**DETAILED PROJECT REPORT**

BANK CREDIT RISK PREDICTION

# **DOCUMENT VERSION CONTROL**

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**ABSTRACT**

The purpose of this project is to predict credit risk of bank South German credit data and machine learning techniques. The credit risk prediction is a critical task for banks as it helps to evaluate the creditworthiness of borrowers and mitigate the risk of default. The project aims to build a model that can accurately predict whether a loan applicant will default or not, based on a set of features such as 'status', 'duration', 'credit history, 'purpose', 'amount', 'savings', 'employment duration', 'installment rate', 'personal status sex', 'other debtors', 'present residence', 'property', 'age', 'other installment plans', 'housing', 'number credits', 'job', 'people liable', 'telephone', 'foreign worker', 'credit risk'.

In this project, we will explore various machine learning algorithms such as Xgboost, Random Forest, Bagging and Boosting to predict credit risk. The dataset used in this project contains historical loan data of bank loan applicants. The dataset includes both good and bad loans, making it suitable for training and testing the models. We will perform exploratory data analysis to gain insights into the data and preprocess the data to prepare it for the machine learning models.

We will evaluate the performance of the models using various evaluation metrics such as accuracy, precision, recall, and F1-score. We will also use ROC curve and AUC to measure the performance of the models. The best-performing model will be selected based on the evaluation metrics.

The results of this project can be used by banks and financial institutions to make informed decisions about whether to approve or reject a loan application. Accurate credit risk prediction can help banks to minimize their losses from loan defaults and improve their profitability.

# **Introduction**

**1.1 Why this DPR Document ?**

The main purpose of this DPR documentation is to add the necessary details of the project and provide the description of the machine learning model and the written code. This also provides the detailed description on how the entire project has been designed end-to-end.

Key points :

* + - Describes the design flow
    - Implementations
    - Software requirements
    - Architecture of the project

Non-functional attributes like:

• Reusability

• Portability

• Resource utilization

## **1.2 Scope**

The DPR document presents the structure of the system, such as thedatabase architecture, application architecture, and technologyarchitecture. The DPR uses non-technical to middle-technical termswhichshouldbeunderstandabletotheadministratorsofthesystem.

## **Definitions**

|  |  |
| --- | --- |
| TERM | DESCRIPTION |
| DATBASE | Collection of information |
| IDE | Integrated Development Environment |
| EDA | Exploratory Data Analysis |
| API | Application programming interface |
| KPI | Key Performance Indicator |
| VS | Visual Studio |
| AWS | Amazon web services |
| GCP | Google Cloud Platform |
| ML | Machine Leaning |

1. **GeneralDescription**

## 

## **2.1 ProductPerspective**

From a product perspective, predicting credit risk of bank project using machine learning can be seen as a valuable tool for financial institutions to better assess creditworthiness of loan applicants. The ability to accurately predict credit risk can help banks and other lending institutions minimize financial losses, reduce default rates, and improve overall profitability.

By using machine learning algorithms to analyze large amounts of historical data, the model can identify patterns and trends that may be indicative of high-risk loan applicants. This can help lenders make more informed decisions about who to approve for loans, and at what interest rates.

The product could potentially be marketed to a wide range of financial institutions, from small community banks to large multinational corporations. It could also be used to improve existing loan approval processes or integrated into new lending platforms.

One potential challenge from a product perspective is ensuring that the machine learning model is accurate and reliable. This will require ongoing data analysis and refinement of the model to ensure that it remains up-to-date and effective. It will also be important to provide clear and transparent explanations of how the model works and how it arrives at its predictions to build trust among users and avoid potential legal or ethical concerns.Overall, predicting credit risk using machine learning can be seen as a valuable product for financial institutions, offering a more accurate and efficient way to assess creditworthiness and reduce financial risks.

## **2.2 ProblemStatement**

Normally, most of the bank's wealth is obtained from providing credit loans so that a marketing bank must be able to reduce the risk of non-performing credit loans. The risk of providing loans can be minimized by studying patterns from existing lending data. One technique that you can use to solve this problem is to use data mining techniques. Data mining makes it possible to find hidden information from large data sets by way of classification.

