ORACLE

Art of Possible with AI & Data Science

Retail Footfall Forecasting with Composite AI

15/02/23

Demo Inspiration

This demo is going to show Oracle AI Platform capabilities to predict number of customers visiting a Retail space by following composite AI approach.

Objective is to make accurate predictions about future footfall and make data-driven decisions about staffing, inventory, rental prices as well as optimizing tenant mix by combining various techniques such as descriptive analytics , NLP, image detection and forecasting .

*"**Composite AI** refers to the fusion of different AI techniques to improve the efficiency of learning and broaden the level of knowledge representations. Since no single AI technique is a silver bullet, composite AI ultimately provides a platform to solve a wider range of business problems in a more effective manner"**

Gartner, 2022

Source: https://www.gartner.co.uk/en/articles/what-is-new-in-artificial-intelligence-from-the-2022-gartner-hype-cycle

Demo Flow

1. Summary

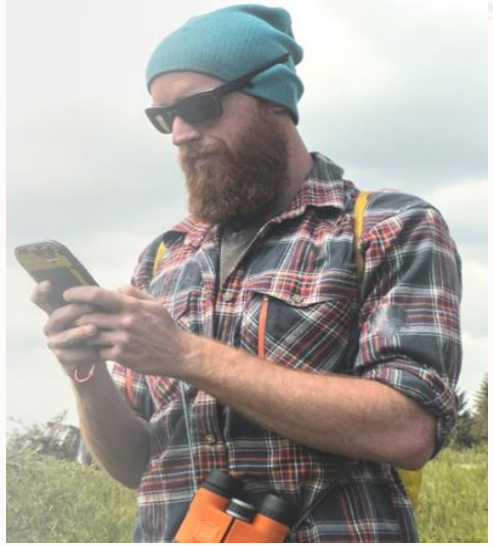
2. How we achieved this?
   - Data Discovery & Preparation
   - Modeling
   - Actionable Insights for Business

3. Behind the Scenes
   - Oracle AI Platform

Target Personas

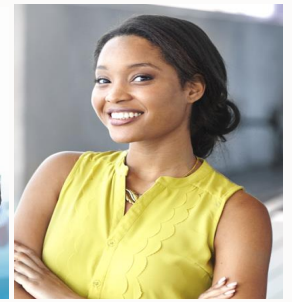
Brand manager would like to understand future footfall for each store to optimize tenant mix in shopping malls and organize customized events to improve brand attachment

Mall manager would like to understand effect of multiple factors such as visitor data, retail data, car parking utilization, customer complaints etc. on daily footfall to plan staffing needs



Data science & analytics expert would like to create data science models to predict future footfall with a composite AI approach

Summary

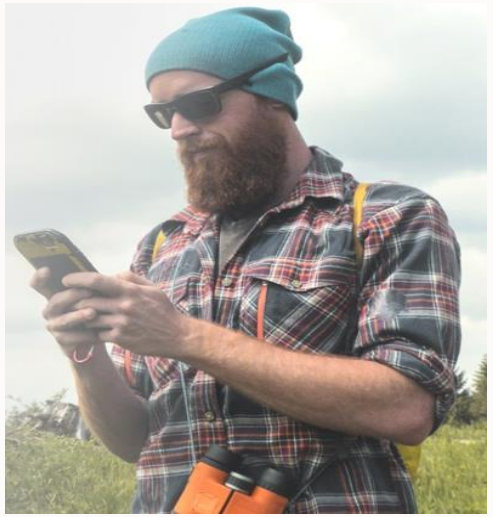


- At the end of the demo brand manager and mall manager will be able get key business insights like below :
  - Which retail spaces have an increasing footfall trend for selected time frames
  - Which type of stores will have more footfall during selected time frames
  - Most important features for footfall trends (floor, categories, store level, etc.)
  - Effect of customer experience on footfall (easy car parking, positive call center engagement, etc.)
  - …..

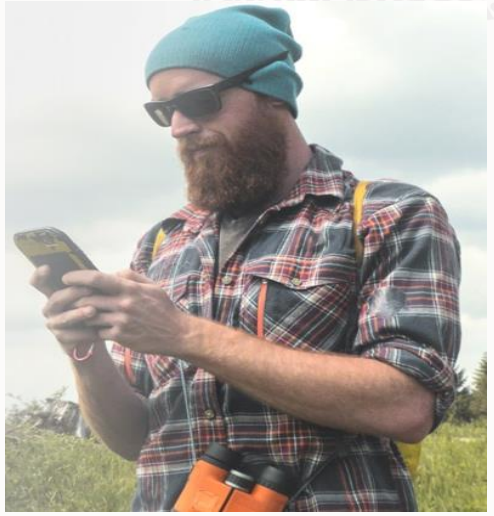
How have we achieved this?

Car Park Utilisation Rate

A full car park can have a negative impact on footfall, as customers may find it difficult to find a parking space, which can lead to frustration and discourage them. Can we see the impact of car park utilization on future footfall to take a proactive action?



