

Project Summary

Batch details	PGPDSE FT OCT_22
Team members	AAYUSH GUPTA, AMBUJ GARG, VATSALA SAHU, VIKASH KUMAR, SHRUTI KUMARI
Domain of Project	FINANCE
Proposed project title	PAY-CHECK PROTECTION PROGRAM (PPP)
Group Number	1
Team Leader	VATSALA SAHU
Mentor Name	ANKUSH BANSAL

Date:

Signature of Mentor

Signature of the Team

Leader

Table of Contents

S.N.O.	Topic	Page No
1	Overview	3-8
2	Business problem goals	9-13
3	Topic survey in depth	14-19
4	Critical assessment of topicsurvey	20-21
5	Methodology to be followed	22-29
6	References	30

Project Details

OVERVIEW



The Paycheck Protection Program (PPP) loan is a special type of loan program designed to provide financial assistance to small businesses impacted by the COVID-19 pandemic. The program was established by the US Small Business Administration (SBA) as part of the Coronavirus Aid, Relief, and Economic Security (CARES) Act, which was signed into law on March 27, 2020.

The primary purpose of the PPP loan program is to help small businesses keep their workers employed and on the payroll during the pandemic. The loan program provides funding to eligible businesses to cover their payroll costs, rent or mortgage interest payments, and utilities. This assistance is critical to businesses that have experienced a significant reduction in revenue due to the pandemic and are struggling to maintain their operations.

To receive a PPP loan, eligible businesses must apply through SBA-approved lenders. The loans are fully guaranteed by the federal government, which means that lenders can make loans to businesses with less risk. This makes the loans more accessible to small businesses that might not otherwise be able to obtain financing.

In addition to providing financial assistance, the PPP loan program also offers the potential for loan forgiveness. To be eligible for loan forgiveness, businesses must use the loan funds for eligible expenses, such as payroll, rent, and utilities, and meet certain conditions, such as maintaining their workforce levels. The loan forgiveness provision is an added incentive for businesses to participate in the program and helps ensure that the funds are being used effectively.

Overall, the PPP loan program is an important tool in the federal government's efforts to support small businesses and the economy during the COVID-19 pandemic. By providing financial assistance and the potential for loan forgiveness, the program helps businesses stay afloat and keep their workers employed.

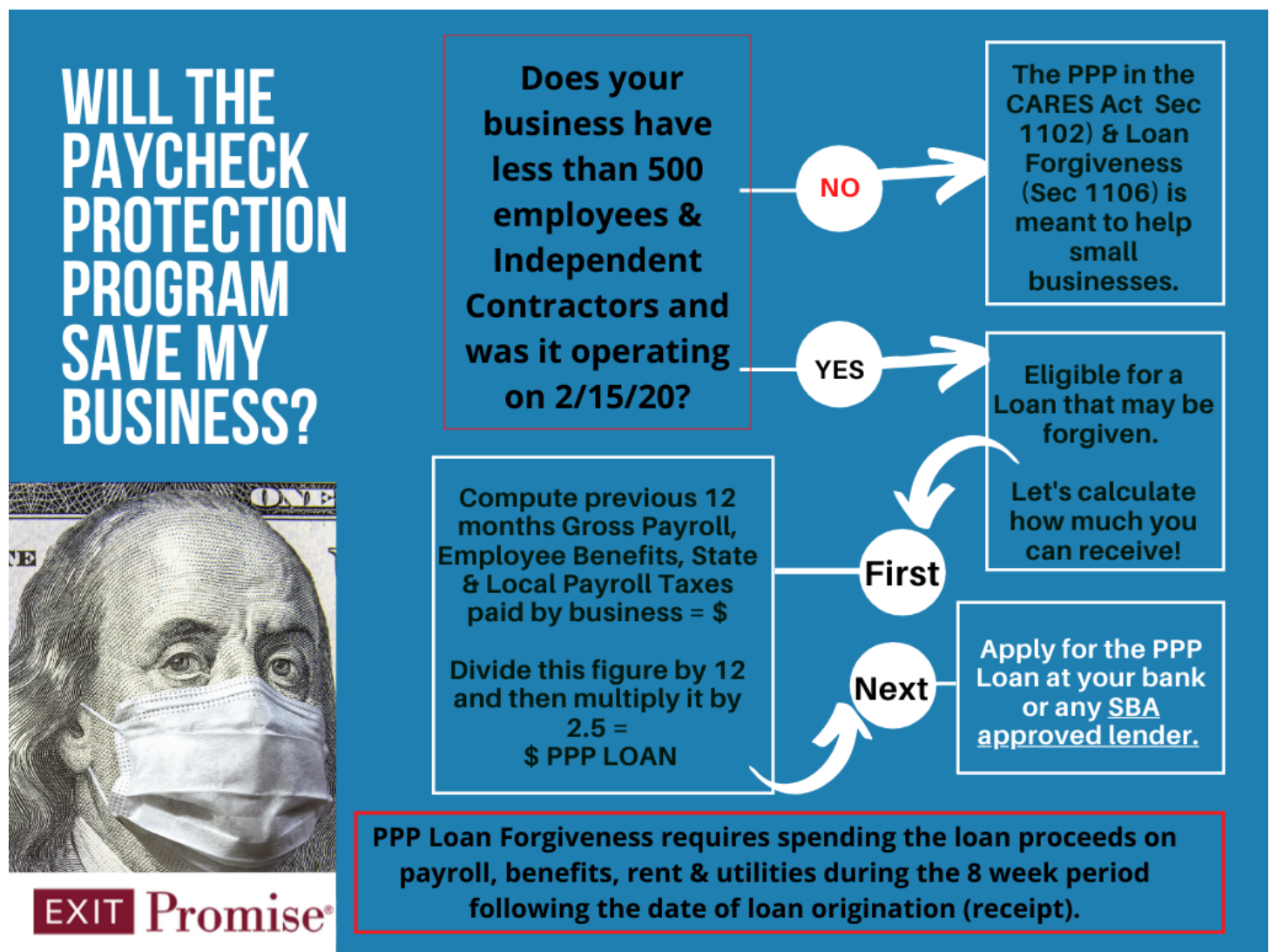


The PPP loan program was initially funded with \$349 billion, but due to the high demand for loans, an additional \$310 billion was added later. The program has been extended multiple times and now has a deadline of May 31, 2021, for applications. The program is available to small businesses with 500 or fewer employees, as well as some larger businesses in certain industries that meet specific size standards.

The amount that small businesses can receive through the PPP loan program is calculated based on their average monthly payroll costs. Generally, businesses can receive up to 2.5 times their average monthly payroll costs, up to a maximum loan amount of \$10 million. The loan proceeds can be used for payroll costs, rent, mortgage interest, and utilities, as well as other eligible expenses such as personal protective equipment (PPE) and certain operating expenses.

