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Contents

[Problem description 3](#_Toc197639033)

[Business understanding 3](#_Toc197639034)

[Project lifecycle along with deadline 3](#_Toc197639035)

# Week-7

# Problem description

**ABC Pharma** wants to understand patient **drug persistency**—whether patients continue to take their medications as prescribed by physicians. The goal is to build a **machine learning model** that predicts persistency using patient demographics, clinical history, risk factors, and treatment behavior. Automating this process will help physicians and the pharma company improve adherence strategies and personalize patient interventions.

# Business understanding

The business objective of this project is to improve drug adherence by identifying patients who are at risk of non-persistence. This initiative aims to reduce costs associated with non-adherence, enhance patient health outcomes, and enable more effective targeting of patient support programs. Key stakeholders include the pharmaceutical company ABC Pharma, the data science team, and healthcare providers. The success of the project will be measured by the development of a predictive model that demonstrates high recall and precision in identifying non-persistent patients, along with sufficient model explainability to support actionable clinical and programmatic interventions.

# Project lifecycle along with deadline

|  |  |
| --- | --- |
| Phase | Task |
| Week 8 | EDA, cleaning, preprocessing |
| Week 9 | Feature engineering, modeling |
| Week 10 | Model tuning, evaluation |
| Week 11 | Deployment |
| Week 12 | reporting |

# Week-8

# Type of data have got for analysis

The dataset consists primarily of **categorical and binary features** collected from patients, along with one key numerical column:

* **Categorical features** include demographic information such as Gender, Race, Ethnicity, Region, Age\_Bucket, and clinical details like Ntm\_Speciality, Ntm\_Specialist\_Flag, and bucketed scores.
* **Binary features** (e.g., risk factors, comorbidities) are represented by "Y"/"N" values and indicate presence or absence of certain medical conditions or risk factors.
* **Numerical features** are minimal; a key example is Count\_Of\_Risks, which is an actual integer count.
* The target variable is Persistency\_Flag, which is binary and classifies patients as Persistent or Non-Persistent with their medications.

# Problems in the data

**Missing Values (NA):**  
Upon inspection, the dataset does **not contain any missing values** (nulls). This is ideal and suggests a pre-cleaned or high-quality data source.

**Outliers:**  
While most columns are categorical or binary (where outliers do not apply), numeric features like Count\_Of\_Risks and Change\_T\_Score may contain **extreme values**.  
These outliers can disproportionately influence models like logistic regression or linear models, so identifying and treating them is important.

**Skewed Features:**  
Some categorical features may be **highly imbalanced**. For example, certain regions, age groups, or risk factors may dominate the data, potentially leading to biased model performance. Also, the target variable Persistency\_Flag should be checked for balance.

# Approaches will be trying to apply on the dataset to overcome problems

Since the dataset does not have NA values, the focus shifts to cleaning and transforming the data for model readiness:

* **Text Cleaning:**  
  Strip whitespaces and fix inconsistencies in text-based columns to avoid incorrect grouping or misclassification during encoding.
* **Binary Encoding of Y/N Columns:**  
  All Y/N columns were converted to 1 and 0, making them suitable for modeling without introducing artificial ordinal relationships.
* **Label Encoding of Categorical Columns:**  
  Non-ordinal categorical variables (e.g., Gender, Race, Region) are label encoded. This keeps the dataset compact for models that can handle categorical codes.
* **Outlier Treatment:**  
  Numerical columns like Count\_Of\_Risks are treated using the **IQR (Interquartile Range) method**. This helps cap extreme values without completely removing data, preserving data integrity while limiting influence on model performance.
* **Feature Scaling:**  
  Applied **StandardScaler** to scale numeric features. This is important for algorithms like logistic regression, SVM, and gradient boosting that are sensitive to feature magnitudes.
* **Train-Test Split and Model Pipeline:**  
  The data is split into training and test sets to prevent data leakage and allow reliable performance evaluation. A gradient boosting model is used as the final classifier, supported by explainable models like logistic regression and random forests for comparison.