================] - 40s 2s/step - loss: 0.0294 - accuracy: 0.9929
Epoch 9/10
24/24 [==============================] - 36s 1s/step - loss: 0.0194 - accuracy: 0.9956
Epoch 10/10
24/24 [==============================] - 33s 1s/step - loss: 0.0165 - accuracy: 0.9962
```

Out[18]:

In [19]:
```python
model.save('aslpng1.h5')
```

Testmodel

Import The Packages And Load The Saved Model

In [38]:
```python
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import numpy as np
```

In [26]:
```python
model=load_model('aslpng1.h5')
```

In [39]:
```python
img = image.load_img('/content/drive/MyDrive/Nalaiyathiran/Dataset/test_set/E/1.png')
img
```

Out[39]:

Load The Test Image, Pre-Process It And Predict

In [44]:
```python
from skimage.transform import resize
def detect(frame):
    img=image.img_to_array(frame)
    img = resize(img,(64,64,1))
    img = np.expand_dims(img,axis=0)
    pred=np.argmax(model.predict(img))
    op=['A','B','C','D','E','F','G','H','I']
    print("THE PREDICTED LETTER IS ",op[pred])
```

In [45]:
```python
img=image.load_img("/content/drive/MyDrive/Nalaiyathiran/Dataset/test_set/D/100.png")
detect(img)
```

```
1/1 [==============================] - 0s 22ms/step
THE PREDICTED LETTER IS  D
```

In [49]:
```python
img=image.load_img("/content/drive/MyDrive/Nalaiyathiran/Dataset/test_set/G/1.png")
detect(img)
```