One of the key benefits of the PPP loan program is the potential for loan forgiveness. If small businesses use the funds for eligible expenses and meet certain criteria, they may be able to have some or all of their loan forgiven. To be eligible for loan forgiveness, businesses must maintain their employee headcount and compensation levels, as well as use at least 60% of the loan proceeds for payroll costs.

In addition to loan forgiveness, the PPP loan program has other favorable terms for borrowers. The loans have a fixed interest rate of 1%, and payments on the loan are deferred for six months, with interest accruing during that time. The loans also have no fees or prepayment penalties.



The PPP loan program has been widely used by small businesses throughout the US. As of the end of March 2021, over 8 million loans had been approved, totaling more than \$734 billion. The program has helped to support small businesses across a wide range of industries, including restaurants, hotels, retail stores, and healthcare providers.

Overall, the PPP loan program has been an important tool for providing financial assistance to small businesses during the COVID-19 pandemic. The program has helped to preserve jobs, support the economy, and ensure that small businesses can continue to operate during these challenging times.

The PPP loan program has faced some criticism and controversy since its inception. Some critics have argued that the program did not do enough to reach the smallest and most vulnerable businesses, while others have raised concerns about the potential for fraud and abuse. In response, the government has implemented additional oversight and accountability measures, including audits and investigations of loans over a certain threshold.

The PPP loan program has gone through several changes and updates since it was first introduced. For example, the program was modified to allow for more flexible use of loan funds, such as expanding the list of eligible expenses and extending the time period for using the funds.

The program has also been extended multiple times, both in terms of the application deadline and the funding available.



In addition to the PPP loan program, there are other forms of COVID-19 relief available to small businesses. For example, the Economic Injury Disaster Loan (EIDL) program provides low-interest loans to small businesses and non-profits that have been impacted by the pandemic.

There are also state and local programs available, as well as tax credits and other incentives.

While the PPP loan program has provided significant financial assistance to small businesses, it is not a panacea for all of the challenges facing these businesses during the pandemic.

Small businesses may still struggle with decreased demand, supply chain disruptions, and other operational challenges.

As such, there have been calls for additional support and relief for small businesses beyond the PPP loan program.

PAYCHECK PROTECTION PROGRAM (PPP) LOAN



**FIND AN
APPROVED LENDER AT:**

<https://www.sba.gov/funding-programs/loans/paycheck-protection-program>

**ABELES
AND
HOFFMAN
P.C.**
CERTIFIED PUBLIC ACCOUNTANTS
AND BUSINESS CONSULTANTS

INTEGRITY.
INSIGHT.
SOLUTIONS.

www.ahcpa.com



\$10 million



2 years



1.0%



6 months to 1 year



- Good faith certificate
- Verification of single source for assistance
- No collateral or personal guarantee

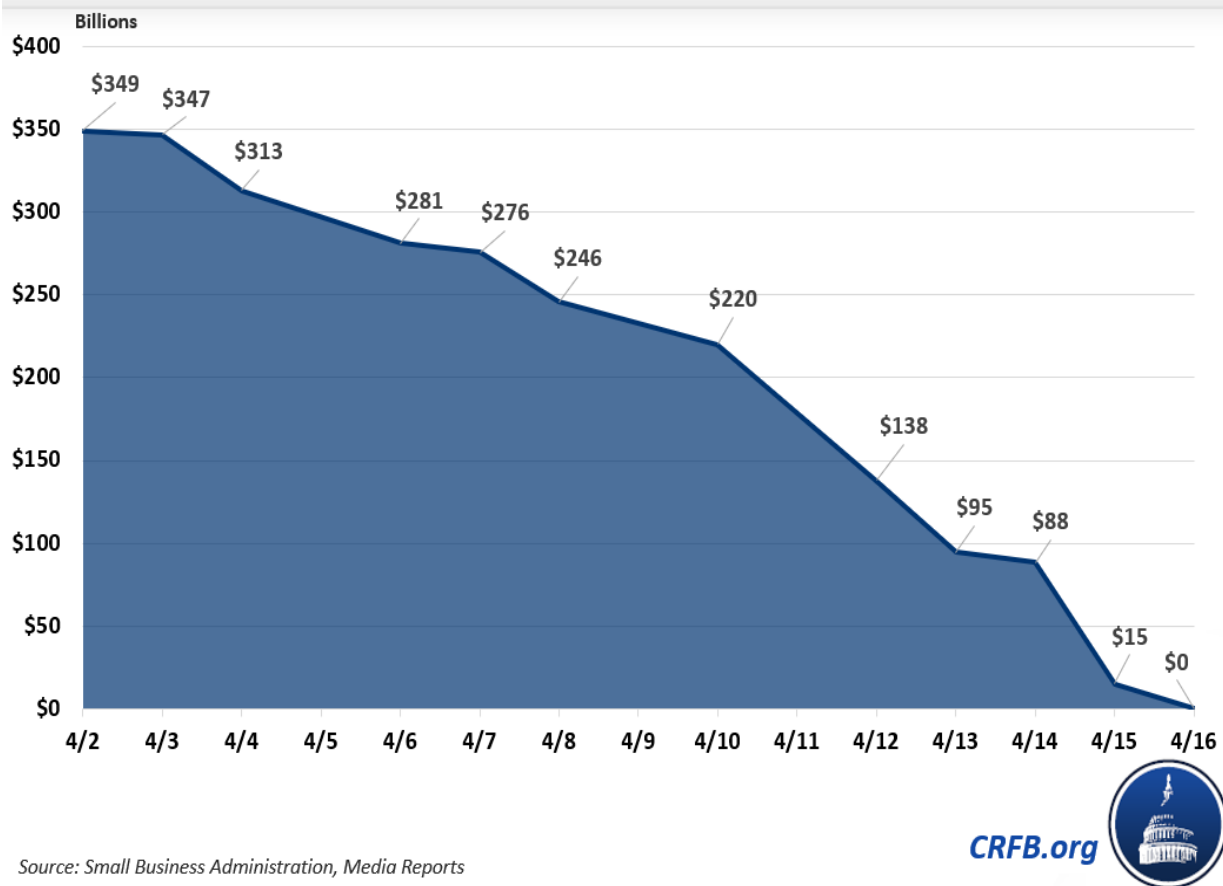


- Payroll Expenses
- Employee Salaries
- Mortgage Interest
- Rent and Certain Utilities
- Interest on debt incurred before 2/15/20

Looking ahead, the future of the PPP loan program is uncertain. While the program has been successful in providing critical support to small businesses during the pandemic, it is unclear whether the government will continue to offer this type of assistance in the long term.

As the pandemic subsides and the economy recovers, policymakers will need to consider the most effective ways to support small businesses and ensure their continued success.