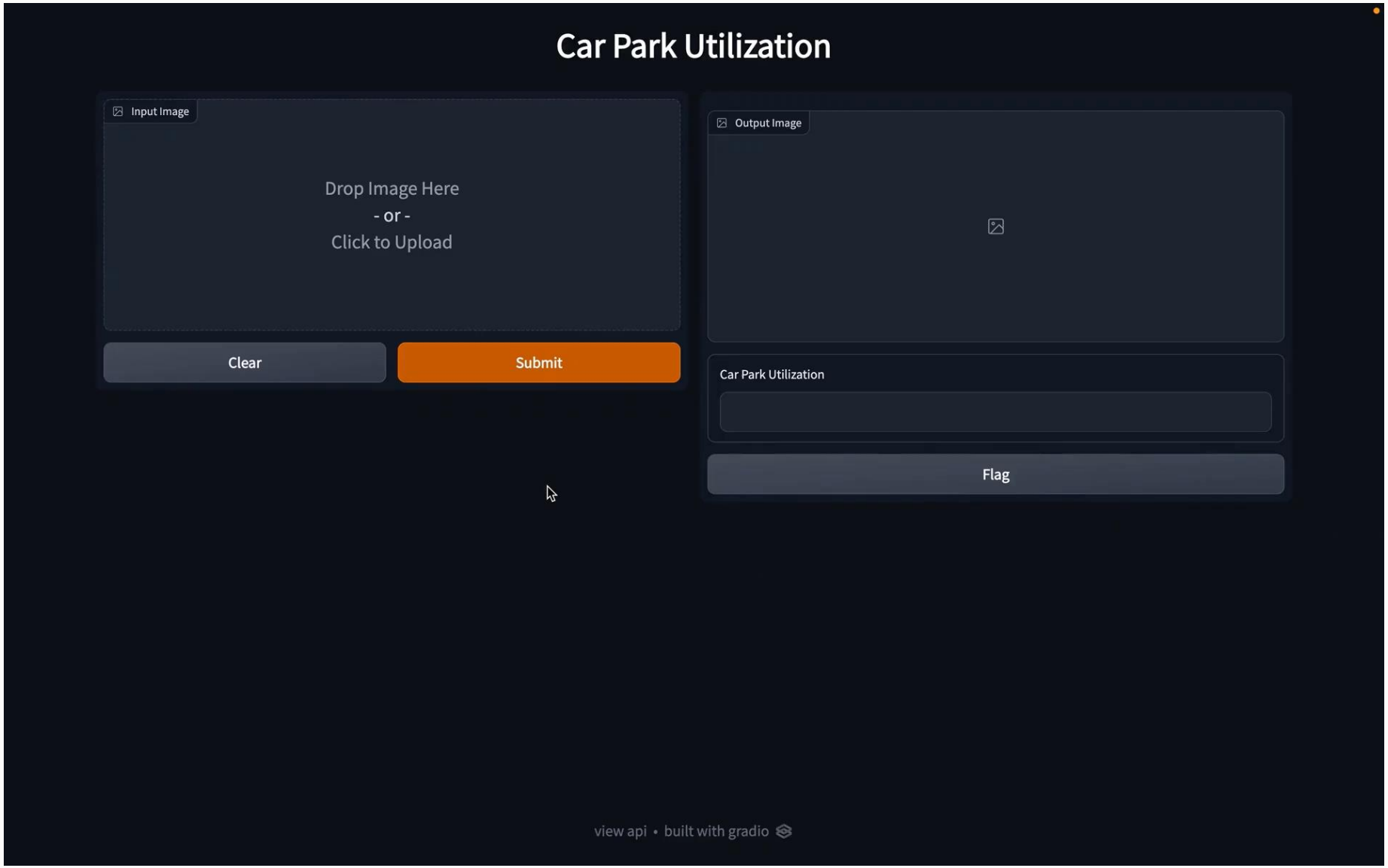
Using computer vision with data coming from CCTV cameras it is possible to predict car park utilization. These cameras can capture images of the car park and detect the number of vehicles present in real-time.



By using Oracle AI Vision, I can analyze this information to see the impact of car park utilization for each hour.

AI Powered Footfall Data

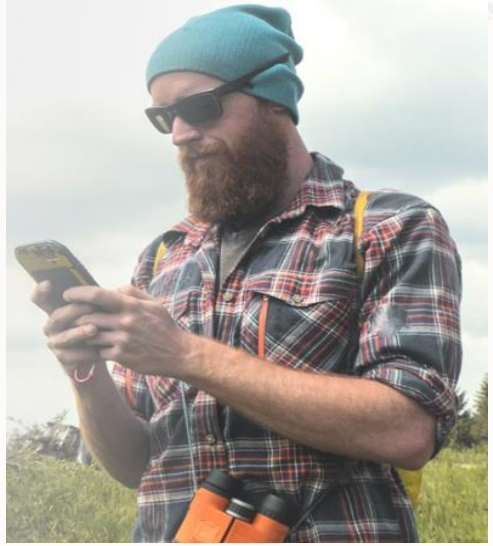
Impact of Car Park Utilization



Call Centre Complaints

Call center complaints are discouraging customers from visiting a store and purchasing specific brands. I need to understand complaints and take a proactive action to keep high brand attachment.

I need to measure the impact of call center complaints and potential negative brand attachment on mall visits.



We have call center data. By using Oracle AI Speech and Language services, I can analyze this information to create business insights.