```
1/1 [==============================] - 0s 24ms/step
THE PREDICTED LETTER IS  G
```

CHAPTER-9
RESULTS

9.1 Performance Metrics

- ### On-Time Final Delivery

This metric shows a carrier's ability to deliver successfully on time to their scheduled required arrival date and/or to the appointment time. Missing an appointment is not only financially costly (in the form of retailer chargebacks), it also adds time to the delivery as you'll likely need to schedule a new appointment, which could be several days out. If your carrier is performing below 98% with this metric, then an operations review should look for process improvement and efficiencies.

- ### Cost Per Pound

This metric measures gross net with total weight moved each month/quarter to show the buying and usage patterns of your customers. The trends revealed in cost-per-pound performance can help you and your customers to buy smarter and save money by not over- or under-buying product.

Warehousing metrics

- Inventory accuracy – This warehousing metric measures the accuracy of orders pulled from the warehouse. High accuracy scores show that the correct products in the correct quantities are going to the correct customers. Low inventory accuracy can create angry customers and result in additional costs to fix orders.

- Dock to Stock – While much attention is paid to outbound order cycle time, inbound cycle time is just as important to your supply chain. The dock-to-stock KPI measures the time between receipt of an order and the time that it is put away. Fast dock-to-stock times boost the efficiency of inbound activities and ensure that product is ready for resale as quickly as possible.
- On-Time Shipping – Shipping speed is vital in both the B2C and B2B worlds, and this metric shows the percentage of shipments that left the warehouse on time. Of course, "on time" can vary between those two worlds. B2C orders generally need to ship the same day (up to a cutoff time), while B2B orders have more of a set cadence with retailers (e.g., retailer may give advance notice of 48 hours, 72 hours, or even a week). Failure to ship on time can result in disappointed customers and can decrease the likelihood that B2B shipments make it to store shelves prior to a holiday surge or big promotion weekend (e.g., Valentine's Day and "Back to School" season)
- Order Accuracy – Customers – both B2C and B2B – not only expect orders to ship in a timely manner, they expect to receive exactly what they ordered. This metric shows accuracy (%) in terms of the number of orders filled correctly. When orders are filled incorrectly, chargebacks and delays are the likely result (e.g., Walmart's On-Time-In-Full [OTIF] policy made a splash years ago by announcing significant penalties for both late and incorrect orders).
- Fill Rate – Fill rate measures the ability of a warehouse to fill orders from a specific distribution center, without having to ship from multiple locations. For a 3PL, high fill rates result from good systems integration that ensures the warehouse inventory count for each SKU matches the figure in the customer's internal system. When these numbers don't match up, retailers can accept more orders than they can fill with current inventory, – resulting in backorders, delays and potential chargebacks.

Using logistics metrics with a 3PL partner

When you're working with a 3PL partner, expensive systems and advanced automation don't always equate to exceptional operational performance. Make sure that your 3PL is capturing, managing, and continually improving the KPIs that matter to you – and your customers' – business.

When partnering with a 3PL, discuss the metrics that your company needs to master. This discussion should also cover the steps your 3PL will take when operations are falling short of the mark, as well as any continuous improvement program that your 3PL has implemented to bolster operations.

CHAPTER-10
ADVANTAGES AND DISADVANTAGES

Advantages of DHL

- Established global presence in about 220 countries
- Door-to-door delivery of packages
- Air and sea delivery
- No pickup fees
- 24/7 international support
- Offers refunds for service failures on its part
- Complete control over transport chain ,e.g..Temperature sensitive
- Possibility to provide value added services
- More flexible dispatching
- Important for reputation as driver represents the company
- No fixed costs
- Better planning in a volatile market
- Improved utilisation of vehicles.

Disadvantages of DHL

- Less significant presence in the U.S.
- Occasional extra charges or surcharges.
- Higher Costs
- Difficulties archeiving good vehicles utilisation
- Own fleet management structures
- Less flexibility and control for retailer
- Loss of direct contract with recipient.

CHAPTER-11
CONCLUSION

Logistics is one the most important and integral part of any organisations strategy and function. When the logistical process is carried out accurately then not only the company reduces the production cost but also improves the efficiency and customer satisfaction. Overall logistics management is very important for today's highly competitive and cut throat corporate world.

DHL has the world's largest express and logistics Network. Over the past decades it had turned delivering goods into a finely oiled process. Be it a book, pen. WIP material, drugs, hazardous chemicals, clothes, documents, wild animals and any other thing under the sun DHL delivers it. With a network spanning 200 countries and with its private fleet of airplanes, mobile vans, cargo ship carriers & even rail way automotives in some counties DHL can handle any type of goods. Not only has that with international network there come the hassle of documentation and paperwork, standard packaging and other formalities to adhere to. But DHL has its own department which looks into the international laws and other formalities. In the end what matters is delivering well in good condition at the door step of the customer. A happy and satisfied customer makes the business grow. Competitors have come and gone but DHL has been able to keep its No 1 position intact. This is because of its dynamic nature and attitude of maintaining good customer relations. Logistics management is important for every organization but more so DHL

We have tried to incorporate all the facets of logistics which propel DHI. to be the best delievery and carriage-service around the world. No wonder that DHL is head and shoulders above all of its competitors.

CHAPTER-12
FUTURE SCOPE

SCOPE OF THE STUDY

In order to understand the concepts of logistics in terms of practical usage and to glimpse into the how a real company or organization uses logistics as a formidable tool to gain customer satisfaction reduce overall cost and increase efficiency I selected "DHL the world's leading courier Service Company, The study is done only how Dhl use logistics system effectively. There are following strength and weakness of DHL

COMPANY STRENGTHS

- Strong Brand Image: In 1997, DHL became the global express transportation company to obtain simultaneous system- wide ISO 9001 certification in international quality standards. DHL has also developed their own quality system that matches their customer's standards.
- Globalism: DHL operates on a global scale. They operate in more than 220 countries. They provide services that appeal to most of the world. They have such a large market in which to operate, and thus realize tremendous revenues. They can also achieve global economies of scale.
- eServices and Technology: DHL uses and continues to search for new technology. They spend nearly 10% of total revenues, for information technology. DHL also has excellent eServices that provide access to systems that ensure customers have control and visibility of their supply chains at all times. Products can be tracked, queried and ordered online.
-

- Corporate symbiosis:DHL has developed its own organizational structure to serve the global market, which it has called "corporate symbiosis." This approach encompasses the empowerment of the DHL personnel at a local level, at the same time recognizing the interdependence of the parts of DHL as a corporate whole.
- Smart-Truck Project. It is the programme which allows DHL to deliver faster. The data are transmitted directly to the dynamic route planning system, which recalculates the routes, depending on the current order situation and volume of traffic.
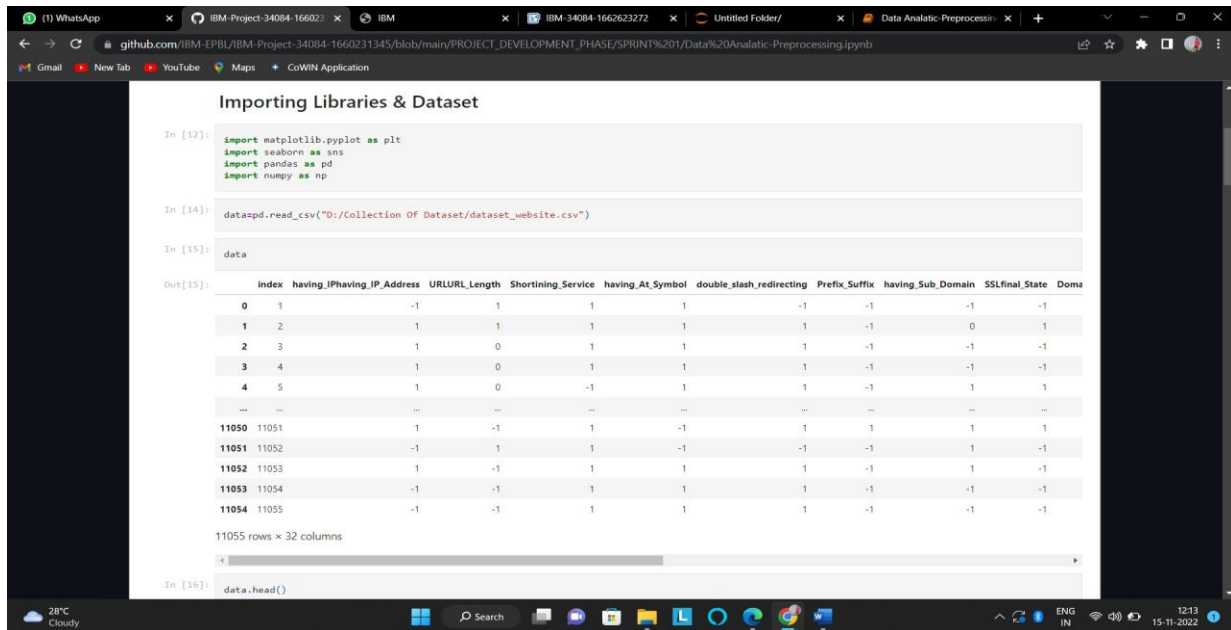
COMPANY WEAKNESS

- High Prices: DHL's prices are above their competitors. This can be a weakness if their customers do not perceive a difference between DHL and its competitors' services.

- Mistakes in Market-Share Estimate: The biggest weakness is DHL's market-share estimate. It is difficult to estimate even when the market is stagnant and contains few competitors, and all market-share estimates should be viewed with circumspection.

- Weak Visibility: It has weak visibility in the communitycompared with its potential.

CHAPTER-13
APPENDIX

Source Code

Out[16]:

	index	having_IPhaving_IP_Address	URLURL_Length	Shortining_Service	having_At_Symbol	double_slash_redirecting	Prefix_Suffix	having_Sub_Domain	SSLfinal_State	Domain_re
0	1	-1	1	1	1	-1	-1	-1	-1	
1	2	1	1	1	1	1	-1	0	1	
2	3	1	0	1	1	1	-1	-1	-1	
3	4	1	0	1	1	1	-1	-1	-1	
4	5	1	0	-1	1	1	-1	1	1	

5 rows × 32 columns

Numerical Analysis

In [17]:
```
data.shape
```

Out[17]: (11055, 32)

In [18]:
```
data.size
```

Out[18]: 353760

In [19]:
```
data.info()
```

