### ****Project Title:****

**AI Loan Risk Analysis and Approval Management**

### ****Objective of the AI Module:****

This AI module is designed to enhance a web-based loan management system by providing intelligent decision support through machine learning. Its primary objective is to assess the financial risk level associated with loan applications and classify them as either Low Risk, Medium Risk, or High Risk. This classification assists in improving loan approval accuracy, reducing human bias, and streamlining decision-making within the system.

### ****Dataset Description:****

The module uses a real-world dataset sourced from Kaggle, which contains anonymized information about previous loan applicants and their loan status. The dataset includes various attributes such as:

* ApplicantIncome
* LoanAmount
* Loan\_Amount\_Term
* Credit\_History
* Gender
* Marital Status
* Education
* Employment Status

These features are used to predict the likelihood of a loan being safe or risky based on past trends.

All records were preprocessed to handle missing values, normalize numeric fields, and encode categorical variables.

### ****Model Architecture and Logic:****

A Logistic Regression model was selected for its simplicity, interpretability, and suitability for binary classification problems. The model was trained using scikit-learn, and achieved an accuracy of **79.59%** on the test dataset.

Before model training, a StandardScaler was used to normalize input features. The final model and scaler were saved to disk using joblib for later reuse in prediction.

During prediction, the model assigns a risk probability score to each new loan application. This score is then mapped to one of three risk categories using predefined thresholds.

### ****Risk Score Interpretation:****

The prediction results are converted to risk categories using the following scale:

| Probability Score | Risk Category |
| --- | --- |
| 0.00 – 0.30 | Low Risk |
| 0.31 – 0.60 | Medium Risk |
| 0.61 – 1.00 | High Risk |

These thresholds were selected to balance the model’s confidence in predictions and provide a more nuanced classification rather than just binary outcomes.

### ****Integration with the Web Project:****

The AI module is intended to be integrated into a broader web programming project based on the MERN (MongoDB, Express.js, React.js, Node.js) stack. The backend will serve as the connection point between the user-submitted form and the AI module.

Upon receiving form data, the backend logic will pass the values to the AI module, which processes the inputs, generates a prediction, and returns a classified risk level. The frontend can then display the risk level to the user or use it to determine whether the loan should be approved, rejected, or flagged for manual review.

This integration allows the system to make fast and consistent decisions without requiring direct human involvement in every case.

### ****Outcome:****

The AI module delivers a clean and effective solution to evaluate loan risks in real-time. By utilizing logistic regression on financial and demographic data, it provides consistent classifications that can be used in both automated and human-assisted approval flows. Its integration into the larger web application demonstrates how machine learning can enhance everyday decision processes without requiring complex infrastructure.

This module successfully fulfills the assignment goal of embedding an AI-based feature into a full-stack web project in a meaningful, functional, and academically appropriate manner.