Paycheck Protection Program Money Evaporated Quickly



Business problem statement (GOALS)

1. What would you achieve by this project?

- From a business point of view, it can be very helpful if one has an idea which businesses are going to utilize the loan amount efficiently. This will help businesses in sanctioning the loan of the right applicant and thus, enjoy profits and also help to maintain a healthy customer base.
- Predict the PPP currently approved loan amount for the Small Businesses.
- The objective is to develop a predictive regression model for PPP current approved loan amount.
- The model will consider essential borrower's and lender's characteristics.
- The goal is to help lenders make informed decisions and distribute funds efficiently.
- The pandemic's impact on small businesses is a key consideration.

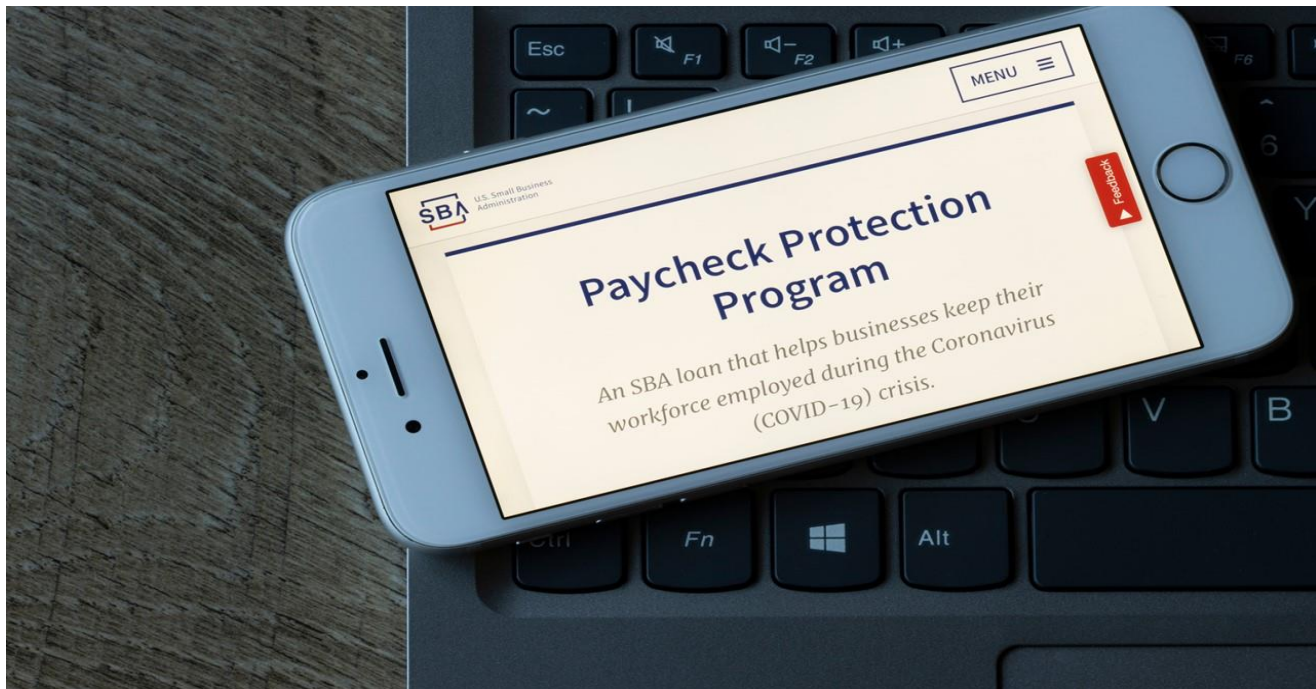


2. *How would this help the business or clients?*

- This business objective, the Machine Learning model developed shall help to determine current approved loan amount by taking into consideration essential borrower's and lender's characteristics. This will help the lenders to take informed decision and distribute the loan amount effectively and efficiently.

This will help businesses and their clients in several ways:

1. **Keeping employees on the payroll:** By providing loans to eligible businesses, the PPP loan program aims to help businesses keep their employees on the payroll during the pandemic. This can help to prevent layoffs and furloughs, which can be devastating for both employees and the businesses they work for.



2. **Covering eligible expenses:** The PPP loan program allows businesses to use the loan proceeds to cover eligible expenses such as payroll costs, rent, mortgage interest, and utilities. This can help businesses to keep their operations running during the crisis, even if they are facing reduced demand or other financial challenges.

3. **Loan forgiveness:** If businesses use the funds for eligible expenses and meet certain criteria, they may be eligible for loan forgiveness. This can help to reduce the financial burden on businesses and ensure that the funds are being used effectively.



Paycheck Protection Program
PPP Loan Forgiveness Application Form 3508S

OMB Control No. 3245-0407
 Expiration date: 10/31/2020

A BORROWER MAY USE THIS FORM ONLY IF THE BORROWER RECEIVED A PPP LOAN OF \$50,000 OR LESS.
A Borrower that, together with its affiliates, received PPP loans totaling \$2 million or greater cannot use this form.

Business Legal Name ("Borrower")	DBA or Tradename, if applicable	
Business Address	Business TIN (EIN, SSN)	Business Phone
	() -	
	Primary Contact	E-mail Address

SBA PPP Loan Number: _____

Lender PPP Loan Number: _____

PPP Loan Amount: _____

PPP Loan Disbursement Date: _____

Employees at Time of Loan Application: _____

Employees at Time of Forgiveness Application: _____

EIDL Advance Amount: _____

EIDL Application Number: _____

Forgiveness Amount: _____

4. **Supporting the economy:** By providing financial assistance to small businesses, the PPP loan program can help to support the broader economy. Small businesses are a key driver of economic growth and job creation, and by helping them to stay afloat, the PPP loan program can help to ensure that the economic impact of the pandemic is minimized.

For clients, the PPP loan program can also provide some peace of mind. If their regular business partners and service providers are able to receive PPP loans and maintain their operations, this can help to ensure continuity of service and avoid disruptions that could be harmful to clients. Additionally, if businesses are able to keep their employees on the payroll and continue to operate during the pandemic, this can help to ensure that clients are able to access the goods and services they need.



3. What is the further scope of the project?

- Automated web-based products on current approved loan amount for the finance sector.



4. Limitation of the project

- Our model is not a generalized model but a business oriented, realistic and specific, meaning needs to be calibrated and updated with time and business.

LIMITATION



TOPIC SURVEY IN BRIEF

1. Problem understanding

- Banks provide loans to the customer/Business based on criteria's which are not standardized.

~~STANDARD~~

- Under the Paycheck Protection Program (PPP) loan, banks and other lenders are responsible for making the loans to eligible businesses, while the Small Business Administration (SBA) guarantees the loans. When deciding which businesses to approve for a PPP loan, lenders will typically consider several factors, including:
- **Eligibility:** The business must meet the eligibility criteria established by the SBA, which includes factors such as size, industry, and financial need.
- **Financial information:** The lender will typically review the business's financial statements, tax returns, and other financial information to assess its ability to repay the loan.
- **Creditworthiness:** The lender may also review the business's credit history and credit score to assess its creditworthiness and ability to repay the loan.

