Objective of Tech Track Phase-I

Build a **Machine Learning model to predict the first Partial Payment Amount for invoices along with Professor- an AI enabled Digital Assistant.**

Business Overview

Introduction to B2B Operations:

The B2B world operates differently from the B2C or C2C world. Businesses work with other businesses on **credit**. When a **buyer business** orders goods from the **seller business**, the **seller business issues an invoice for the same**. This invoice for the goods contains various information like the details of the goods purchased and when it should be paid.

The simplest definition of **accounts receivable** is money owed to an entity by its customers. Correspondingly, the amount not yet received is **credit** and, of course, the amount still owed past the due date is **Account receivables.** A more formal definition of A/R is:

> ***"Accounts Receivable represents money owed by entities to the firm on the sale of products or services on credit. In most business entities, accounts receivable is typically executed by generating an invoice and either mailing or electronically delivering it to the customer, who, in turn, must pay it within an established timeframe, called credit terms or payment terms."***

Seller business interacts with various businesses and sells goods to all of them at various times. Hence, the seller business needs to keep track of the total amount it owes from all the buyers.

This involves keeping track of all invoices from all the buyers. Each invoice will have various important fields like a payment due date, invoice date, invoice amount, baseline date etc.

The buyer business needs to clear its amount due before the due date. However, in real-world scenarios , the invoices are not always cleared ie. paid in full amount in one go. Instead, they get paid in installments. These installments are known as **partial payments**.

Account receivables Department:

1. In the ideal world, the buyer business should payback within the stipulated time (ie the **Payment Term**). However, in the real world, the buyer business seldom pays within their established time frame, and this is where the Account receivables Department comes into picture.
2. Every business consists of a dedicated Account receivables Department to collect and track payment of invoices.
3. It consists of a Account receivables team that is responsible for:

- Collecting payments from customers for their past due invoices
- Sending reminders and follow ups to the customers for payments to be made
- Looking after the entire process of getting the cash inflow
- Help the company get paid for the services and products supplied.

For example:
Let's suppose Walmart wishes to add 20,000 Nike shoes to its sports department. Now, Walmart becomes the buyer business whereas Nike is the seller business. Since this is B2B, the business is done on credit.

After successful delivery of the shoes, Nike establishes a Payment term within which Walmart must pay it's total open amount, let's suppose $1.2M.

If Walmart is unable to pay within the decided payment term, it becomes the duty of the Account receivables department of Nike to follow up and get Walmart to pay the outstanding amount.

Professor - Digital Assistant:

- Most of you will be familiar with the digital assistants such as Apple's Siri, Amazon's Alexa and so many more. Professor is HighRadius's own AI enabled digital assistant.
- It is capable of answering questions and helping with work just like a knowledgeable colleague, or a reliable resource.
- Before following up with the customers, a Account receivables analyst has to prepare for the call where he's required to search through heaps of data, pulling up reports from multiple resources, analysing the data to find relevant information and so on.A lot of time is spent searching for a specific set of customer information (eg. Invoice details, open amount, payment history, deduction amount etc) before he makes a call. Professor basically helps you get quick answers and perform analytics to speed up this process.
- In this part of the internship, you will be building a basic Professor chatbot model that is capable of providing insightful answers to simple Account receivables domain questions.

Problem Statement for ML Model

The objective of the first half of the summer internship project is:

- To build a Machine Learning Model to **predict the first partial payment amount of an invoice** when it gets created in the system.
- **Categorize** the payment type **as fully paid or partially paid**.
- Create a **Account receivables digital assistant** - Professor.

You will be receiving an invoices dataset that contains the past payment information and behaviour of various buyers. Based on the previous payment patterns, the ML model needs to predict what will be the first payment amount made by the customer.

For example:

Invoice No	Paid Date	Actual Open Amt($)	Installment	Paid Amt($)	Invoice Type
1001	3/12/2020	900	First (I1)	400	Partially Paid
1001	10/12/2020	500	Second(I2)	200	Partially Paid
1001	17/12/2020	300	Third(I3)	300	Fully Paid

In this example, the single invoice (1001) gets paid in three installments. The total amount to be paid for the invoice is $900. In the first installment $400 gets paid. In the second $200 and finally $300 is paid to clear the invoice.

So the objective is to predict the first installment amount for any invoice. In this case it's $400.