```
RangeIndex: 11055 entries, 0 to 11054
Data columns (total 32 columns):
 #   Column                       Non-Null Count  Dtype
---  ------                       --------------  -----
 0   index                        11055 non-null  int64
 1   having_IPhaving_IP_Address   11055 non-null  int64
 2   URLURL_Length                11055 non-null  int64
 3   Shortining_Service           11055 non-null  int64
 4   having_At_Symbol             11055 non-null  int64
 5   double_slash_redirecting     11055 non-null  int64
 6   Prefix_Suffix                11055 non-null  int64
 7   having_Sub_Domain            11055 non-null  int64
 8   SSLfinal_State               11055 non-null  int64
 9   Domain_registeration_length  11055 non-null  int64
 10  Favicon                      11055 non-null  int64
 11  port                         11055 non-null  int64
 12  HTTPS_token                  11055 non-null  int64
 13  Request_URL                  11055 non-null  int64
 14  URL_of_Anchor                11055 non-null  int64
 15  Links_in_tags                11055 non-null  int64
 16  SFH                          11055 non-null  int64
 17  Submitting_to_email          11055 non-null  int64
 18  Abnormal_URL                 11055 non-null  int64
 19  Redirect                     11055 non-null  int64
 20  on_mouseover                 11055 non-null  int64
 21  RightClick                   11055 non-null  int64
 22  popUpWidnow                  11055 non-null  int64
 23  Iframe                       11055 non-null  int64
 24  age_of_domain                11055 non-null  int64
 25  DNSRecord                    11055 non-null  int64
 26  web_traffic                  11055 non-null  int64
 27  Page_Rank                    11055 non-null  int64
 28  Google_Index                 11055 non-null  int64
 29  Links_pointing_to_page       11055 non-null  int64
 30  Statistical_report           11055 non-null  int64
 31  Result                       11055 non-null  int64
dtypes: int64(32)
memory usage: 2.7 MB
```

In [20]:
```
data.describe()
```

Out[20]:   index having_IPhaving_IP_Address URLURL_Length Shortining_Service having_At_Symbol double_slash_redirecting Prefix_Suffix having_Sub_Domain SSLfinal_State

In [20]: `data.describe()`

Out[20]:

	index	having_IPhaving_IP_Address	URLURL_Length	Shortining_Service	having_At_Symbol	double_slash_redirecting	Prefix_Suffix	having_Sub_Domain	SSLfinal_State
count	11055.000000	11055.000000	11055.000000	11055.000000	11055.000000	11055.000000	11055.000000	11055.000000	11055.000000
mean	5528.000000	0.313795	-0.633198	0.738761	0.700588	0.741474	-0.734962	0.063953	0.250927
std	3191.447947	0.949534	0.766095	0.673998	0.713598	0.671011	0.678139	0.817518	0.911892
min	1.000000	-1.000000	-1.000000	-1.000000	-1.000000	-1.000000	-1.000000	-1.000000	-1.000000
25%	2764.500000	-1.000000	-1.000000	1.000000	1.000000	1.000000	-1.000000	-1.000000	-1.000000
50%	5528.000000	1.000000	-1.000000	1.000000	1.000000	1.000000	-1.000000	0.000000	1.000000
75%	8291.500000	1.000000	-1.000000	1.000000	1.000000	1.000000	-1.000000	1.000000	1.000000
max	11055.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

8 rows × 32 columns

In [21]: `data.isnull().any()`

Out[21]:
```
index                         False
having_IPhaving_IP_Address    False
URLURL_Length                 False
Shortining_Service            False
having_At_Symbol              False
double_slash_redirecting      False
Prefix_Suffix                 False
having_Sub_Domain             False
SSLfinal_State                False
Domain_registeration_length   False
Favicon                       False
port                          False
HTTPS_token                   False
Request_URL                   False
URL_of_Anchor                 False
Links_in_tags                 False
SFH                           False
```

Out[21]:
```
index                         False
having_IPhaving_IP_Address    False
URLURL_Length                 False
Shortining_Service            False
having_At_Symbol              False
double_slash_redirecting      False
Prefix_Suffix                 False
having_Sub_Domain             False
SSLfinal_State                False
Domain_registeration_length   False
Favicon                       False
port                          False
HTTPS_token                   False
Request_URL                   False
URL_of_Anchor                 False
Links_in_tags                 False
SFH                           False
Submitting_to_email           False
Abnormal_URL                  False
Redirect                      False
on_mouseover                  False
RightClick                    False
popUpWidnow                   False
Iframe                        False
age_of_domain                 False
DNSRecord                     False
web_traffic                   False
Page_Rank                     False
Google_Index                  False
Links_pointing_to_page        False
Statistical_report            False
Result                        False
dtype: bool
```

In [22]: `data.isnull().sum()`

Out[22]:
```
index                         0
having_IPhaving_IP_Address    0
URLURL_Length                 0
Shortining_Service            0
having_At_Symbol              0
double_slash_redirecting      0
```