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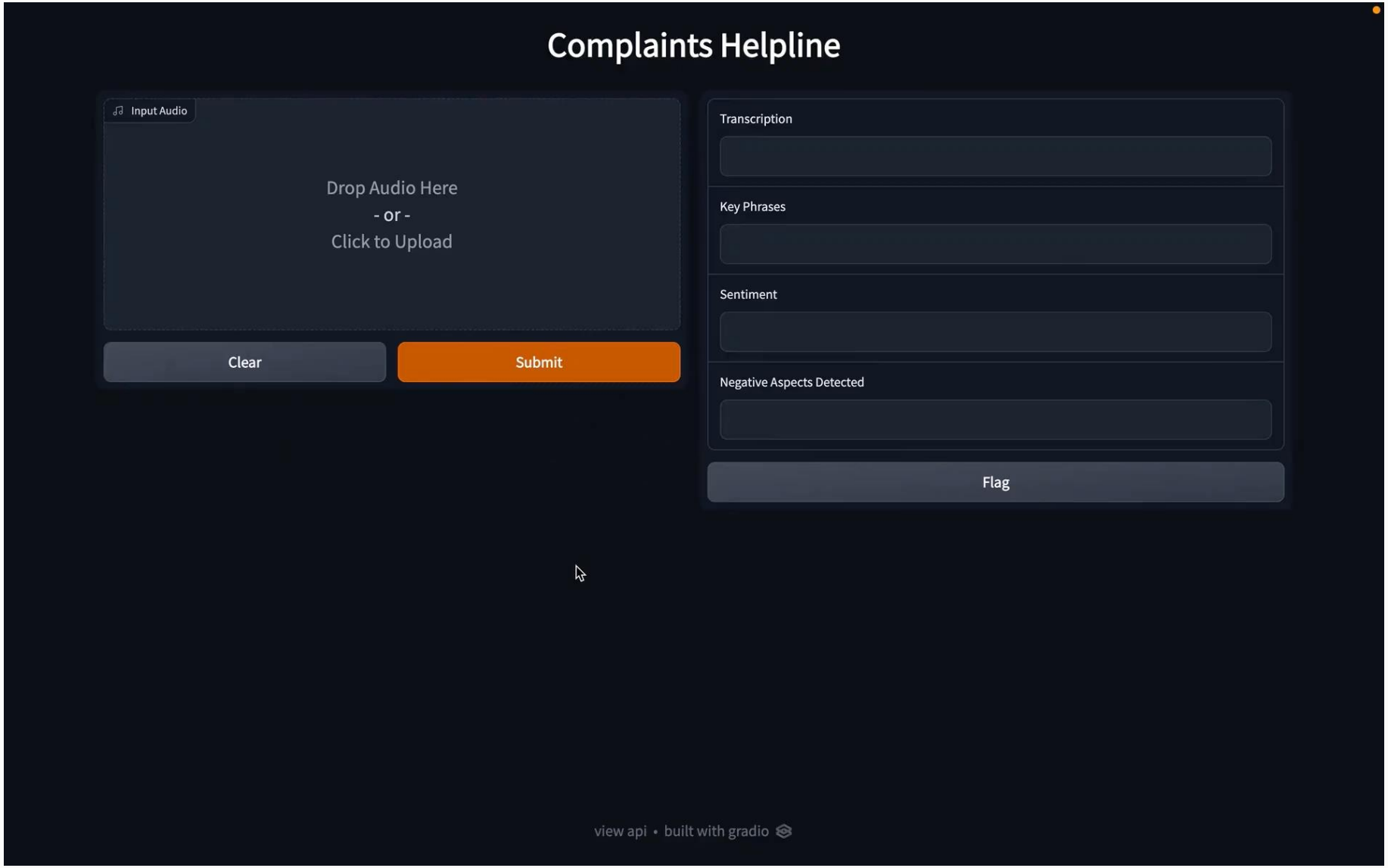
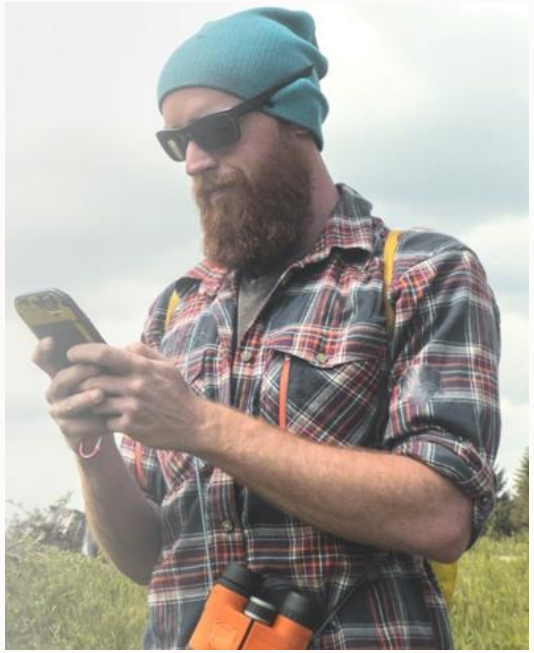
AI Powered Footfall Data

Impact of Call Center Complaints



Data discovery and preparation

Data Discovery & Preparation



Now, I can add call center & car parking insights as additional information and combine them with the rest of the historical data for machine learning purposes.

