**Loan Approval Report**

**Introduction:**

In the financial sector, loan approvals play a pivotal role in ensuring effective credit allocation while managing risks. These decisions require a thorough evaluation of various factors, such as demographic characteristics, income levels, loan amounts, and credit history. However, the complexity of these interrelated factors often poses challenges for decision-makers.  
This project aims to analyze a dataset containing information on loan applications to uncover patterns influencing approval outcomes. By exploring key factors like income, credit history, property location, and demographics, we aim to identify the drivers behind loan approval decisions. Furthermore, the project seeks to develop a predictive model that can assist financial institutions in making more data-driven and efficient decisions, ultimately improving the overall loan approval process

**Objectives:**

1. **Missing Values Treatment**

- Investigate the impact of missing values in the dataset and strategies to handle them (e.g., imputation, removal).

2. **Demographic Insights**

- Explore how factors like gender, marital status, number of dependents, education, and employment status influence the likelihood of loan approval.

3. **Income & Loan Amount Analysis**

-Analyze the impact of applicant and co-applicant income on loan approval.

- Determine whether the loan amount requested has any correlation with income or loan approval.

4. **Credit and Loan Term Insights**

- Assess the influence of credit history and loan term on loan approval decisions.

5. **Property Area Analysis**

- Understand how the location of the property affects loan approval chances.

**Data Exploration:**

- Load and inspect the dataset.

- Dataframe information and dtypes were explored using **df.dtypes** and **df.describe().**

- The categorical columns were analyzed and explored using the **groupby** method

**Handling Missing Data:**

- Handling missing values by replacing ‘Nan’ with ‘Unknown’ and ‘0’ and converting the column according to their data types.

- The values in the **Loan\_Status** column were replaced from 'Y' to 1 and from 'N' to 0.

- Check how missing data handling affects the dataset and model performance.

**Demographic Analysis:**

- By using **barplot** explore the relationship between **Loan Approval** and **Gender**.

- By using **barplot** analyze how **Marital Status** affects **Loan Approval Rates.**

- By using **groupby** on the **Dependents** and **Loan\_Status** columns, it calculates the count of each group combination and then reshapes the resulting data with **unstack().**

- By using **barplot** investigates how **Loan** **Approval** rates vary across different **Education** **Backgrounds**

- By using **barplot** assess how **Self-Employment** status influences **Loan** **Approval** outcomes

**Income and Loan Amount Analysis:**

- Separate **boxplots** were used to examine the relationship between **Applicant** **Income** and **Loan\_Status**, as well as to analyze the impact of **Co-Applicant** **Income** on **Loan** **Approval**.

- These plots were then combined using **subplots** for better visualization and understanding

- Correlation between features was explored and visualized as a **heatmap** using seaborn

- The **groupby** method was used to compare the loan amounts requested by various demographic groups, such as **Gender**, **Marital** **Status**, and **Education** **Level**

**Credit History and Loan Term Analysis:**

- **Barplot** was used to examine the **Loan** **Approval** **Rates** for applicants with different **Credit** **Histories**

- **Barplot** was used to analyze the relationship between **Loan**\_**Amount**\_**Term** and **Loan** **Approval** **Rate**.

- A **pivot** **table** was used to examine how **Credit** **History** interacts with **Loan** **Term**.

**Property Area and Loan Approval:**

-First, **groupby** the data by **Loan** **Approval** and **Property** **Area**, then use a **barplot** to analyze the distribution of loan approvals across different property areas and check if property area affects the loan amounts requested.