```
Out[22]: index                          0
         having_IPhaving_IP_Address     0
         URLURL_Length                  0
         Shortining_Service             0
         having_At_Symbol               0
         double_slash_redirecting       0
         Prefix_Suffix                  0
         having_Sub_Domain              0
         SSLfinal_State                 0
         Domain_registeration_length    0
         Favicon                        0
         port                           0
         HTTPS_token                    0
         Request_URL                    0
         URL_of_Anchor                  0
         Links_in_tags                  0
         SFH                            0
         Submitting_to_email            0
         Abnormal_URL                   0
         Redirect                       0
         on_mouseover                   0
         RightClick                     0
         popUpWidnow                    0
         Iframe                         0
         age_of_domain                  0
         DNSRecord                      0
         web_traffic                    0
         Page_Rank                      0
         Google_Index                   0
         Links_pointing_to_page         0
         Statistical_report             0
         Result                         0
         dtype: int64
```
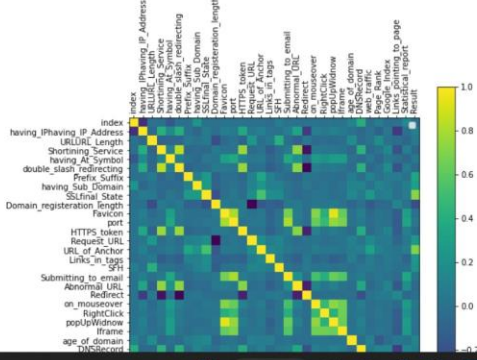
Data Visualization