Product Attributes
Date
Event Flag
Temperature
Mall ID
Mall Name
Mall Size
Market Area Type
Mall Pull Factor
Nearest Mall
Distance to Nearest Mall
MallNumYears
Weekday
WeekendFlag
MallTotalOpenHours

Product Attributes
Store ID
Store Category
NumCovidCases
Store Size
Max Capacity
Store Level
StoreUsage
StoreStatus
StoreTotalOpenHours
StoreLocationType
StoreConcept
StorePriceIndex
StoreNumYears
CompetitorPromo

Product Attributes
StoreFreqShopping Card
CallCenter_NumComplaints
Accessibility by Taxi
Accessibility by Metro
Acessibility by bus
Avg walking distance (M)
Car park utilization rate
Revenue
Total Footfall

Data Discovery & Preparation

Machine learning algorithms require data to be formatted in a specific way, so data sets generally require some amount of discovery & cleansing and feature engineering before they can yield useful insights

Missing Values:

- What is missing value?
- What can cause missing value?
- What might be the problem if we have missing value in data?
- How we can impute missing values?

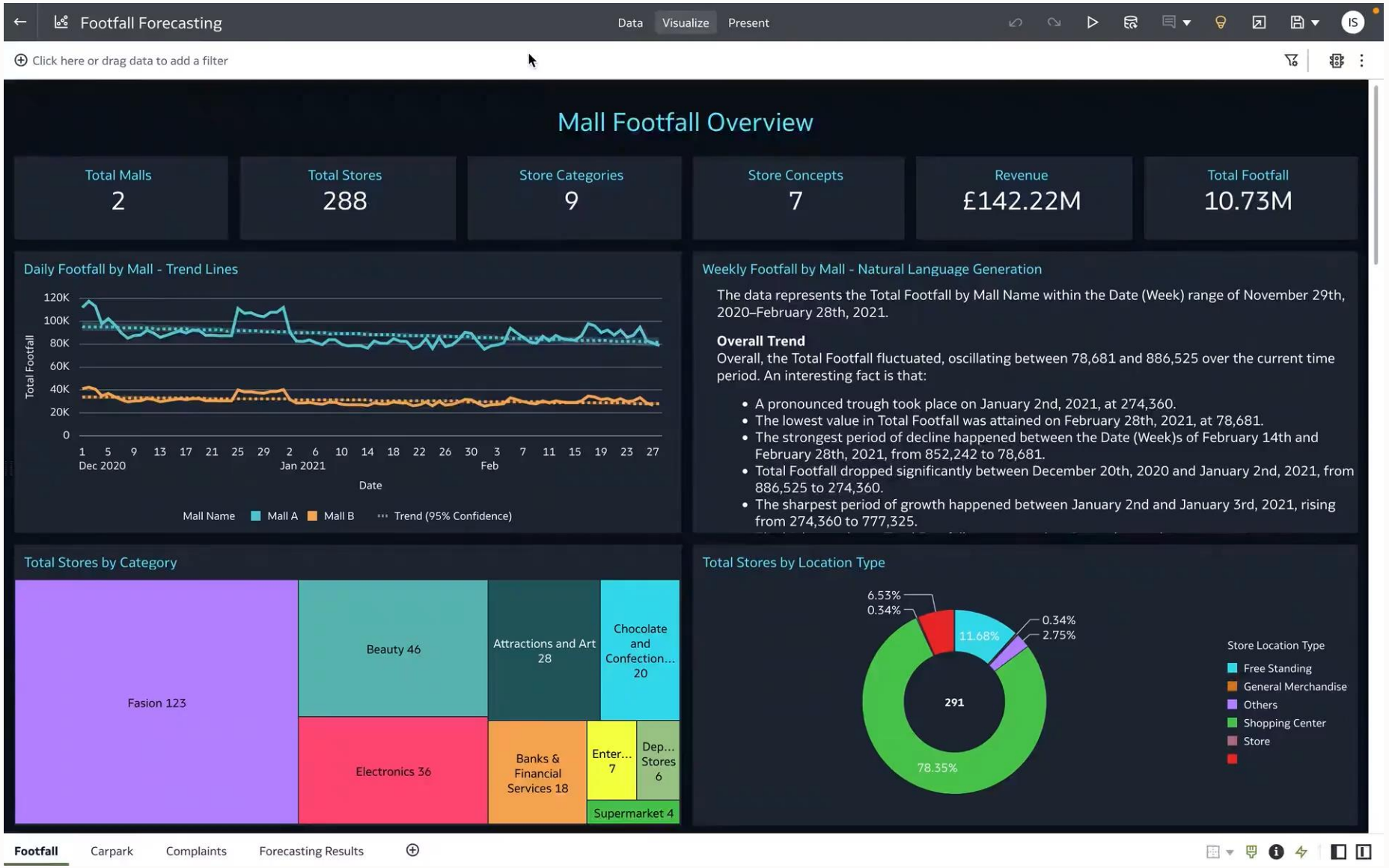
Outlier Detection

- What is an outlier?
- How to detect an outlier?
- What might be the problem if we have missing value in data?
- How to deal with an outlier?

