Certainly! I can explain the "AI-Driven Customer Service Reminder System" project from your perspective, using "My" as requested.

**My AI-Driven Customer Service Reminder System**

My capstone project, titled "AI-Driven Customer Service Reminder System," is designed to **automate and personalise vehicle service reminders and customer communications** for automotive dealerships and service networks. It covers the **entire process from data handling to model deployment**, leveraging advanced data science and machine learning workflows.

**My Project Overview and Key Features**

This project provides an end-to-end solution for predictive maintenance and customer engagement within the automotive after-sales domain. I analyse various customer and vehicle data points to **proactively identify service needs, predict future costs, segment customers, and generate tailored communication strategies**.

My key features and capabilities include:

* **Comprehensive Data Collection:** I gather and consolidate both **structured data** (e.g., purchase year, odometer readings, warranty/insurance status, last service details, communication history from CSV files) and **unstructured data** (free-text customer feedback).
* **Robust Data Preprocessing:** I perform several crucial steps to prepare the data:
  + **Missing value handling**, data type conversion, and outlier filtering.
  + **Feature engineering** to create insightful variables such as age\_of\_vehicle, odometer\_reading, last\_service\_kms, and avg\_kms\_per\_month.
  + Encoding of categorical features (e.g., customer\_type, AMC\_status).
  + Generating **sentiment features** from customer feedback using sentiment analysis.
  + I utilise libraries like **pandas, numpy, scikit-learn, and textblob** for these tasks.
* **Exploratory Data Analysis (EDA):** I visualise distributions of numeric features, identify relationships between variables (e.g., last\_service\_cost vs. age), and detect feature importances for modelling.
* **Advanced Machine Learning Models:** My project leverages three types of AI models:
  + **Classification Models:**
    - **Purpose:** These models **predict if a customer's vehicle requires urgent service within the next 120 days** based on vehicle usage, history, and customer behaviour.
    - **Features Used:** I use features like age\_of\_vehicle, odometer\_reading, last\_service\_kms, avg\_kms\_per\_month, next\_service\_due\_kms, last\_service\_cost, insurance\_status, fuel\_type, transmission, customer\_type, feedback\_score, customer\_feedback, AMC\_status, and number\_of\_services. Raw text customer feedback is processed using **TF-IDF vectorisation**.
    - **Techniques:** I employ supervised classification algorithms such as **RandomForestClassifier, GradientBoostingClassifier, and LogisticRegression**, often within pipelines that include StandardScaler for numeric features and OneHotEncoder for categorical features.
    - **Output:** The models generate predictions and confidence scores, providing a list of customers needing urgent service, along with their predicted urgency/segment.
    - **Business Value:** This capability directly supports **proactive service reminders**, helps in churn reduction, enables personalised marketing campaigns, and optimises call-centre operations by focusing efforts on high-priority customers.
  + **Regression Models:**
    - **Purpose:** These models predict **continuous numerical values**, such as the **next service cost, the number of days until the next service is needed, and Customer Lifetime Value (CLTV)**.
    - **Business Value:** This helps in **predictive maintenance** (knowing what expensive services are coming), **financial forecasting**, and **warranty/AMC planning**.
  + **Clustering Models (Unsupervised):**
    - **Purpose:** These models perform **unsupervised grouping of customers or vehicles into segments** based on similar characteristics without predefined labels.
    - **Characteristics Used:** I cluster customers based on driving behaviour, service spend patterns, feedback sentiment (extracted from customer feedback), and service regularity.
    - **Business Value:** Clustering is vital for **customer profiling**, helping to understand distinct customer personas (e.g., "price-sensitive & regular," "premium, late responders"). This understanding allows for **better product bundling and targeted offers**.
* **Intelligent Customer Segmentation:** I label each customer into specific segments (e.g., **Critical, High Priority, Medium, Low**) based on model predictions, service due dates, and feedback scores.
* **Personalised Communication Generation:** I output **tailored reminder message templates** for each customer segment and recommend optimal communication channels (Email, WhatsApp, SMS, Phone).
* **Seamless Deployment:** The system is designed for local/server batch deployment and can be exported as a model service (Flask/FastAPI microservice or scheduled script) for integration with existing CRM systems or messaging gateways.

**My Technologies & Libraries Used**

My project primarily uses:

* **Python 3.x**
* **pandas**
* **numpy**
* **scikit-learn** (including RandomForestClassifier, GradientBoostingClassifier, SVC, LogisticRegression, StandardScaler, OneHotEncoder, ColumnTransformer, Pipeline, SimpleImputer, train\_test\_split, classification\_report, accuracy\_score, mean\_squared\_error, r2\_score, KMeans, PCA, cross\_val\_score)
* **textblob**
* **lightgbm** (lgb)
* **joblib**
* **matplotlib.pyplot** and **seaborn** for visualisations.
* **geopy.distance.geodesic** for distance calculations.

**My Deployment Instructions**

* **Local/Server Batch Deployment:** I prepare my latest customer data as a modify\_service\_df.csv file. Then, I run a Python script (e.g., 02.Classification\_04.ipynb or 02.Classification\_01.ipynb) to generate the ai\_based\_service\_reminder.csv file, which contains the tailored reminders and communication plans.
* **Model Deployment as a Service:** For continuous, automated operation in a production environment, I can export the trained pipeline model (e.g., service\_reminder\_model.pkl, Class\_service\_reminder\_model1.pkl, Class\_service\_reminder\_model\_03.pkl, Class\_service\_reminder\_model4.pkl, Class\_service\_reminder\_model5.pkl). This model expects the same features as used during training and can be deployed as a **Flask/FastAPI microservice or a scheduled script**. This service can then be integrated with existing **CRM systems or messaging gateways** to dispatch automated communications.

**My Model Performance**

My classification models within this project demonstrate **near-perfect precision and recall (1.00)** for accurately identifying urgent and high-priority customers. Typical metrics include an accuracy of **1.00**.

**My Business Value & Impact**

My AI-driven system creates significant value for automotive dealerships and service networks:

* **It increases revenue** through enhanced customer retention and effective upselling.
* **It reduces operational costs** by automating routine customer touchpoints and efficiently targeting at-risk customers.
* **It enables hyper-personalisation**, fostering stronger customer loyalty and facilitating premium service offerings.
* **It improves customer experience**, leading to reduced negative feedback and decreased churn rates.
* **It supports data-driven management**, providing insights for optimising workshop fulfilment, call centre staffing, stock management, and financial forecasting.

My capstone project demonstrates immediate value by making the after-sales journey **"smart," automated, and truly customer-centric**.