Project: Creditworthiness

# Step 1: Business and Data Understanding

Provide an explanation of the key decisions that need to be made. (250 word limit)

## Key Decisions:

Answer these questions

* What decisions needs to be made?

The bank needs to be able to quickly determine which of their new applicants are creditworthy or not. Since there is an influx of approximately 500 new applicants, task automation sounds like the best approach to quickly analyzing all new applicants. In order to make this work, clean the dataset, create dummy variables, and determine which features would be most useful in my predictions.

* What data is needed to inform those decisions?

The file *credit-data-training.xlsx* should be used to build a predictive model that can be used to make predictions on new applications which are found in the file *customers-to-score.xlsx*. Predictor variables will need to be determined in order to create an efficient model that makes predictions with the highest potential accuracy.

* What kind of model (Continuous, Binary, Non-Binary, Time-Series) do we need to use to help make these decisions?

Since I am trying to categorize applicants in as creditworthy or non-creditworthy, this project requires a binary classification model.

# Step 2: Building the Training Set

*Build your training set given the data provided to you. The data has been cleaned up for you already so you shouldn’t* ***need to convert any data fields to the appropriate data types.***

*Here are some guidelines to help guide your data cleanup:*

* For numerical data fields, are there any fields that highly-correlate with each other? The correlation should be at least .70 to be considered “high”.
* Are there any missing data for each of the data fields? Fields with a lot of missing data should be removed
* Are there only a few values in a subset of your data field? Does the data field look very uniform (there is only one value for the entire field?). This is called “low variability” and you should remove fields that have low variability. Refer to the "Tips" section to find examples of data fields with low-variability.
* Your clean data set should have 13 columns where the Average of **Age Years** should be 36 (rounded up)

***Note:*** *For the sake of consistency in the data cleanup process, impute data using the median of the entire data field instead of removing a few data points. (100 word limit)*

***Note:*** *For students using software other than Alteryx, please format each variable as:*

|  |  |
| --- | --- |
| **Variable** | **Data Type** |
| Credit-Application-Result | String |
| Account-Balance | String |
| Duration-of-Credit-Month | Double |
| Payment-Status-of-Previous-Credit | String |
| Purpose | String |
| Credit-Amount | Double |
| Value-Savings-Stocks | String |
| Length-of-current-employment | String |
| Instalment-per-cent | Double |
| Guarantors | String |
| Duration-in-Current-address | Double |
| Most-valuable-available-asset | Double |
| Age-years | Double |
| Concurrent-Credits | String |
| Type-of-apartment | Double |
| No-of-Credits-at-this-Bank | String |
| Occupation | Double |
| No-of-dependents | Double |
| Telephone | Double |
| Foreign-Worker | Double |

*To achieve consistent results reviewers expect.*

*Answer this question:*

* In your cleanup process, which fields did you remove or impute? Please justify why you removed or imputed these fields. Visualizations are encouraged.

I dropped *Duration-in-Current-address* because more than half field is null (≈ 69%). *Concurrent-Credits* and *Occupation* were removed for having a variance of zero. Finally, I imputed the median value 33 of *Age-years* after splitting the training and testing data. This was handled after splitting the training and testing data or else I would have violated a core tenet in the machine learning procedure. I can only assume to know the median value of the training set to make predictions, not the testing set. In other words I don't want to fit information from my testing set into my training set.

# Step 3: Train your Classification Models

*First, create your Estimation and Validation samples where 70% of your dataset should go to Estimation and 30% of your entire dataset should be reserved for Validation. Set the Random Seed to 1.*

*Create all of the following models: Logistic Regression, Decision Tree, Forest Model, Boosted Model*

*Answer these questions for* ***each model*** *you created:*

* Which predictor variables are significant or the most important? Please show the p-values or variable importance charts for all of your predictor variables.

I read Feature Engineering Made Easy, by Sinan Ozdemir. Chapters 3-5 of this book provides a helpful walkthrough on how to select the features with highest predictability. The four predictor variables I have selected are listed below:

* Account-Balance\_Some Balance
* Credit-Amount
* Duration-of-Credit-Month
* Payment-Status-of-Previous-Credit\_Some Problems

* Validate your model against the Validation set. What was the overall percent accuracy? Show the confusion matrix. Are there any bias seen in the model’s predictions?

*You should have four sets of questions answered. (500 word limit)*

# Step 4: Writeup

*Decide on the best model and score your new customers. For reviewing consistency, if Score\_Creditworthy is greater than Score\_NonCreditworthy, the person should be labeled as “Creditworthy”*

*Write a brief report on how you came up with your classification model and write down how many of the new customers would qualify for a loan. (250 word limit)*

*Answer these questions:*

* Which model did you choose to use? Please justify your decision using **all** of the following techniques. Please only use these techniques to justify your decision:
  + Overall Accuracy against your Validation set
  + Accuracies within “Creditworthy” and “Non-Creditworthy” segments
  + ROC graph
  + Bias in the Confusion Matrices

**Note:** Remember that your boss only cares about prediction accuracy for Creditworthy and Non-Creditworthy segments.

* How many individuals are creditworthy?

**Before you Submit**

Please check your answers against the requirements of the project dictated by the [rubric](https://review.udacity.com/#!/rubrics/265/view) here. Reviewers will use this rubric to grade your project.