If the predicted first partial payment amount is equal to the total amount due, the invoice is categorized as **fully paid**. If the predicted payment amount is less than the total amount due, the invoice needs to be categorized as **partially paid**.

You will also be building a **Account receivables chatbot** that will be trained on the specific aspects of the Account receivables domain. The chatbot will be able to answer domain specific questions related to the Account receivables department.

HIGH LEVEL REQUIREMENTS OF APPLICATION

Specifically, below are the major aspects of the application that needs to be developed. The details for each of the below is provided in the functional overview section.

1. **Invoices Dataset:**
    a. HighRadius will provide you a **invoices dataset** which you need to parse and process.
2. **AI Support in the application:**
    a. Add support for predicting the first partial payment amount for invoice(s).
    b. UI should have a button to trigger the prediction of payment amount.
    c. Payment amount needs to be persisted across sessions in the UI.
3. **Professor Chatbot Window:**
    a. Build a chatbot agent Professor.
    b. Train the chatbot with intents and variants related to Account receivables use case.

FUNCTIONAL OVERVIEW

(1) Invoices Dataset:

Below is the sample CSV file screenshot.

account_id	document_numb	company_code	fiscal_year	branch	customer_numbe	fk_customer_ma	document_date_	baseline_date_n	due_date_
60	20000950	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20000950	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20000950	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20000950	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20000870	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20000870	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20000870	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20000870	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20001004	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20001004	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20001004	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20001004	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20000831	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20000831	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20000831	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20000831	\N	\N	\N	999888	-1	05-04-16	\N	\N
60	20103019	\N	\N	\N	999888	-1	11-04-16	\N	\N
60	20103019	\N	\N	\N	999888	-1	11-04-16	\N	\N
60	20103019	\N	\N	\N	999888	-1	11-04-16	\N	\N
60	20103019	\N	\N	\N	999888	-1	11-04-16	\N	\N
60	20000972	\N	\N	\N	999888	-1	05-04-16	\N	\N

List of all the fields part of dataset are as follows:

- Company ID
- Document Number
- Business Code
- Create Year
- Branch
- Customer Number
- Customer Map ID
- Document Create Date
- Baseline Create Date
- Due In Date
- Invoice ID
- Total Open Amount
- Customer Payment Terms

- Clear Date
- Is Open Invoice
- Order Type Indicator
- Order Create Date
- Area Of Business
- Shipping Date
- Job Key
- Taxation Amt
- Dispute Amount
- Shipping To
- Doc Id
- Document Create Date
- Actual Amount Outstanding
- Customer Name
- Age of Invoice
- Dispute Valid Status
- Total Retainage Amount
- Posting ID
- Strategy ID
- Display Currency
- Debit Credit Status
- Valid Amount Outstnding

Refer to this link for detailed description of column headers.

(2) AI Prediction of partial payment amount:

1. As part of the problem statement, the first Partial Payment Amount of an invoice will be predicted.
2. The **Predict button** will be located towards the right and over the invoices grid.
3. Clicking on the Predict button will populate the **Predicted Payment Type and Predicted Amount** column of the grid with the predicted values derived from the ML model.

(3) Professor Chatbot Window:

- You will also be building the Professor chatbot component as part of the internship project
- The Professor icon will be displayed at the top right corner of the screen and will remain static throughout.
- The chatbot will be able to give Account receivables domain specific answers to the user.

Example:

User (types in) : Show me the total amount due for Walmart.

Professor : I found that Walmart has a total of $1.2M amount past due.

Week Wise Objective

1. **Week 1**: Business Overview, Introduction to Python & it's libraries, Statistics for Data Science, Feature Engineering & Feature Selection, Introduction to Scikit-Learn, Understanding Machine Learning Algorithms & Problem Statement Solving
2. **Week 2:** Problem Statement Solving, Introduction to Dialogflow, Understanding Agents, Entity, Contexts, Responses and Text Analysis

Glossary

1. Invoice - A document which is issued by a seller to a buyer when some goods are purchased. The fields which can be part of the invoice are defined below
2. Open Invoice - Invoices which are not cleared (payment not done) are called Open Invoices.
3. Closed Invoice - Invoices which are cleared (payment done) are called Closed Invoices.
4. B2B - Business to Business
5. B2C- Business to Consumer
6. C2C - Consumer to Consumer
7. Payment Terms - These indicate the period within which payments should be made and how. These terms are usually included in the invoices generated by companies and sent to customers.Eg Net 30, Net 60