**Project Report**

**Title:**

**Property Inspection Prediction Using Logistic Regression**

**Introduction:**

This project aims to predict the outcome of property inspections based on several conditions, such as the state of the roof, plumbing, and other critical systems. The primary goal is to automate decision-making for property evaluations, making the process more efficient and reliable.

**Objective:**

To develop a machine learning model that predicts whether a property passes or fails an inspection based on input features.

**Dataset Description:**

The dataset used (inspection.csv) contains information about property inspection conditions and whether the inspection was passed. Each row represents a property inspection instance with the following columns:

* **Roof condition**
* **Plumbing condition**
* **Electrical system condition**
* **Windows condition**
* **Alarm system functionality**
* **Doors condition**
* **Flooring condition**
* **Foundation condition**
* **Heating/Cooling system functionality**
* **Inspection passed (Target variable)**

The dataset was balanced to ensure equal representation of both passed and failed inspections.

**Methodology:**

1. **Data Cleaning:**
   * Balanced the dataset to avoid bias by randomly sampling an equal number of passed and failed inspection rows.
2. **Feature Engineering:**
   * Features: Conditions of various components (roof, plumbing, electrical, etc.).
   * Target: Binary classification indicating if the inspection passed (1) or failed (0).
3. **Model Selection:**
   * **Logistic Regression** was chosen for its simplicity and effectiveness in binary classification tasks.
4. **Model Training and Testing:**
   * Data split into 80% training and 20% testing sets.
   * The model was trained on the training data and evaluated using the test data.
5. **User Interaction:**
   * A predict function allows users to input the conditions of a property and predict the inspection outcome. If the inspection fails, the system lists specific reasons.

**Results:**

* **Model Accuracy:** The model achieved an accuracy of **<insert\_accuracy>** on the test data, demonstrating its ability to predict inspection outcomes effectively.

**Key Features of the Model:**

* **Interactive Prediction:**  
  Users can enter property conditions, and the system predicts whether the inspection will pass or fail.
* **Feedback for Failed Inspections:**  
  The model identifies and lists specific conditions that caused the failure.

**Conclusion and Future Work:**

The project successfully developed a predictive model for property inspections. Future improvements include:

1. Adding more features (e.g., property size, age).
2. Exploring advanced models (e.g., decision trees, random forests) for better accuracy.
3. Incorporating real-time data collection and deployment as a web application.

**References:**

* Dataset: Custom property inspection dataset (inspection.csv).
* Libraries: Pandas, Scikit-learn.