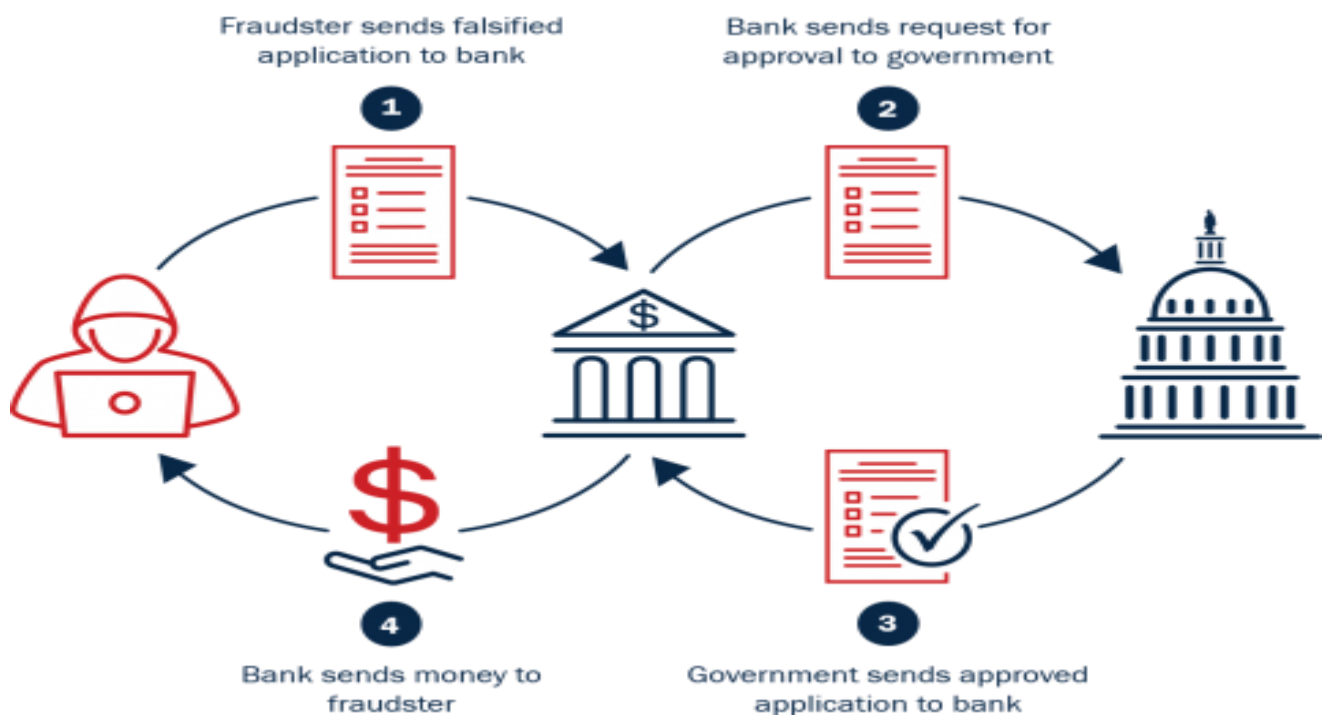
- **Business plan:** The lender may ask for a business plan or other documentation outlining how the business plans to use the loan funds and how it intends to maintain operations during the pandemic.
- **Relationship with the lender:** In some cases, a business's existing relationship with the lender may also play a role in the approval process.



It's worth noting that while the SBA has established broad eligibility criteria for the PPP loan program, lenders have some discretion in deciding which businesses to approve for loans. Additionally, lenders may have their own underwriting standards and requirements that businesses must meet in order to qualify for a PPP loan. As such, it's important for businesses to work closely with their lender and provide all the necessary information and documentation to maximize their chances of being approved for a PPP loan.

2. Current solution to the problem

- Manual intervention in lending loan to applicants, lenders may manually review loan applications and supporting documentation to ensure that they are complete and accurate, and to verify the borrower's eligibility and financial information.
- Additionally, the Small Business Administration (SBA) may conduct a manual review of certain loan applications as part of its oversight of the program. For example, the SBA may manually review loans above a certain threshold, loans made to businesses in certain industries or geographic areas, or loans made to businesses with certain ownership structures.
- It's also worth noting that there have been instances of fraud and abuse in the PPP loan program, which may require manual intervention to investigate and address. In some cases, lenders and the SBA may conduct additional due diligence or verification checks to ensure that loan funds are being used appropriately and that businesses are meeting the program's eligibility and forgiveness criteria.



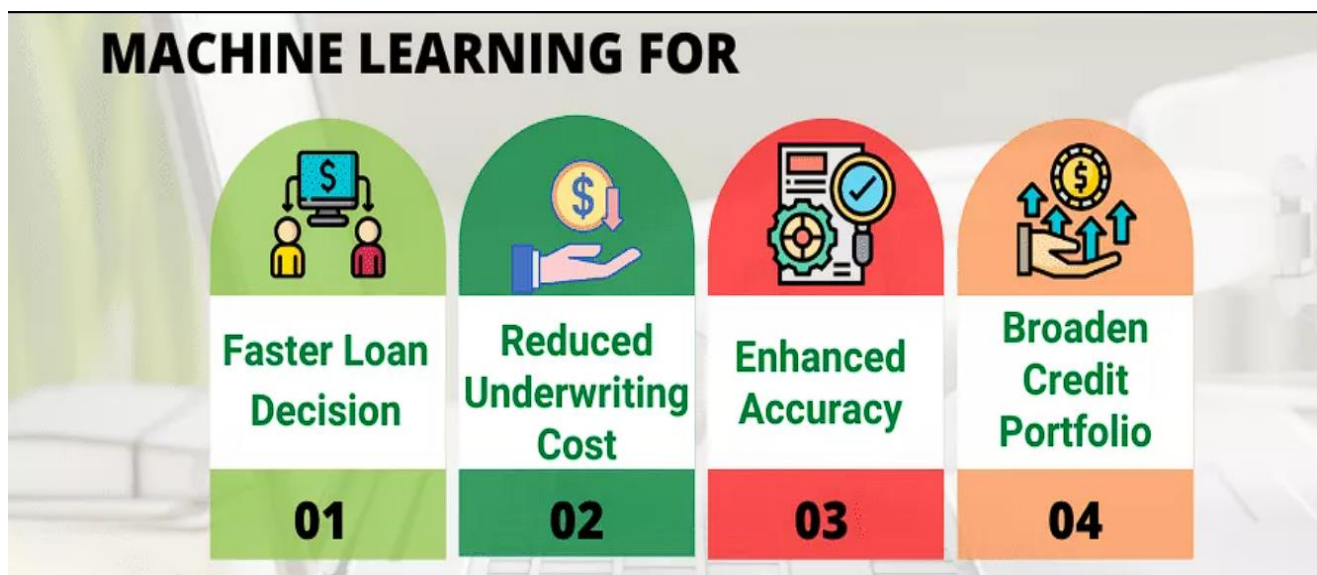
3. *Proposed solution to the problem*

- Algorithm and ML driven loan lending to deserved applicants.