```python
In [25]: def plot_corr(df,size=8):
             corr=df.corr()
             fig,ax=plt.subplots(figsize=(size,size))
             ax.legend()
```

Data Visualization

```python
In [25]: def plot_corr(df,size=8):
             corr=df.corr()
             fig,ax=plt.subplots(figsize=(size,size))
             ax.legend()
             cax=ax.matshow(corr)
             fig.colorbar(cax)
             plt.xticks(range(len(corr.columns)), corr.columns, rotation='vertical')
             plt.yticks(range(len(corr.columns)), corr.columns)
         plot_corr(data)
```

```
No handles with labels found to put in legend.
```

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github.com/IBM-EPBL/IBM-Project-34084-1660231345/blob/main/PROJECT_DEVELOPMENT_PHASE/SPRINT%201/Data%20Analatic-Preprocessing.ipynb

M Gmail   ▶ New Tab   ▶ YouTube   ♥ Maps   + CoWIN Application

No handles with labels found to put in legend.


```
In [26]:  with sns.color_palette('muted'):
              sns.countplot(x=data['Result'])
```

---

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github.com/IBM-EPBL/IBM-Project-34084-1660231345/blob/main/PROJECT_DEVELOPMENT_PHASE/SPRINT%201/Data%20Analatic-Preprocessing.ipynb

M Gmail   ▶ New Tab   ▶ YouTube   ♥ Maps   + CoWIN Application

```
In [26]:  with sns.color_palette('muted'):
              sns.countplot(x=data['Result'])
```


Splitting the data

```
In [27]:  x=data.iloc[:,1:31].values
          y=data.iloc[:,-1].values
```

```
In [28]:  x
```

```
Out[28]: array([[-1,  1,  1, ...,  1,  1, -1],
                 [ 1,  1,  1, ...,  1,  1,  1],
                 [ 1,  0,  1, ...,  1,  0, -1],
                 ...,
                 [ 1, -1,  1, ...,  1,  0,  1],
                 [-1, -1,  1, ...,  1,  1,  1],
                 [-1, -1,  1, ..., -1,  1, -1]], dtype=int64)
```

```
In [29]:  y
```

```
                 [-1, -1,  1, ...,  -1,  1, -1]], dtype=int64)
In [29]:   y

Out[29]:   array([-1, -1, -1, ..., -1, -1, -1], dtype=int64)
```

Train, Test & Split

```
In [30]:   from sklearn.model_selection import train_test_split
           x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=0)

In [31]:   x_train.shape

Out[31]:   (8844, 30)

In [32]:   y_train.shape

Out[32]:   (8844,)

In [33]:   x_test.shape

Out[33]:   (2211, 30)

In [34]:   y_test.shape

Out[34]:   (2211,)

In [ ]:
```

IMPORTING NECESSARY LIBRARIES

```
In [ ]:   import os
          import cv2
          import numpy as np
          import matplotlib.pyplot as plt
          from keras.preprocessing.image import ImageDataGenerator
```

RENAMING DATA FILES

