Canada Post

BISI Capstone Project Introduction

SPRING 2023

Capstone Project 1:

Employee Staffing Optimization

Problem Statement

To ensure long-term financial sustainability, Canada Post has to optimize its staffing to meet the demand

1

Canada Post relies on a workforce to carry out its operations

2

Planning workforce and attendance is not just about ensuring that employees are present

3

To achieve the goal of delivering on-time, Canada Post needs to plan its workforce and attendance effectively

Project Deliverables

1. **Analyzing historical data, calculate the optimal number of employees required to achieve highest service results at minimum cost in the distribution plant for the year 2024**, based on historical data and relevant plant/depot information. The model should take into account past patterns to make accurate predictions on a daily basis and help management make informed decisions.
2. **Perform Exploratory Data Analysis (EDA)** to identify key patterns, relationships, deeper insights in the data, and generate any hypotheses which can guide further analysis and modeling.
3. Based on the results of the EDA, **develop a ML solution or set of recommendations** to address the problem or capitalize on the opportunity.
4. **Create a detailed report or presentation that summarizes the project**, including the problem, the data and methods used, the findings, and the recommendations.

Canada Post
Sample Data Set

Feature Engineering:

Analyzing historical data, calculate the optimal number of employees required to achieve highest service results at minimum cost in the distribution plants/depots.

Engineer new features as appropriate based on the dataset analysis.

Vancouver

- The data includes (by production day, by shift): Hours, Volume, Productivity
- Plant uses mechanical processing

Workforce Management

Data sets will include, year, week number, data of week, calendar date, shift number)

Region Cutoffs

Data sets will include items with physical induction scans including volumes process time before/after cutoff

Historical Data (waiting for final data)

- Data will consist of 2019 numbers (pre-COVID) and 2022 to 2024 data

Canada Post Sample Data Set

Depot Dashboard Metadata Description

Column Name	Datatype	Description
CALENDAR_DATE	'YY/MM/DD'	DATE
NATIONAL_HOLIDAY_IND	BYTEINT	Flag for national holiday
PROVINCIAL_HOLIDAY_IND	BYTEINT	Flag for provincial holiday
IMPACT_DAY_FLG	BYTEINT	
DAY_OF_WEEK	INTEGER	Day of week for example: Sunday=1...Saturday=7
WEEK_OF_YEAR	INTEGER	Week number of year
DAY_OF_MONTH	INTEGER	Day of month
MONTH_NO	INTEGER	Month number for example: January=1...dec=12
YEAR_NO	INTEGER	year
COST_CENTRE_ID	VARCHAR (10)	Canada Post facility id which is unique
PEAK	BYTEINT	Flag to indicate peak month
SITE_PROVINCE_CODE	VARCHAR (5)	Province code for example: Ontario: ON
ACTUAL_VOLUME	INTEGER	Actual volume arriving to the cost centre for that particular calendar date
PLANT_NAME_EN	VARCHAR(20)	Plant Name
PCR_CC_ROLLUP	VARCHAR(70)	Cost Centre Name
PCR_CC_CITY	VARCHAR (30)	Location (city) for that cost centre
PCR_CC_POSTAL_CODE	VARCHAR(6)	Location (postal code) for the cost centre

Canada Post
Sample Data Set

Induction / Processing Metadata Description

Column Name	Datatype	Description
PLANT_POSTAL_CODE		Postal Code
PLANT_NAME		Plant
FISCAL_YEAR		Year
FISCAL_WEEK_NUMBER		Week number
PRODUCTION_DAY_OF_WEEK_NUMBER		Week day number 1 = Sunday
SHIFT_DATE		Date
SHIFT_NUMBER		# 2 normal hours - 1 and 3 are the main focus
BUSINESS_PROCESS_NUMBER		Id of the process
BP_ENGLISH_NAME		Subcategory
REPORTING_TYPE_ENGLISH_NAME		Subcategory
PLANT_VOLUME		Number of parcel processed
WORKED_HOUR		Number of worked hours

Guidelines and Expectations

Expectations

Python | Visualizations | Experiment | Optimal Models | Recommendations

1. Use of Python programming language to build the predictive model
2. Visualizations should be done using either Python, PowerBI.
3. Experiment with various models - evaluate their performance using evaluation metrics
4. Determine the optimal model and provide a rationale for the chosen model.

Recommendations and suggestions if any.

Thank you

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