- Algorithm and machine learning (ML) techniques can be used to help automate and streamline the loan application and approval process, and to help identify deserving loan applicants. Some ways in which algorithm and ML can be used in loan lending include:
 - **Predictive modeling:** Predictive modeling can be used to analyze past loan performance data and identify factors that are most predictive of loan default. This information can then be used to develop credit scoring models that can help lenders evaluate loan applications and assess creditworthiness more accurately.
 - **Automated underwriting:** Automated underwriting systems can use algorithms and ML to analyze loan applications and supporting documentation and make a recommendation on whether or not to approve the loan. This can help to speed up the approval process and reduce the need for manual intervention.
 - **Fraud detection:** ML can be used to detect patterns and anomalies in loan applications and other data sources that may indicate fraud or other suspicious activity. This can help lenders to identify and prevent fraudulent loan applications and protect against financial losses.

- **Portfolio management:** Algorithms and ML can be used to help lenders manage loan portfolios more effectively by identifying loans that are at risk of default, predicting future delinquency rates, and optimizing collection strategies.
- **Personalization:** ML techniques can be used to personalize loan offerings based on the individual borrower's credit history, financial situation, and other factors. This can help to increase loan approval rates and improve borrower satisfaction.
- Overall, the use of algorithms and ML in loan lending can help to improve efficiency, accuracy, and risk management, while also helping to identify deserving loan applicants and reduce the risk of default and fraud. However, it's important to ensure that these technologies are used responsibly and ethically, and that human oversight and intervention is still used where necessary to ensure fair and equitable lending practices.



4. Reference to the problem

- <https://www.aura.com/learn/ppp-loan-fraud>
- <https://bench.co/blog/operations/paycheck-protection-program/#lvav2>
- <https://www.wordstream.com/blog/ws/2020/04/01/cares-act-paycheck-protection-program>
- <https://www.nytimes.com/2021/06/27/business/ppp-relief-loans-blueacorn-womply.html>



CRITICAL ASSESSMENT OF TOPIC SURVEY

While the PPP loan program has provided much-needed financial assistance to small businesses during the COVID-19 pandemic, one of the main criticisms of the PPP loan program is that it was initially plagued by technical glitches and administrative issues. Many small businesses had difficulty accessing the loans due to difficulties in navigating the application process, and the program ran out of funding multiple times before additional funding was approved. There are also some criticisms of the program that are worth considering:

Accessibility: One of the main criticisms of the PPP loan program is that it has been difficult for some small businesses to access. The program has faced challenges in terms of application processing, disbursement of funds, and changing eligibility requirements. Some businesses that need the assistance the most have struggled to navigate the complex application process and secure funding.

Equity: Another criticism of the PPP loan program is that it has not been equally accessible to all businesses. For example, some larger businesses were able to secure loans intended for small businesses, while some minority-owned businesses and businesses in underserved communities were unable to access the program. This has raised concerns about equity and fairness in the distribution of funds.

Effectiveness: Some critics have raised questions about the effectiveness of the PPP loan program in achieving its intended goals. For example, there have been concerns about whether the program has actually prevented layoffs or whether it has simply delayed them. Additionally, some businesses that have received PPP loans have still had to close or lay off workers due to continued financial struggles.

Loan forgiveness: While loan forgiveness is a key feature of the PPP loan program, there have been concerns about how forgiveness will be implemented and how it will impact businesses in the long run. For example, businesses may face tax implications or other financial challenges related to loan forgiveness.

Another criticism of the program is that it has been unevenly distributed, with some businesses receiving large amounts of funding while others received little or none. Some businesses were able to secure loans even if they were not in urgent need of funds, while others were left struggling to stay afloat.

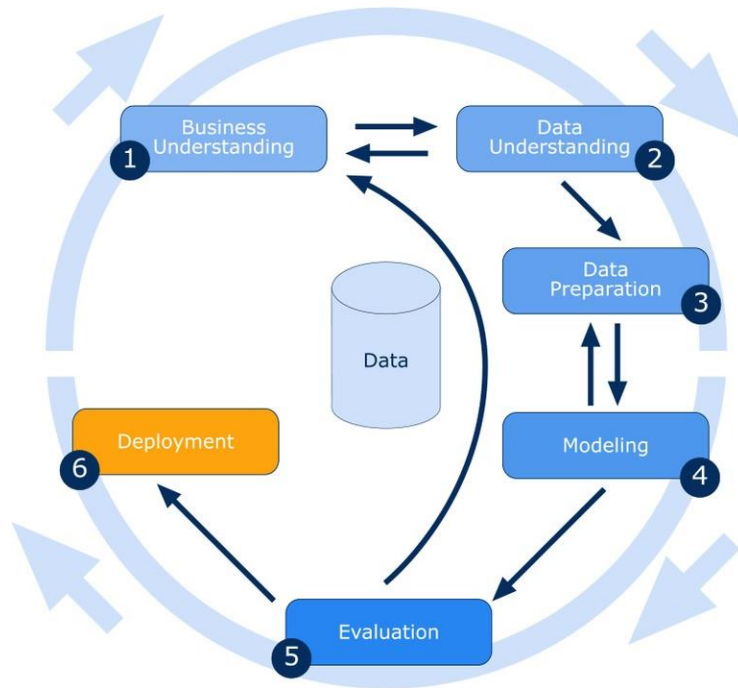
There have also been concerns about the lack of transparency and accountability in the program. Some businesses have been accused of using the loans for unauthorized purposes, and there have been reports of fraud and abuse in the program. Additionally, some have raised concerns that the program has not been effective in reaching the businesses and communities that need it most, particularly minority-owned and low-income businesses.

Despite these criticisms, the PPP loan program has also had some positive impacts. It has helped to keep millions of workers employed and has supported many small businesses that may have otherwise been forced to close their doors permanently. Additionally, the loan forgiveness provisions of the program have provided a much-needed lifeline for struggling businesses.

In conclusion, while the PPP loan program has faced some challenges and criticisms, it has also provided critical support to many small businesses during a time of unprecedented economic disruption. As the program continues to evolve and adapt, it will be important to address these challenges and ensure that the program remains effective, transparent, and equitable for all businesses and communities.



METHODOLOGY TO BE FOLLOWED (Follow 1-2-3-4-5)



1. Business Understanding:

- The Pay check Protection Program (PPP) is a government-funded loan program designed to provide financial assistance to small businesses affected by the COVID-19 pandemic. The goal of the program is to help small businesses maintain their payroll and keep their employees on the payroll during the pandemic, hence the name "Paycheck Protection".