The goal of this project, you have to build a model to predict whether the person, described by the attributes of the dataset, is a good (1) or a bad (0) credit risk

## **2.3 ProposedSolution**

The solution of the this problem statement if perform EDA on the dataset to generate meaningful insights from the data and use this data to hyper tune with appropriate machine learning algorithms which will have the maximum accuracy in predicting the credit risk. Thus creating a user interface where a user can put in the various features of the data which will in return give the credit risk is present or not.

* 1. **TechnicalRequirements**

Thesolutioncanbeacloud-basedorapplicationhostedonaninternalserver or even be hosted on a local machine. For accessing thisapplicationbelowaretheminimumrequirements:

* Goodinternetconnection.
* WebBrowser.

Fortrainingmodel,thesystemrequirementsareasfollows:

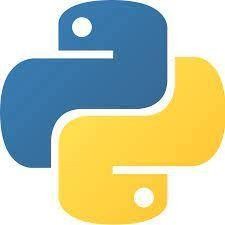
* +4GBRAMpreferred
* OperationSystem:Windows,Linux,Mac
* VisualStudioCode/Jupyternotebook/Pycharm

**2.5 DataRequirements**

Datarequirementscompletelydependsonourproblemstatement.

* Commaseparatedvalues(CSV)file.
* Inputfilefeature/fieldnamesanditssequenceshouldbefollowedasperdecided.
  1. **Tools Used**

Python programming language and frameworks such as NumPy,Pandas,Scikit-learn,Matplotlib, Seaborn and Flask areusedtobuildthewholemodel.







* Pandasisanopen-sourcePythonpackagethatiswidelyusedfordataanalysis andmachinelearning tasks.
* NumPyismostcommonlyusedpackageforscientificcomputinginPython.
* Matplotlib and Seabornareanopen-sourcedatavisualizationlibraryusedtocreateinteractiveandqualitycharts/graphs.
* Scikit-learnisusedforamachinelearning.
* Flaskisusedtobuild anAPI.
* VSCode and PycharmareusedasIDE(IntegratedDevelopmentEnvironment)
* GitHubisusedasversioncontrolsystem.
* FrontenddevelopmentisdoneusingHTML/CSS.
* Heroku, GCP, Azure, AWSareusedfordeploymentofthemodel.

**2. 7 Constraints**

Thismodelmustbeuserfriendly,asautomatedaspossibleandusersshouldnot be required toknowanyoftheworkings.

**2.8 Assumptions**

The main objective of the project is to develop an API to predict thebank credit risk using South German credit data.Machinelearning based classification models are used for predicting abovementionedcasesontheinputdata.

* 1. **DesignDetails**

## **3.1ProcessFlow**



## **EventLog**

Thesystemshouldlogeveryeventsothattheuserwillknowwhatprocessis running internally.

**InitialStep-By-StepDescription:**

* + - Thesystemidentifiesatwhatsteploggingrequired.
    - Thesystemshouldbeabletologeachandeverysystemflow.
    - Developercanchooseloggingmethod.Youcanchoosedatabaselogging.

Systemshouldnothangoutevenafterusingsomanyloggings.

# **Performance**

## 

## **4.1 Reusability**

The entire solution will be done in modular fashion and will be APIoriented.So,inthecaseofthescalingtheapplication,thecomponentsarecompletelyreusable.

## **ApplicationCompatibility**

Theinteractionwiththeapplicationisdonethroughthedesigneduserinterface,whichtheendusercanaccessthroughanywebbrowser.

## **4.3 Deployment**





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**6.0Conclusion**

In conclusion, the use of machine learning algorithms to predict credit risk in banks has shown promising results. By analyzing various factors such as credit history, income, employment status, and others, these models can accurately predict the likelihood of a borrower defaulting on a loan.

This project has demonstrated the effectiveness of using XGBoost and Random Forest algorithms to predict credit risk with high accuracy. The feature importance analysis has also provided valuable insights into the most important factors affecting credit risk.

The implementation of this project can help banks and financial institutions in making informed decisions about lending and risk management. It can also aid in reducing the risk of default and improving the overall financial stability of the institution.

However, it is important to note that the accuracy of these models can be affected by various factors such as the quality and quantity of data, feature engineering, and model selection. Thus, ongoing monitoring and refinement of these models are crucial to ensure their effectiveness and reliability in predicting credit risk.