



Changing the Future of Agricultural Finance with Data and AI

Alex Mak



Acknowledgements



This project is done during my **data science internship** at **Agriculture Finance Services Corporation (AFSC)** in **summer 2024**, they have provided agri-finance service to Albertan farmers for over 80 years.

- I want to sincerely thank them for believing in me and giving me the chance to grow!

This project was a team project where I was working with other interns at AFSC to investigate the impact of data to the future of agricultural finance. I was also lucky enough to become the **project manager**!

- I also want to thank my teammates for being crazy with me, this project will not go far without them.

This slide focuses on the part of the project I was responsible on.

My Team

Jesse Cole



Project Sponsor

Saroj Aryal



My Supervisor / Mentor



Alex Mak (Me!)

*Data & AI
(Project Manager)*



Seth Graham

Lending / Finance



Kiana Mailloux

Human Resources



Lesley Brausse

Finance

Software Tools & Methodologies Used

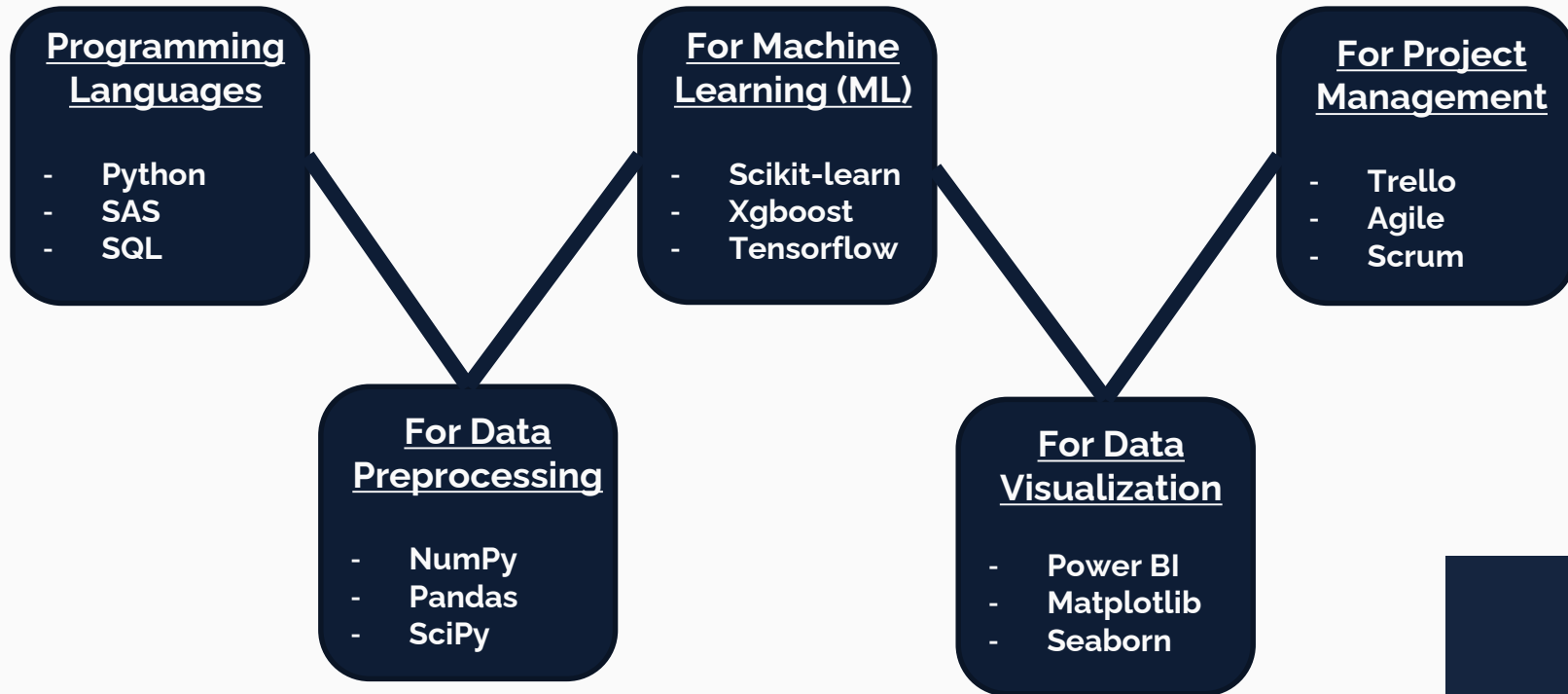


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01

Project Problem

Understanding Agriculture Finance



What is it?