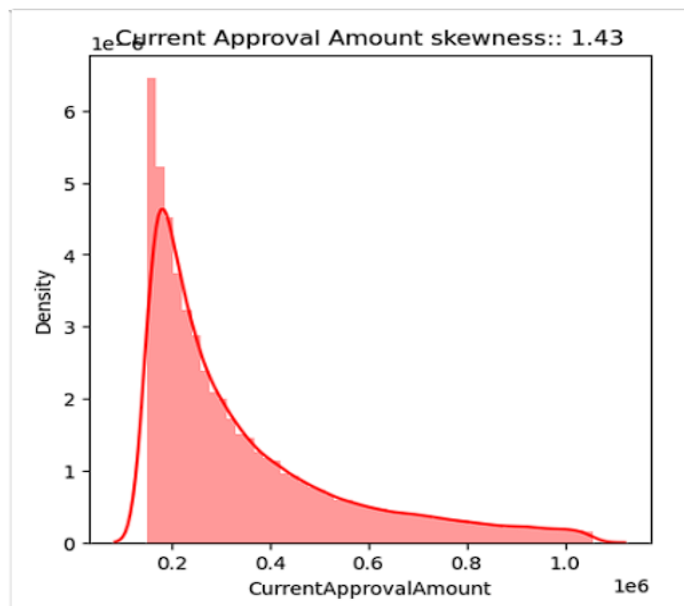
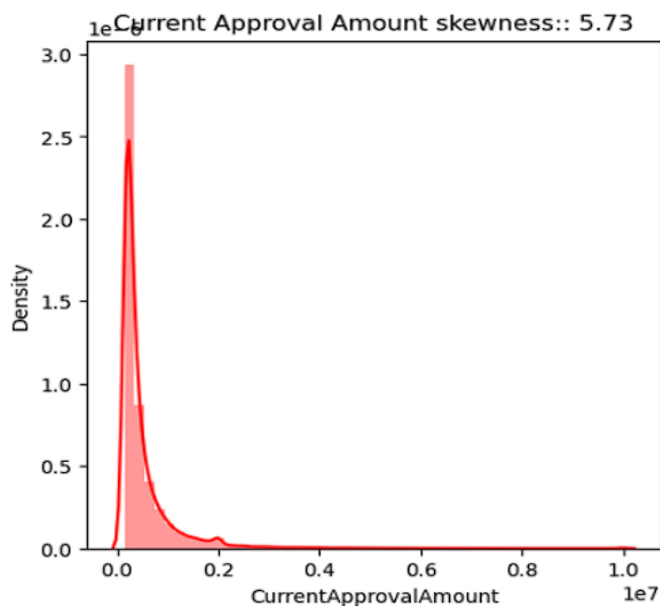
2. Data Understanding:

- The details regarding loan such as, Loan Number, Processing date and Method, the approval amounts and forgiveness amount, the loan status, loan term and loan status dates are provided regarding the loan.
- The borrower details such as the borrower businesses' name, the borrower geographical details, the number of employees working, whether it is a franchise, the project is in which city, state, and the race, ethnicity, gender, and veteran status of the business owner and whether the business is Non-Profit organization. The borrower details and Project details have high similarity. So, we would be considering just one amongst them.

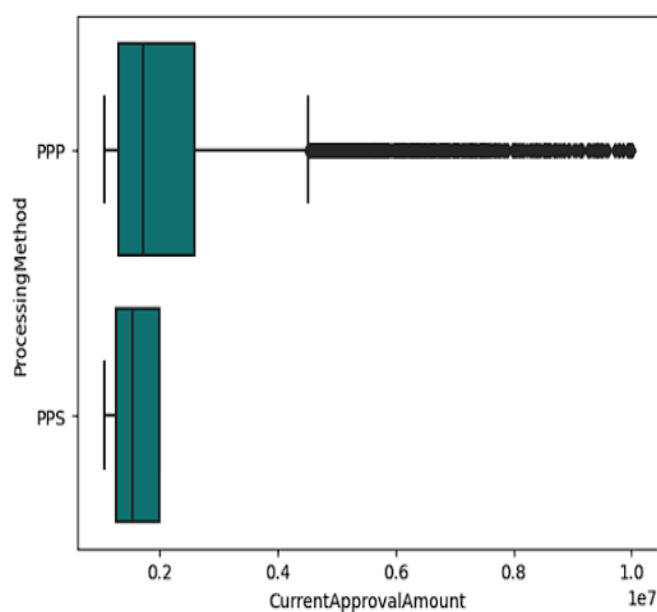
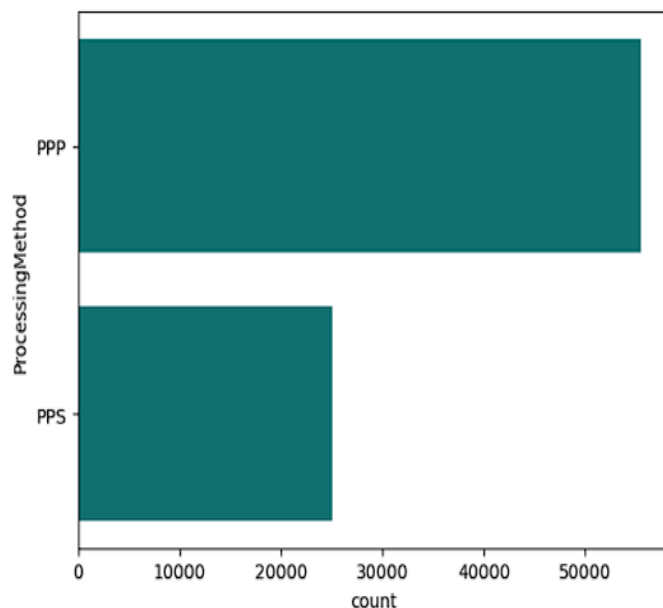
- The Lender banks details such as the Lender banks name, the geographical details, the SBA Office code, the servicing banks' details etc are given. The originating lender banks and servicing banks have almost similar values; therefore, we would be going ahead with just the originating lender records.
- The data has high number of Missing Values, Skewness i.e., the data is not normally distributed, the data has high multicollinearity which might impact the models and predictions later on.
- The Pay check Protection Program (PPP) loan data provides insight into the distribution of PPP funds and the businesses and organizations that received these funds. Here are a few key insights that can be gleaned from the PPP loan data:
 - **Business size:** The PPP loan data can show the number of small businesses that received PPP loans, as well as the size of the loans that were issued to these businesses.
 - **Term:** The term for which the borrower is borrowing the loan.
 - **Undisbursed Amount:** The amount which still remains to be disbursed to the borrower.
 - **Rural / Urban Indicator:** It indicates whether the borrower belongs to rural or an urban area.
 - **Industry distribution:** The PPP loan data can also show the distribution of loans across different industries, such as construction, retail, and hospitality.
 - **Regional distribution:** The PPP loan data can also show the distribution of loans across different regions, such as states, cities, or metropolitan areas.
 - **Loan distribution by lender:** The PPP loan data can show the distribution of loans by lender, including banks, credit unions, and non-bank lenders. Overall, the PPP loan data provides valuable information about the distribution of PPP funds and the businesses and organizations that received these funds. This information can be used to inform future policy decisions and help support small businesses and organizations impacted by the pandemic.