```
In [ ]:   def rename_imgs(file_name):
              folder_path = r'test_dataset/'+file_name

              num = 0
              for file in os.listdir(folder_path):
                  # if num%10 == 0:
                  #     print(f'Renamed {num} files...')
                  # os.rename(folder_path+'\\'+file, folder_path+'\\'+file_name+'_'+str(num)+'.jpeg')
                  num += 1

In [ ]:   fn = 'Space'
          rename_imgs(fn)

In [ ]:   file_names = '0123456789'+'ABCDEFGHIJKLMNOPQRSTUVWXYZ'
          for fn in file_names:
              rename_imgs(fn)
```

DISPLAYING SAM PLE IMAGES FROM DATASET

```
In [ ]:   train_data_path = 'train_dataset/'
          test_data_path = 'test_dataset/'
```

DISPLAYING SAMPLE IMAGES FROM DATASET

```
In [ ]:  train_data_path = 'train_dataset/'
         test_data_path = 'test_dataset/'
```

```
In [ ]:  def display(img,sign=None):

             img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
             fig = plt.figure(figsize=(7,7))
             ax = fig.add_subplot(111)
             plt.title(sign)
             ax.imshow(img)
```

Training Data Images

```
In [ ]:  sign_img = cv2.imread(train_data_path+'O/O_234.jpeg')
         display(sign_img,'a')
```

```
In [ ]:  sign_img = cv2.imread(train_data_path+'A/A_204.jpeg')
         display(sign_img,'A')
```

```
In [ ]:  sign_img = cv2.imread(train_data_path+'3/3_340.jpeg')
         display(sign_img,'3')
```

```
In [ ]:  sign_img = cv2.imread(train_data_path+'M/M_100.jpeg')
         display(sign_img,'M')
```

```
In [ ]:  sign_img = cv2.imread(train_data_path+'S/S_10.jpeg')
         display(sign_img,'Space')
```

Test Data Images

```
In [ ]:  sign_img = cv2.imread(test_data_path+'S/S_15.jpeg')
         display(sign_img,'S')
```

```
In [ ]:  sign_img = cv2.imread(test_data_path+'Z/Z_1.jpeg')
         display(sign_img,'Z')
```

```
In [ ]:  sign_img = cv2.imread(test_data_path+'7/7_8.jpeg')
         display(sign_img,'7')
```

AUGMENTATION AND PREPROCESSING THE DATASET

Creating ImageDataGenerator

```
In [ ]:  image_gen = ImageDataGenerator(rotation_range=30,
                                        width_shift_range=0.1,
                                        height_shift_range=0.1,
                                        shear_range=0.2,
                                        zoom_range=0.2,
                                        rescale=1/255,
                                        horizontal_flip=True,
                                        fill_mode='nearest',
                                        validation_split=0.25)
```

Original Image

```
In [ ]:  sign_img = cv2.imread(train_data_path+'3/3_100.jpeg')
         display(sign_img,'3')
```

Augmented Images

```
display(image_gen.random_transform(sign_img))
```

```
display(image_gen.random_transform(sign_img))
```

SPLITING INTO TRAIN AND VALIDATION DATASET

Train Data Generator

```
train_data_gen = image_gen.flow_from_directory(train_data_path,
                                               target_size=(250,250),
                                               batch_size=16,
                                               shuffle=True,
                                               class_mode='binary',
                                               subset='training')
```

Validation Data Generator

```
validation_data_gen = image_gen.flow_from_directory(train_data_path,
                                                    target_size=(250,250),
                                                    batch_size=16,
                                                    shuffle=True,
                                                    class_mode='binary',
                                                    subset='validation')
```

Test Data Generator

```
test_data_gen = image_gen.flow_from_directory(test_data_path,
                                              target_size=(250,250),
                                              batch_size=8,
                                              shuffle=True,
                                              class_mode='categorical',
                                              )
```