Variable Selection/Feature Engineering

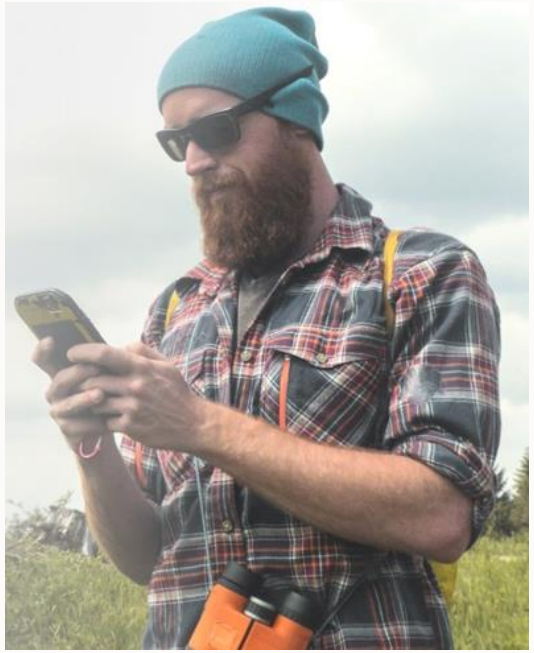
- Gather all related variables/explanatory factors by using previous knowledge, project knowledge, sector knowledge, industry experience etc.
- Create new variables
- Decide which variables are the best ones for explaining dependent variable

Data Discovery & Preparation



Footfall Forecasting

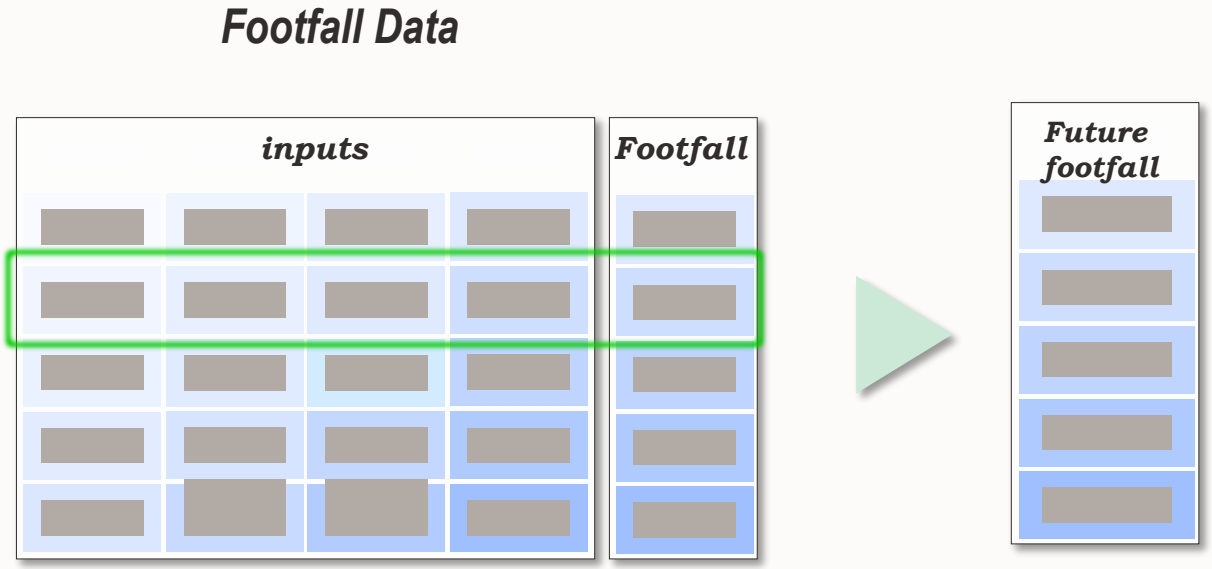
Modelling



I am ready to build footfall forecasting models to predict number of footfall for each store for the next 14 days.

What is a footfall forecasting model?

A mathematical or statistical equation that will detect future footfall



Footfall Forecasting

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/ 3-InternalWork / AI_Approach /

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Launcher | 02-footfall-forecasting.ipyr

Markdown | Python [conda env:generalml_p37_cpu_v1]

Footfall Forecasting

Imports

[1]:
```
%matplotlib inline
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
from tqdm import tqdm
import logging
import seaborn as sns

from prophet import Prophet

from sklearn.metrics import mean_squared_error
from sklearn.metrics import mean_absolute_error

import ads
from ads.dataset.factory import DatasetFactory
```

Data Loading

[2]:
```
# Read in Dataset
dirty_df = pd.read_excel('AIA_Footfall_Forecasting.xlsx')
```

[3]:
```
# Preview Data
dirty_df.head()
```

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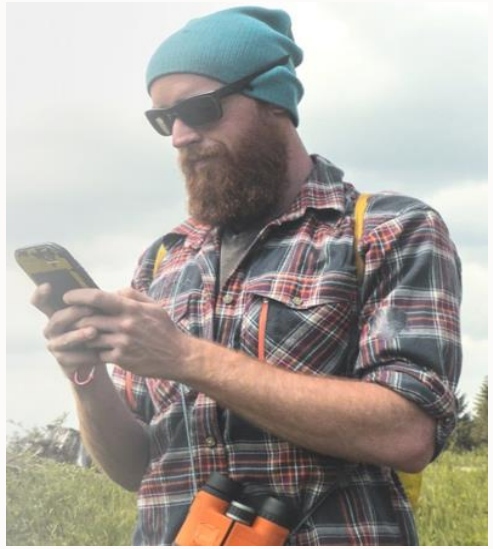
Actionable Insights for Business

