

Team Project: Designing and Constructing a Prototype for a ML-based Decision Support System

Machine Learning for Business Analytics

CIS432, Spring A 2025

Simon Business School

Instructor: Yaron Shaposhnik

Submission due date: Monday 2/24 at 10pm

Presentations: Thursday 2/27 during lectures

High-level description: In this project, you will develop a predictive model and a decision support system (DSS) to allow customers to inquire about their eligibility for a Home Equity Line of Credit (HELOC). You will work on this project in a team of 4-5 students of your choosing. (If you need assistance finding teammates, please contact the TAs.) Your submission will consist of a report, presentation, and code.

Background: You are a business analyst intern working for Simon Bank of Rochester®. The bank offers a wide range of services, including HELOC loans, which allow homeowners to borrow against the equity in their homes. This provides them with a flexible line of credit for various expenses. Currently, reviewing HELOC applications is done manually by expert loan officers, which requires substantial time.

Your manager has tasked you with examining whether some of this work can be automated. She is hesitant about completely delegating this task to a machine but is open to using automation for initial screening and assessment. She envisions an app through which customers could apply and be automatically assessed. The outcome of this assessment could be one of two:

1. Negative - The application is denied and closed.
2. Positive - The application is sent to a loan officer for review.

To comply with regulations, if an application is denied, the system must generate an explanation. Additionally, it would be beneficial for the company to advise applicants on how they can improve their chances of approval in future attempts.

The manager asks for your thoughts. You explain that with access to historical data about previous HELOC applications, you can create a predictive model to assess applications. She connects you with a business intelligence specialist, who shares a dataset of approximately 10,000 previous applications, indicating whether they were approved and whether the loans were paid back on time (see [data](#) and [description](#)).

Task 1: Formulating the problem

What kind of prediction task are you trying to solve? What would be an appropriate measure(s) of performance? What performance level would be sufficient for the bank to use the tool? How much cost savings would you expect as a function of the performance level?

Task 2: Exploratory data analysis

Conduct an exploratory analysis of the data. Are there issues that need to be addressed before training the model? How would you address them?

Task 3: ML model

Train a predictive model and evaluate its performance. Briefly report on the training and evaluation process. Which models did you consider as candidates? Were there models you immediately ruled out? Explain your choice of the final model.

Task 4: Explanations

Create intuitive explanations for the predictions of the model. You may use algorithms, visualizations, and text. Generative AI tools may be used if helpful. Explain your choices.

Task 5: Prototype

Develop a working prototype of an app using [streamlit](#). For simplicity, you may assume that applicants give the bank permission to access all relevant information about them, which will be retrieved automatically. However, to illustrate the tool, include controls in your prototype that allow users to specify the values of different features to demonstrate how the system functions.

Task 6: Discussion

Do you expect the model's performance in practice to match the performance computed in your analysis? How will you ensure that the performance of the model does not deteriorate over time?

Task 7: Presentation 2/27 (in-person, during class)

Prepare a 7-minute presentation describing your work. Focus on improvements to current practices, use numeric examples, and provide a live demonstration of the tool. All team members should present and be prepared to answer questions.

Task 8: Submission 2/24 at 10pm (via Vocareum)

Submit all files by Monday, 2/24, at 10 PM. The submission should include:

- A report (at most 7 pages), including a complete page describing how you used generative AI in the task (if applicable; otherwise leave it blank).
- All code used in the project.