```
train_data_gen.class_indices
```

```
test_data_gen.classes
```

```
len(train_data_gen.classes)
```

```
len(test_data_gen.classes)
```

DHL_Facilities.csv - Excel (first view, rows 1–8)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	X	Y	OBJECTID	FEATURE_	NAME	ADDRESS	ADDRESS2	CITY	STATE	ZIP	LATITUDE	LONGITU	MATCH_S	PLACEME	CENSUS_C	LAST_PICK	LOCATION	LOCATION_TH
2	-1.1E+07	5030051	1	2093	DHL STATI	5120 EAST	NOT AVAII	NORTH PL	NE	69101	41.11995	-100.686	OK	On Road	Not Availa	3:00 Pm [M-F] no Sat Pickup	Drop Box	Drop Box and Drop Off Facility
3	-8043436	5299085	2	2293	PC CONNE	450 MARL	NOT AVAII	KEENE	NH	3431	42.91528	-72.2554	OK	Not Availa	3.3E+14	6:30 Pm [M-F] no Sat Pickup	Drop Box	Drop Box and Drop Off Facility
4	-8045972	5301971	3	2294	20 CENTR/	20 CENTR/	NOT AVAII	KEENE	NH	3431	42.93426	-72.2782	OK	Not Availa	3.3E+14	5:00 Pm [M-F] no Sat Pickup	Drop Box	Drop Box and Drop Off Facility
5	-8046142	5301455	4	2299	SHIPPING	63 EMERA	NOT AVAII	KEENE	NH	3431	42.93087	-72.2797	OK	Not Availa	3.3E+14	5:00 Pm [M-F] no Sat Pickup	DHL Autho	DHL Authorized Shipping Center
6	-8053022	5367961	5	2597	CLAREMO	159 PLEAS	NOT AVAII	CLAREMO	NH	3743	43.36674	-72.3415	OK	Not Availa	3.3E+14	3:00 Pm [M-F] 12:00 Pm [Sat]	DHL Autho	DHL Authorized Shipping Center
7	-7992278	5623122	6	2853	25 NELSO!	25 NELSO!	NOT AVAII	NORTON	VT	5907	45.01017	-71.7959	OK	Not Availa	5E+14	12:00 Pm [M-F] no Sat Pickup	Drop Box	Drop Box and Drop Off Facility
8	-9407483	4583990	7	4305	UNIVERSI	1900 S LIME	NOT AVAII	LEXINGTO	KY	40536	38.0323	-84.5089	OK	On Buildin	Not Availa	8:00 Pm [M-F] no Sat Pickup	Drop Box	Drop Box and Drop Off Facility

DHL_Facilities.csv - Excel (second view, rows 10–16)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
10	-8072775	5218061	9	6772	D H JONES	27 PRAY S'	NOT AVAII	AMHERST	MA	1002	42.37992	-72.519	OK	Not Availa	2.5E+14	5:00 Pm [M-F] no Sat Pickup	Drop Box	Drop Box and Drop Off Facility
11	-8081281	5212345	10	6774	106 RUSSE	106 RUSSE	NOT AVAII	HADLEY	MA	1035	42.34198	-72.5954	OK	Not Availa	2.5E+14	5:00 Pm [M-F] no Sat Pickup	Drop Box	Drop Box and Drop Off Facility
12	-8153608	5211299	11	6802	DHL EXPRI	100 VALLE	NOT AVAII	LENOXDAI	MA	1242	42.33503	-73.2451	Zip Centro	\nPlaceme	2.5E+14	4:30 Pm [M-F] no Sat Pickup	Drop Box	Drop Box and Drop Off Facility
13	-8157179	5217533	12	6804	ARNOFF	55 PITTSFI	NOT AVAII	LENOX	MA	1240	42.37642	-73.2772	OK	Not Availa	2.5E+14	1:00 Pm [M-F] 10:00 Am [Sat]	DHL Autho	DHL Authorized Shipping Center
14	-8147414	5230091	13	6807	DOWNINC	1 DOWNIN	NOT AVAII	PITTSFIELE	MA	1201	42.4597	-73.1895	OK	Not Availa	2.5E+14	5:00 Pm [M-F] no Sat Pickup	Drop Box	Drop Box and Drop Off Facility
15	-8154614	5228377	14	6808	BERKSHIRI	1 W ST	NOT AVAII	PITTSFIELE	MA	1201	42.44834	-73.2541	OK	Not Availa	2.5E+14	5:00 Pm [M-F] no Sat Pickup	Drop Box	Drop Box and Drop Off Facility
16	-8204565	5253491	15	7126	TD BANKN	71 TROY R	NOT AVAII	EAST GREE	NY	12061	42.61459	-73.7029	OK	Not Availa	3.61E+14	6:00 Pm [M-F] no Sat Pickup	Drop Box	Drop Box and Drop Off Facility