

AI-Driven Retail Customer Buying Pattern Predictor – Technical Document

Team : Cerulean

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Introduction

The **AI-Driven Retail Customer Buying Pattern Predictor** analyzes customer purchasing behavior using machine learning and Azure AI services. It assists vendors in understanding buying patterns and provides easily understandable analysis in human language, offering multilingual support while ensuring data privacy and security.

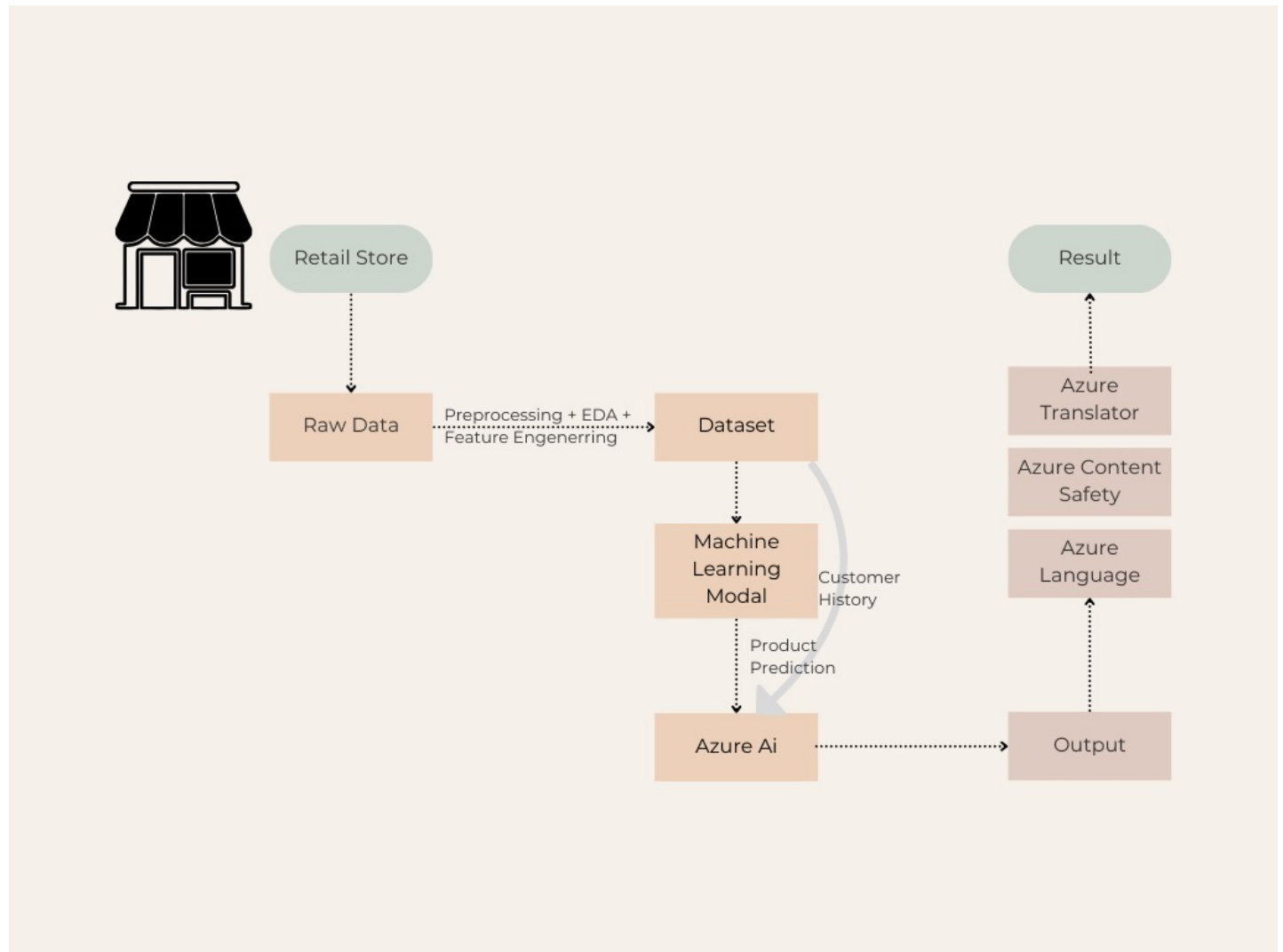
Objectives:

- Predict purchase probabilities based on browsing & order history.
- Provide easy-to-understand trend analysis.
- Ensure privacy safeguarding and content safety using Azure AI Services.
- Provide multilingual support for wider accessibility.

- Deploy as a web-based dashboard for real-time analytics.

System Architecture & Data Flow

Data Flow Overview:



Detailed Steps:

1. **Data Extraction:** Orders and online customer behavior data fetched from GitHub.
2. **Data Preprocessing & Feature Engineering:** Cleaning, normalization, and feature extraction.
3. **Model Training (Random Forest Classifier):** Outputs probability of purchase for each category.
4. **Azure AI Services Integration:**
 - **Azure Content Safety:** Ensures personal data security.
 - **Azure OpenAI API:** Provides analytics & insights.
 - **Azure Translator:** Enables multilingual support.
 - **Azure Language Services:** Ensures no personal data leakage.
5. **Deployment:**
 - Web frontend built using Flask & Bootstrap.

Azure AI Services Integration

Data Flow Overview:



Microsoft
Translator
API



Content safety



Language Service

- **Azure Content Safety:** Ensures no personal data leaks & filters offensive content.
- **Azure OpenAI API:** Provides detailed purchase behavior insights.
- **Azure Translator:** Enables multilingual analytics support.
- **Azure Language Services:** Ensures data privacy and security.

Step-by-Step Deployment Guide

Prerequisites:

- Install Python 3.x

- Set up Azure AI Services API keys
- Install dependencies:

```
pip install -r requirements.txt
```

Deployment Steps:

1. Clone the Repository:

```
git clone https://github.com/gaurav96931/Retail-Marketing-Insights.git
```

2. Run the Backend:

```
python app.py
```

3. Access the Web Application: Open <http://localhost:5000>

Testing & Evaluation

Testing Methodology:

- **Classification Report:** Accuracy, F1-score, Recall, Precision.
- **AUC-ROC Curve Analysis.**
- **User Acceptance Testing (UAT):** Confirms usability for vendors.

Results Summary:

- **Model Accuracy:** 81% in predicting the most likely product category to be bought.
- **Average ROC Curve Area:** 0.6
- **Multilingual support:** Works seamlessly across multiple languages.

Challenges Faced

- **Privacy concerns:** Used Azure Content Safety.
- **Data Interpretation :** The dataset was a bit vague hence we had to do a lot data visualisation and eda to understand it fully.
- **Integration of Various Features:** Referred to documentation and reviewed the codes repeatedl.

Future Improvements

Upcoming Enhancements:

- **Deep Learning Implementation:** Utilize Azure ML Services for advanced modeling.
 - **Improved UI/UX:** Enhance frontend with React or Vue.js.
 - **Scalability:** Deploy using Kubernetes for large-scale vendor support.
 - **Voice Integration:** Enable vendors to query insights using Azure Speech Services.
 - **Recommendation System:** Provide real-time product recommendations.
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