Agriculture finance (also known as agri-finance) is a field that incorporates additional agricultural factors in traditional finance services.



What Areas Does it Include?

Agri-finance includes insurance, loans, risk management, investments, and many more. This project will focus on credit risk management.



What is its Difference from Finance?

Even though they are similar, traditional finance solutions does not always work well when solving agri-finance business problems. Hence, tailored data-solutions are needed!

Credit Risk Modeling



What is it?

- One of the largest risk finance corporations are exposed to
- Occurred when borrower don't pay back
- Unnecessary financial losses



Ways to Reduce it

- Identify the factors of causing loans to end in default
- Forecast the default outcome for loans
- Assess and predict risk on loans in advance



Reducing it can...

- **Avoid potential financial losses**
- **Mitigate exposable risk**
- **Improve customer trust**



Manage Credit Risk = Maximize Profit & Revenue in a Controlled Risk Environment

02

Project Objectives



Four Major Objectives

1

Finding Key Factors of Causing Loans to Default

Of course, using data

(data preprocessing, exploratory data analysis, prescriptive analytics, descriptive analytics)

2

Forecast the Default Outcomes for Loans

With data & AI-driven credit risk models

(data science, predictive modeling)

3

Explore Ways to Improve the Predicted Outcome

Using statistical machine-learning methods

- Data resampling techniques
- Explainable AI (XAI)

(machine learning, deep learning)

4

Extract, Visualize, Report Actionable Insights

Includes a capstone project report that investigates the application of data-driven decision-making in the agri-finance sector

(data reporting, visualization, and storytelling)

Project Steps

Machine-Learning Model Development

- Decision Tree
- Random Forest
- Xgboost
- Xgboost Random Forest
- Neural Networks

Data Collection
From Databases &
External Sources

Used **Clustering**
Technique to Replace
Some Missing Data

Implement Advanced
ML techniques to Further
Improve Findings



Data Preprocessing

- Data Cleaning
- Data Imputation
- Data Transformation

Exploratory Data
Analysis (EDA)
&
Feature
Engineering

Optimized Machine
Learning Models
with
Semi-Automated
Pipeline

Report Findings and
Insights with
Power BI Dashboards



03

Technical Findings

Key Findings

1

Identified **4 key factors** that impact loans' default outcome
(accrued interest, arrear interest, total amount due, proportion of remaining payment)

2

Built models that predict the **default outcomes of 97.5% of loans**

3

Improved anomaly (default loan) detection by **6.5%**

4

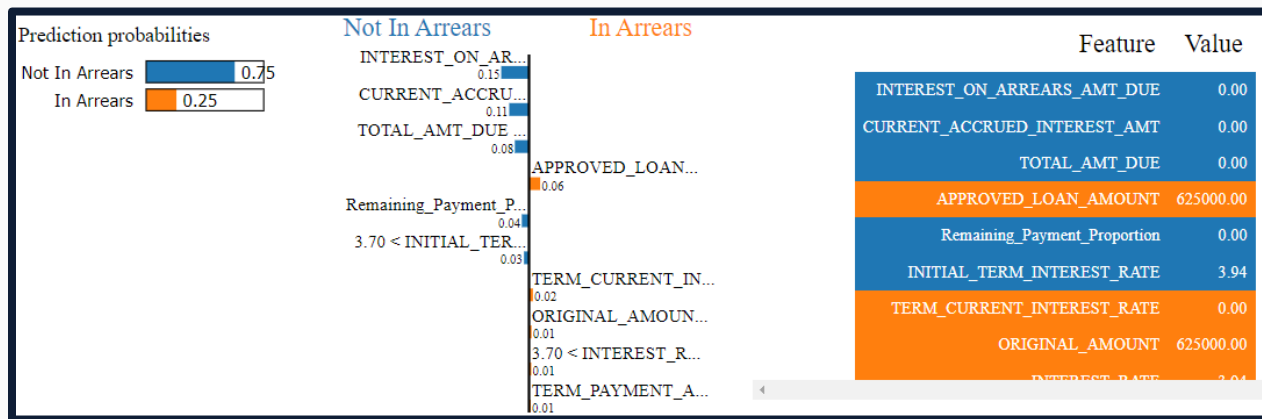
Built **interpretable & credible solutions** with Explainable AI methods.