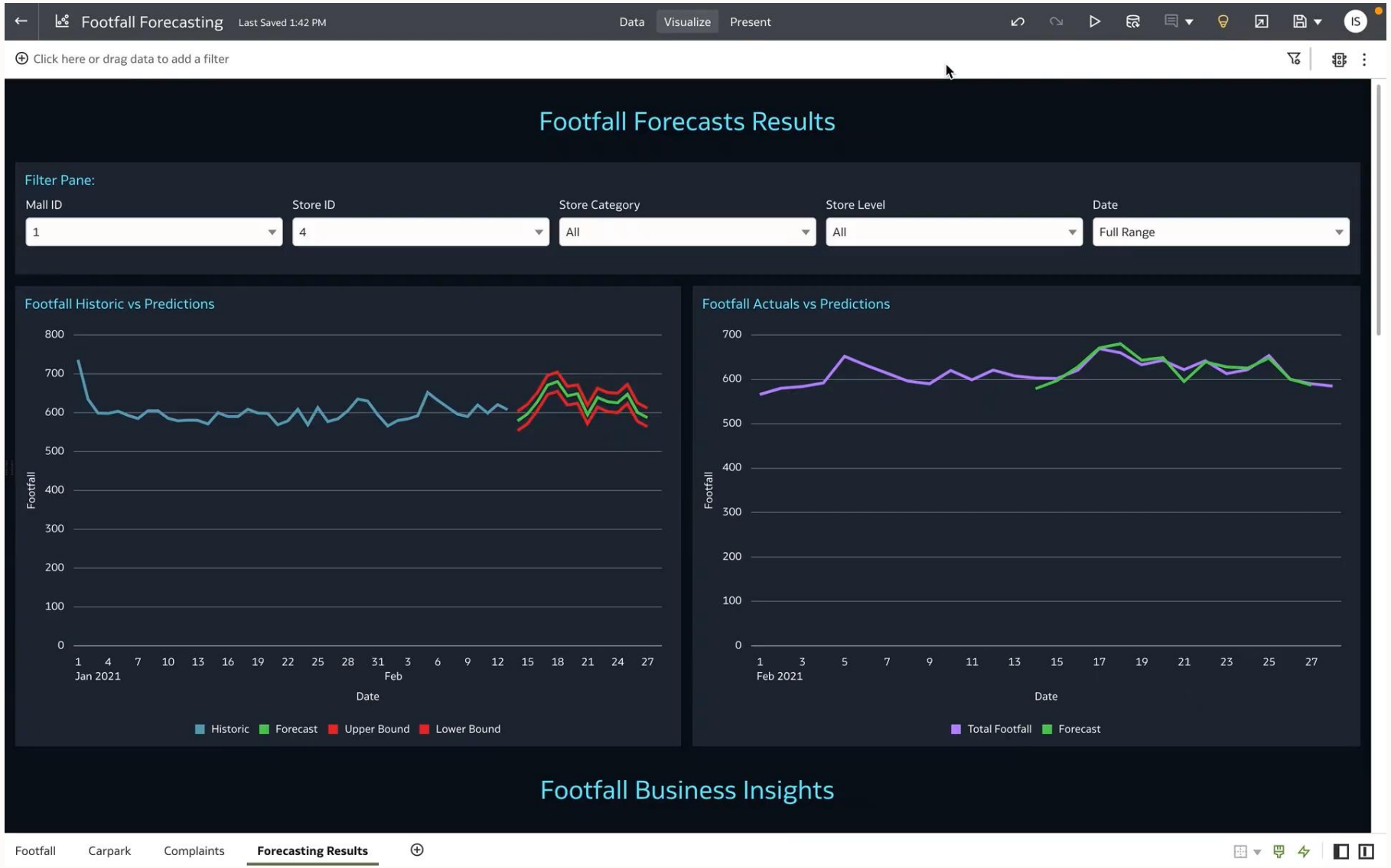


Data science & analytics expert creates business dashboards to show future footfall and factors affecting future footfall