3. Data Preparation:

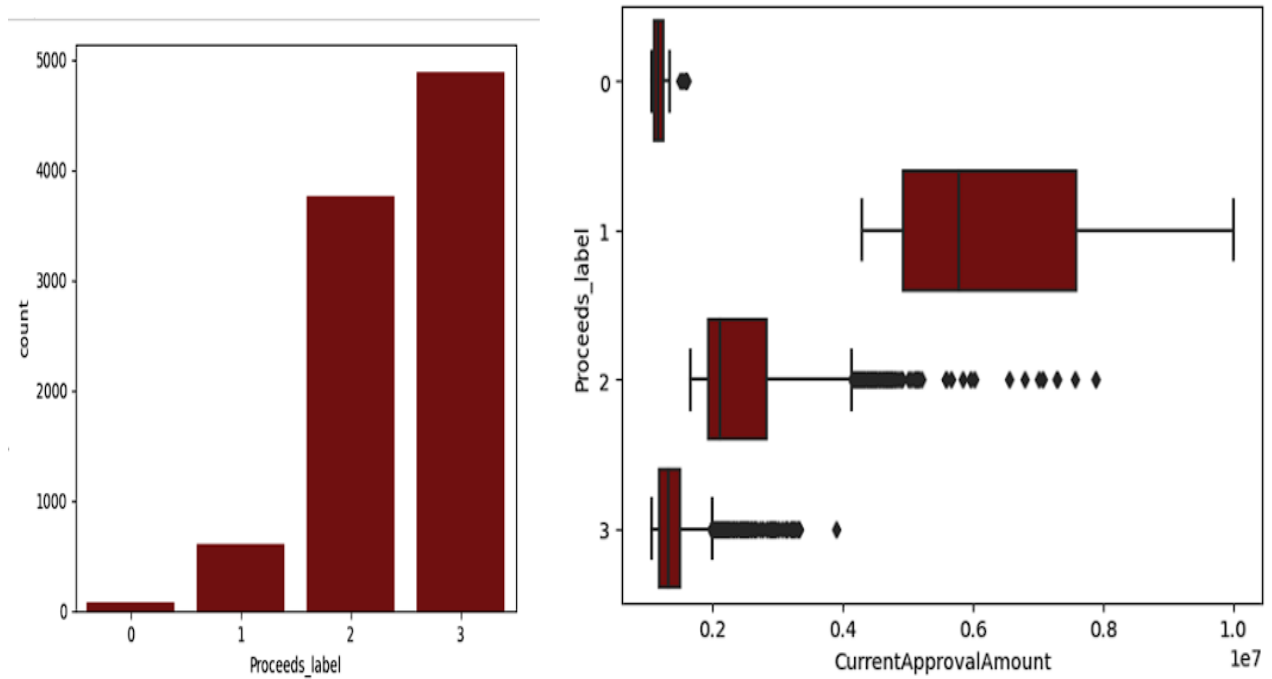
- We'll perform Exploratory Data Analysis (EDA) to calculate statistics and make figures to find trends, anomalies, patterns, or relationships within the data. The goal of EDA will be to learn what our data can tell us.



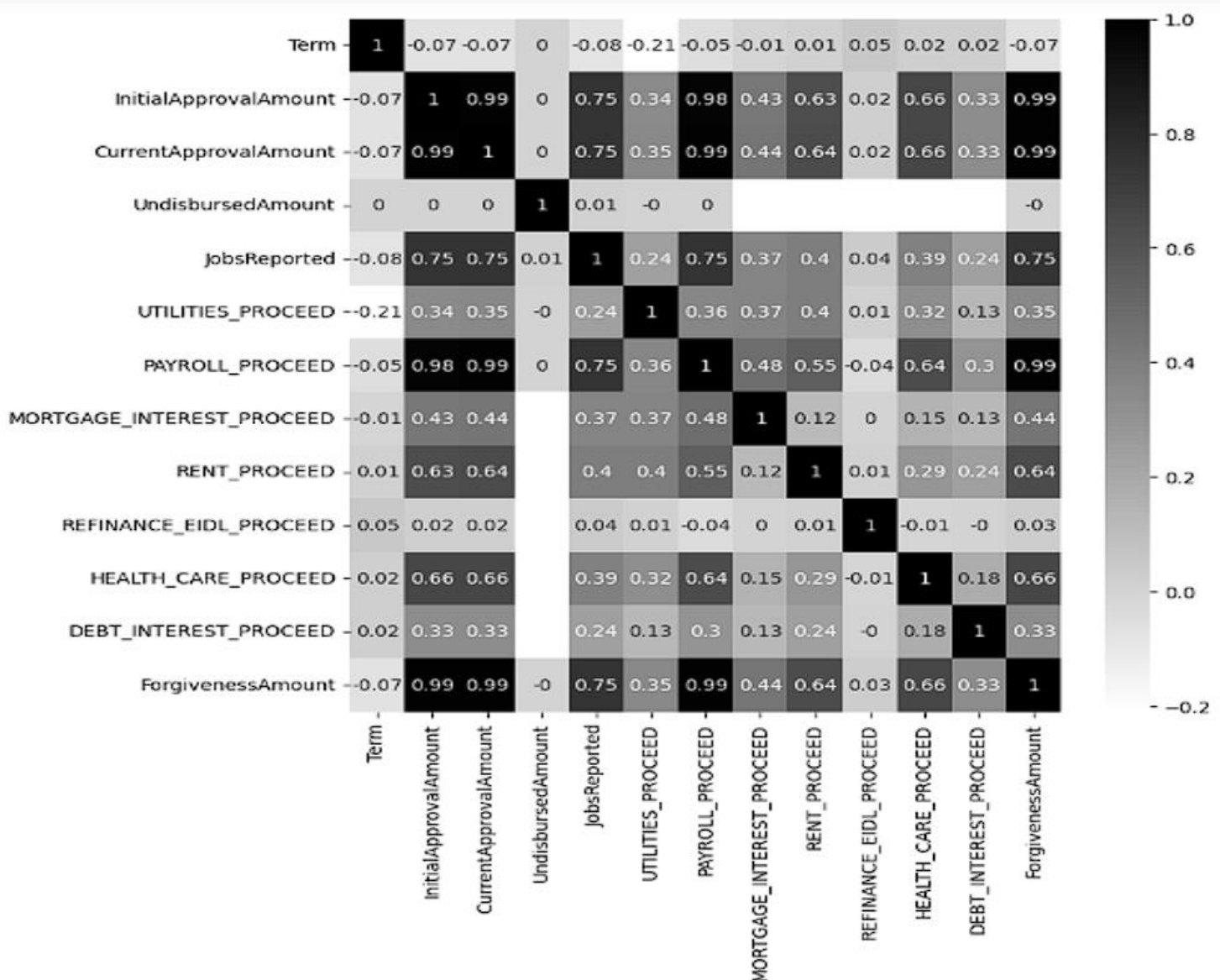
- The Target Variable: Current Approval Amount, it was highly skewed therefore it was divided into two parts, of outliers and without outliers' data.