5

Extract and display actionable insights on **Power BI dashboards**.

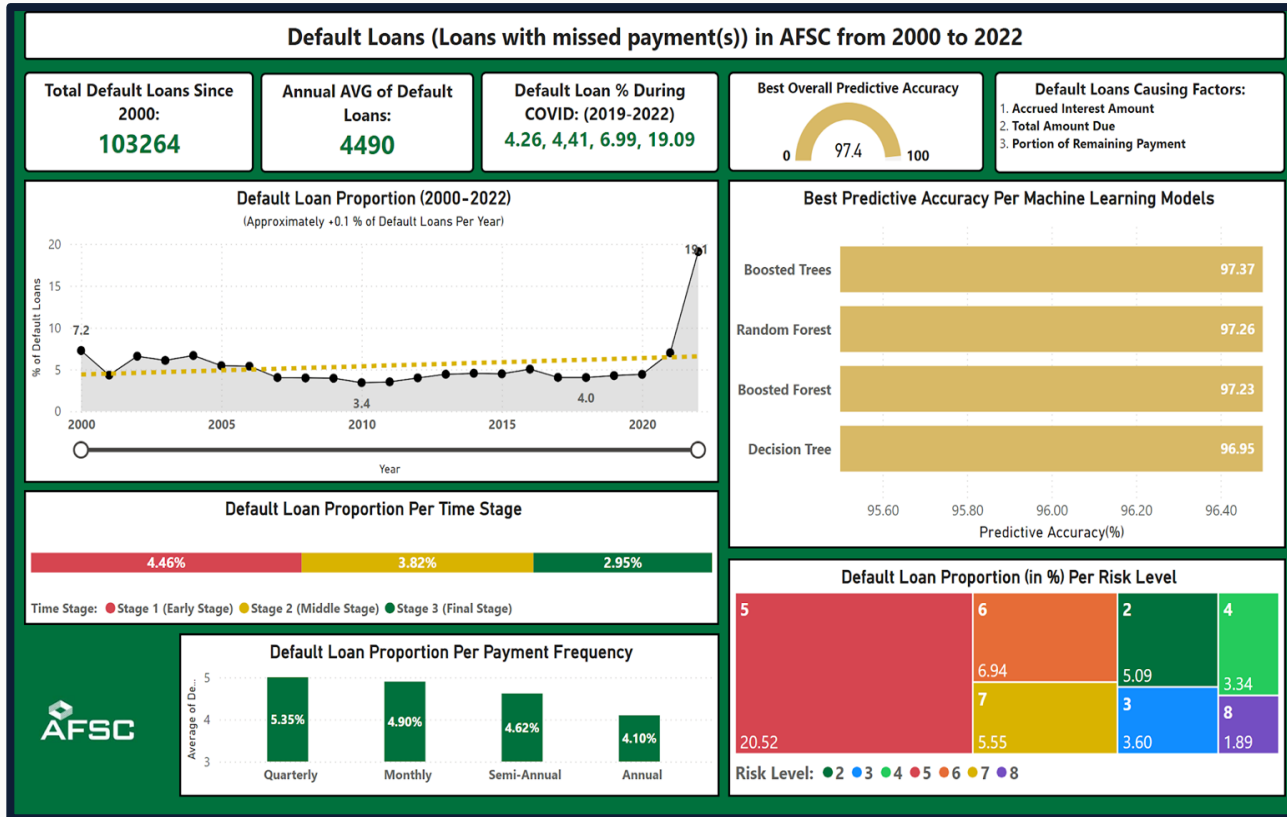
LIME, an Explainable AI (XAI) Technique

Make Local Approximations with the Trained Model

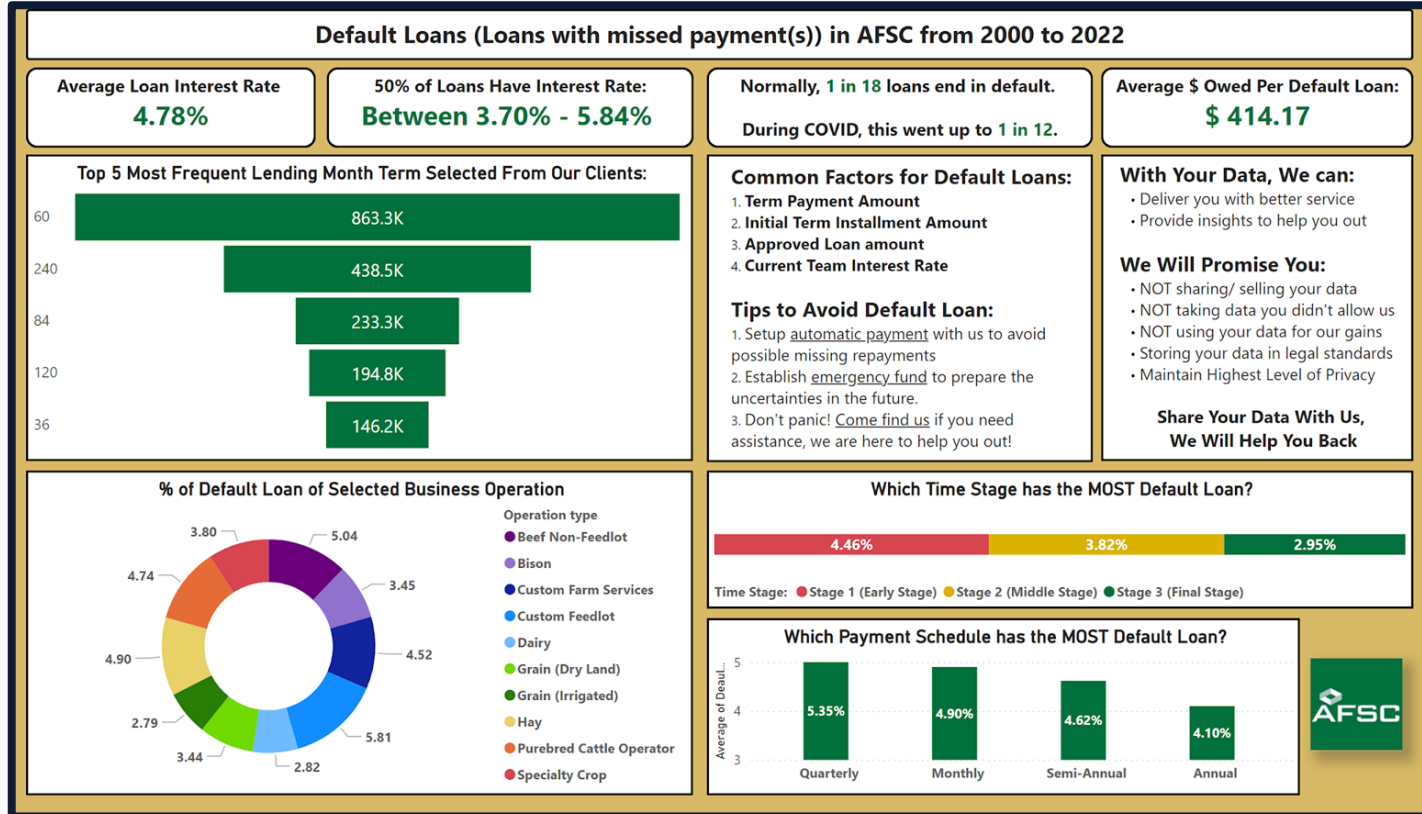


- Predicted probabilities (per feature)
- Example's actual values

Power BI Dashboard for Enterprise Use



Power BI Dashboard for External Use



04

Business Implications



Defining Assumptions

If the developed model can be applied to detect the default outcomes for **all of the loans from AFSC in the fiscal year of 2023** with the following assumptions:



1. Data Model Retaining the Same Predictive Accuracy

When the optimized model can still predict **97.5%** of loans' default outcome correctly



2. Realistic Expectation when ML solutions are Practically Applied

Only **10%** of the loans that the optimized model predicted as default can be prevented from being actually in default at the end.



4.4 % of Total Credit Risk

Can be Reduced from Being Exposed

\$12 Million Dollars

Worth of Potential Financial Loss Saved



If you want to...

- Know more about my project
- See my capstone project report
- Collaborate with me for something promising
- Have a simple coffee chat with me
- Do all of the above 😊

Then Let's Connect!

My LinkedIn:



My GitHub:



Thanks!



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