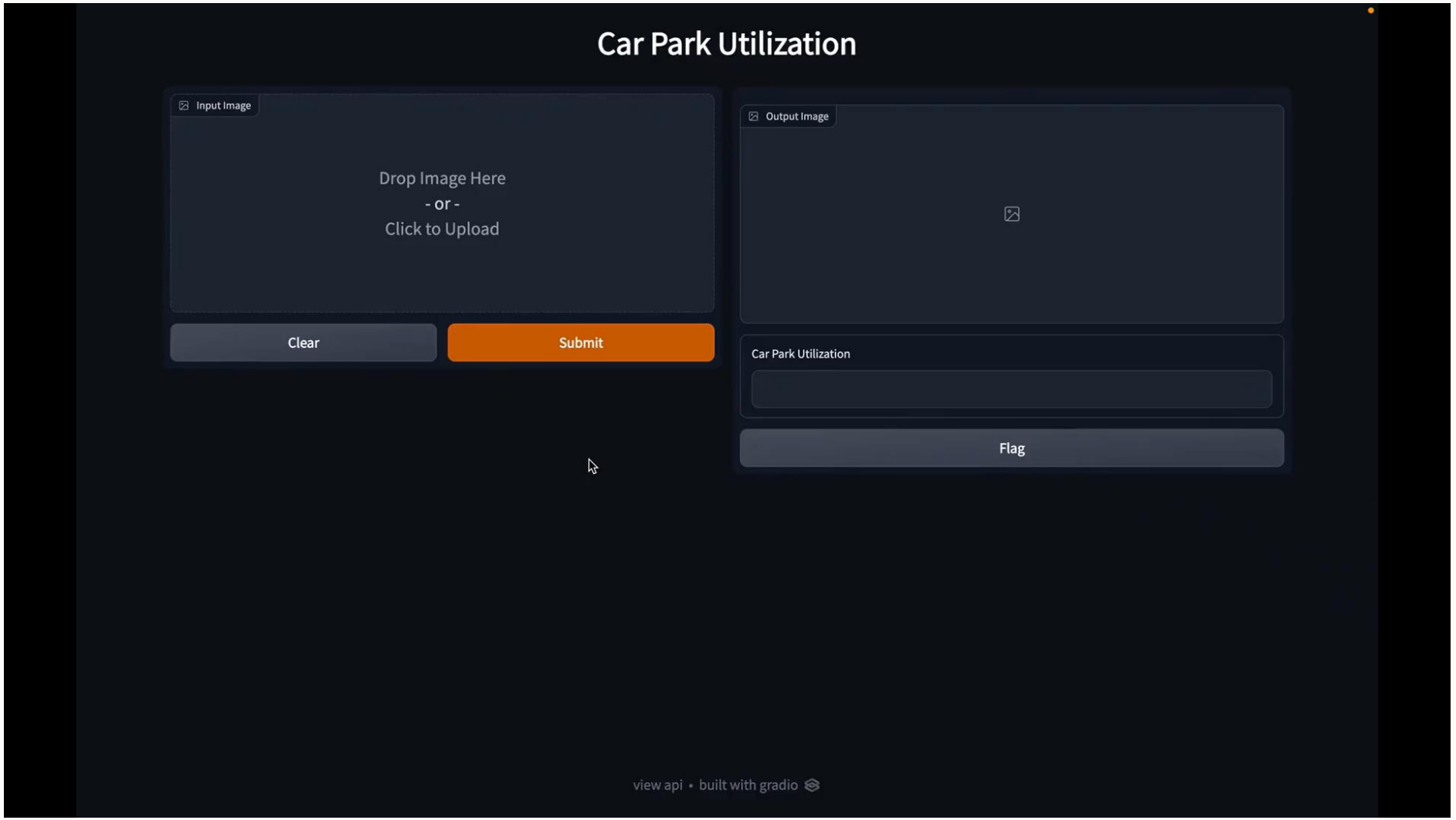
Mall manager checks her dashboards to understand footfall effect of multiple factors and plans her mall strategy accordingly

Brand manager check dashboards to understand fluctuation in different brands & stores and plan his marketing strategy