- The loans were processed using two methods PPP and PPS. Some of the business owners had taken loan twice, therefore the processing method used was PPS.



- The maximum loans come under cluster 2 and 3, but the highest loan amount come under cluster 1, whereas the loans under cluster 1 were of the least amount.



- Most of the Predictors are highly correlated to each other, but also highly related to the Target variable. The Forgiveness amount, Payroll proceeds columns might directly explain the Target variable. The data has high multicollinearity as well.
- We'll start out with a high-level overview, then narrows in to specific areas as we find intriguing areas of the data.
- The problem of class imbalance in our data can be solved by up sampling or down sampling techniques.
- The findings may be interesting in their own right, or they can be used to inform our modelling choices, such as by helping us decide which features to use

- **FEATURE ENGINEERING:**

- Binning of Categorical columns:

- The States were binned into regions according to US Information.
- The cities were binned based on the number of loans borrowed in that city.
- The business Types were binned into three categories of Corporations, Non-Profit Organizations and others.

- Deriving New Features:

- There were 3 new features Business Sector, Business Sub Sector and Business Industry group were derived from the NAICS Code of the businesses.
- The Date, Month, Year was extracted from the Loan Approval Date and Loan Status Date, difference between these was also derived.
- The Franchise Name had a large number of missing values; therefore, it was converted as whether it is a Franchise? (Yes or no).
- From Borrower Name, we created a new column of Repeat Borrower (Yes or No) based on the number of loans the borrower had taken.
- The Forgiveness Column was Derived Based on whether the loan amount was forgiven.

4. Modelling:

- After the data is cleaned and prepared, it will be processed using either of the following Machine Learning techniques:
- **LGBM Regressor Model:** LGBM Regressor Model for Without Outliers Data, after applying all the models, the LGBM Regressor was giving the best R-sq and least RMSE value. Therefore, we tuned the LGBM Regressor model and applied Sequential Feature Selector to get a better result.

R2_Train	0.8014
R2_Test	0.7762
Adj R2 Train	0.8010
Adj R2 Test	0.7757
Train RMSE	92581.0144
Test RMSE	97267.4608

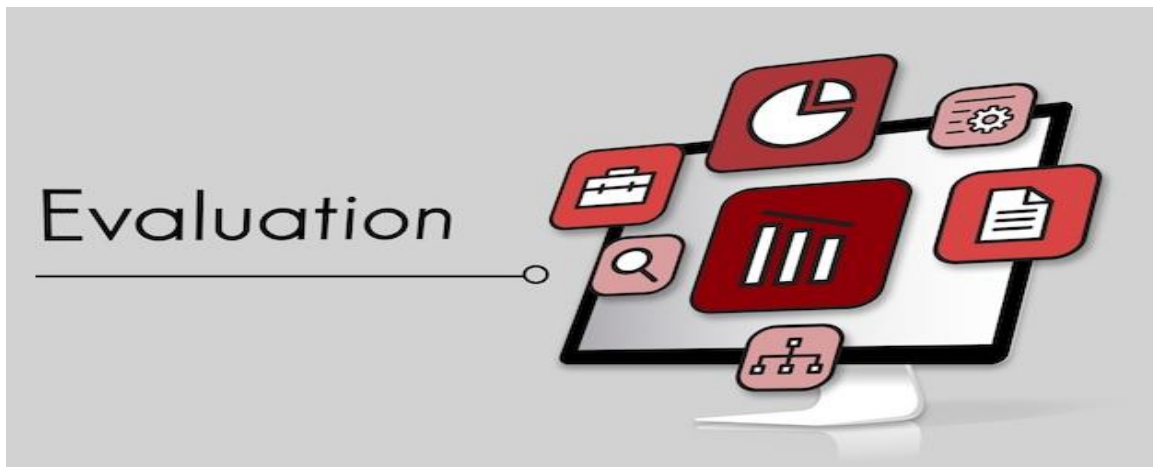
- **K-Nearest Neighbors**
- **Gradient Boosting Regressor Model** - Gradient Boosting Regressor Model for Outliers Data, after all other regression models were applied, the gradient Boosting Regressor model gave the best R-sq and least RMSE value, therefore it was tuned to get a better result.

R2_Train	0.8435
R2_Test	0.8240
Adj R2 Train	0.8424
Adj R2 Test	0.8228
Train RMSE	565966.0454
Test RMSE	588882.2483

- **Linear Regression**
- **Decision Trees**
- **Random Forest Models**
- **Neural Network**

5. Evaluation:

- Thoroughly evaluating the model and review the steps executed to construct the model to be certain it properly achieves our business objectives. A key objective is to determine if there is some important business issue that has not been sufficiently considered. At the end of this phase, final model will be created.



6. Deployment:

- Project currently doesn't involve deployment.

Reference documents of PPP

- https://en.wikipedia.org/wiki/Paycheck_Protection_Program
- <https://www.cognizant.com/us/en/industries/banking-technology-solutions/paycheck-protection-program-forgiveness-solution>
- <https://www.brookings.edu/opinions/how-to-fix-the-paycheck-protection-program-make-sure-it-actually-protects-paychecks/>
- <https://www.wsj.com/articles/how-to-fix-the-paycheck-protection-program-11590954296>
- <https://home.treasury.gov/policy-issues/coronavirus/assistance-for-small-businesses/paycheck-protection-program>
- https://en.wikipedia.org/wiki/Cross-industry_standard_process_for_data_mining

Reference Documents



Notes For Project Team

Sample Reference for Datasets (to be filled by team and mentor)

Original Owner of Data	Nick Lovejoy (Owner) CC0: PUBLIC DOMAIN
Data Set Information	Data on businesses that received money from the SBA during COVID
Previous relevant journals used the data set	-
Citation	Paycheck Protection Program Loan Data. (n.d.). Paycheck Protection Program Loan Data Kaggle. https://datasets/nflovejoy/paycheck-protection-program-loan-data
Link to Web Page	https://www.kaggle.com/datasets/nflovejoy/paycheck-protection-program-loan-data