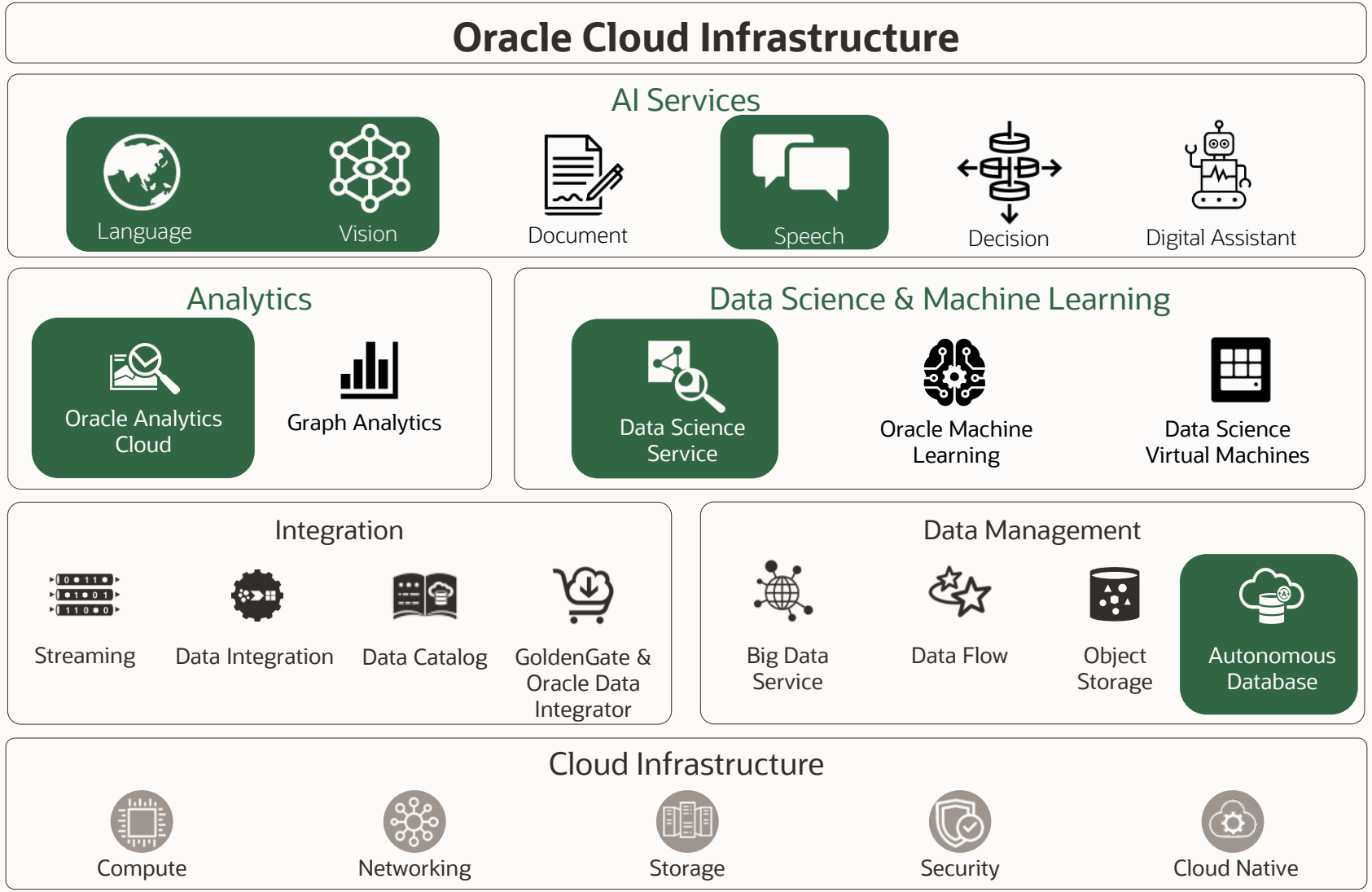
Actionable Insights for Business



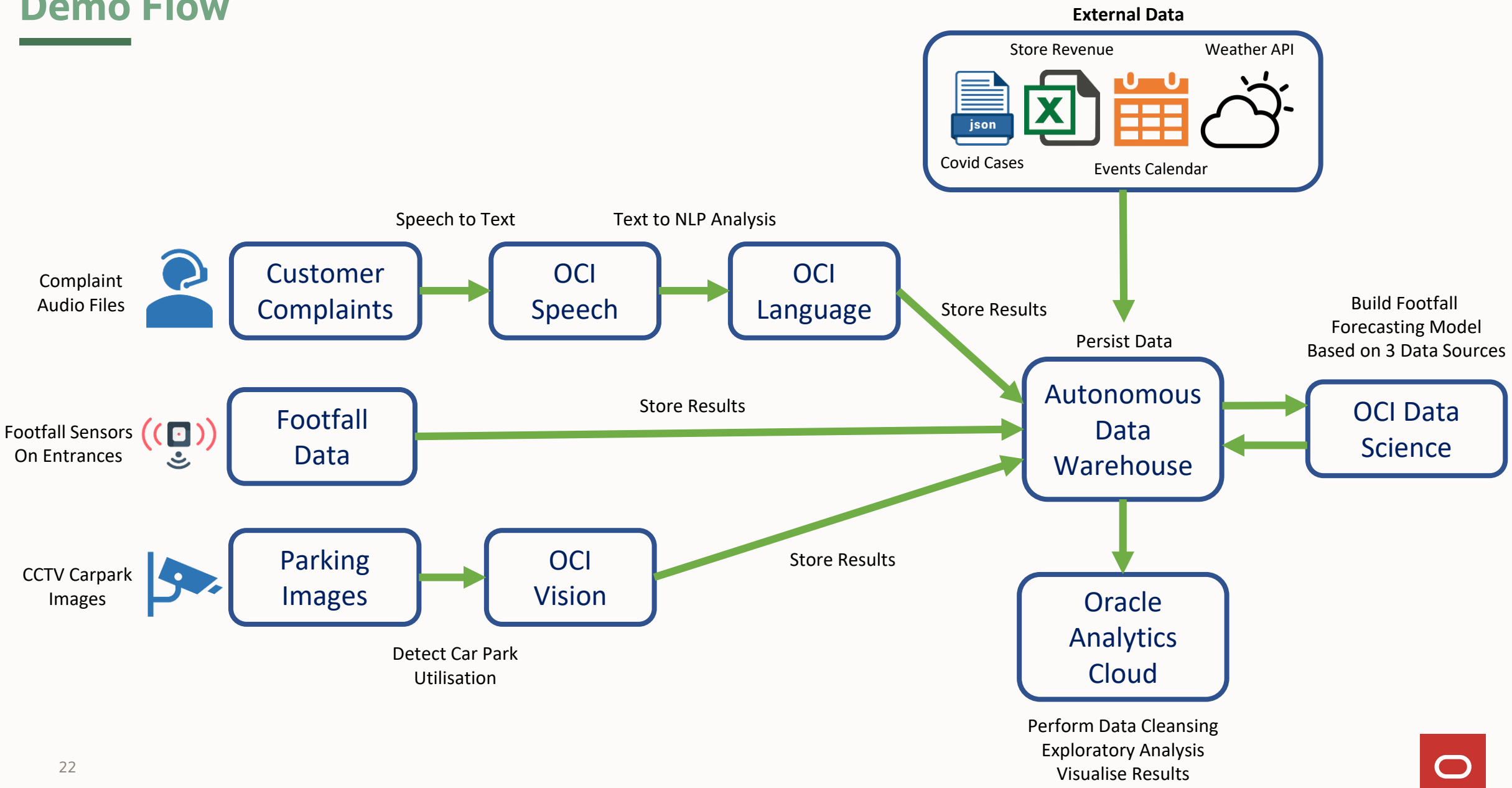
Lets Bring it all Back Together (Full Demo)



Behind the Scenes: Oracle AI Platform



Demo Flow


External Data
Store Revenue
Weather API
json
Covid Cases
Events Calendar
Speech to Text
Text to NLP Analysis
Complaint Audio Files
Customer Complaints
OCI Speech
OCI Language
Store Results
Persist Data
Build Footfall Forecasting Model Based on 3 Data Sources
Footfall Sensors On Entrances
Footfall Data
Store Results
Autonomous Data Warehouse
OCI Data Science
CCTV Carpark Images
Parking Images
OCI Vision
Store Results
Detect Car Park Utilisation
Oracle Analytics Cloud
Perform Data Cleansing
Exploratory Analysis
Visualise Results

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