EDA – Lending Club Case Study

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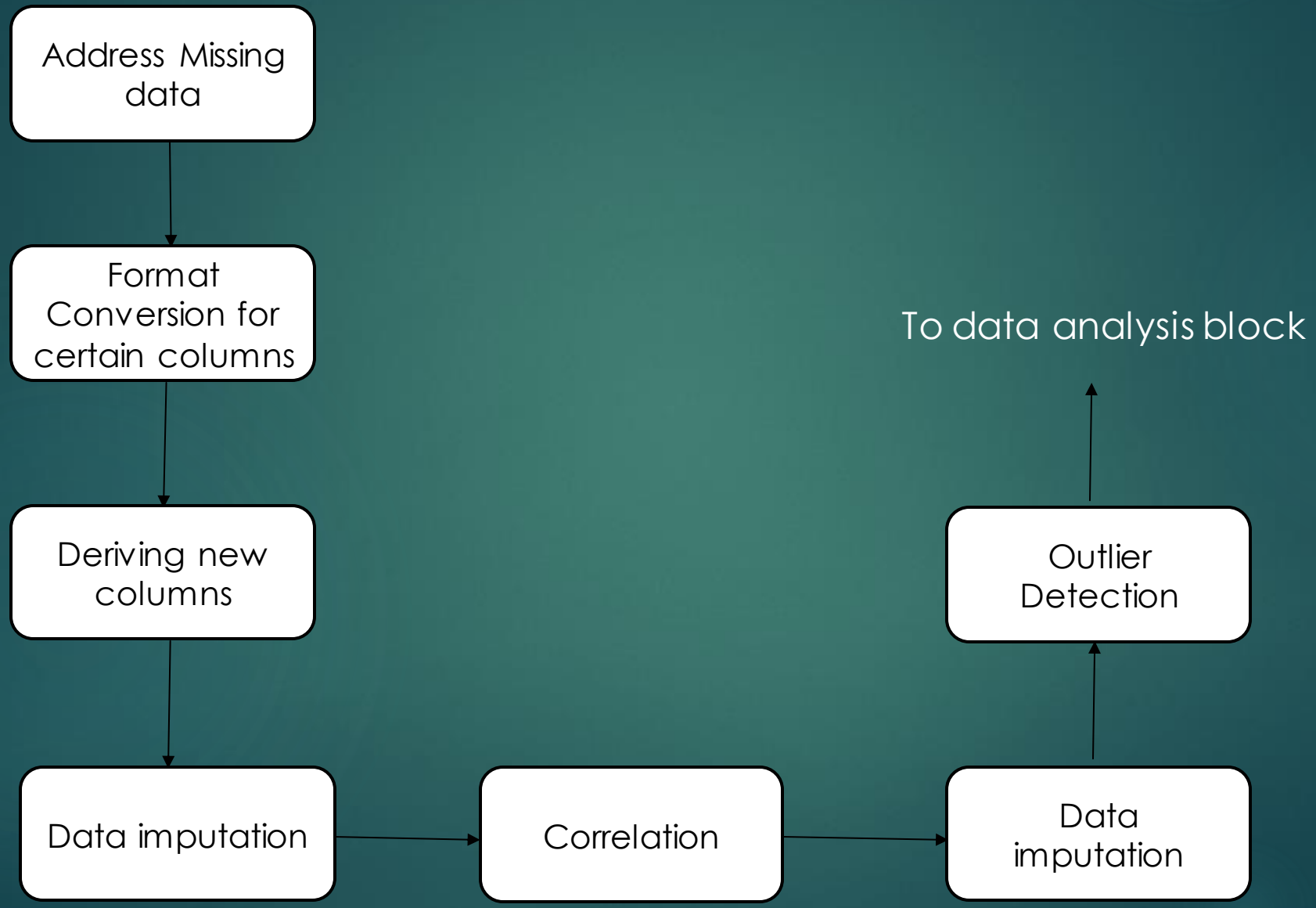
EPGP MAY COHORT IN AI & ML

Data Cleaning blocks involved



Addressing Missing Data Block

- Columns with more than 60% missing data are removed.
- Special Cases: id, member_id, url are not features. Therefore, these columns are removed. They do not give any information, hence they are dropped from analysis as well.

Format Conversion for certain columns block

- Term: Converting this to numeric and then convert to years instead of months.
- Int_rate: Removing % symbol
- Emp_length: Removing the string "years" and then convert it into buckets: 0-2, 2-4, 4-6, 6-8, 8-10 and > 10 years.
- Revol_utiL: Removing % symbol

Quasi Constant Variables block

- Columns with more than 95% constant data are removed.

Deriving new columns block

- Annual_inc: Categorizing this column in to bins of $20,000.
- Funded_amount: Categorizing this column in to bins of $5,000.
- Int_rate: Categorizing this column in to [0-8, 8-10, 10-12, 12-14, 14-16, >16]
- From columns, *issue_d* and *last_payment_d,* we compute the time elapsed from the issue date in years(float) i.e. if 5 years and 3 months have elapsed, it will represented as 5.25 years. Column name: delta.
- This is then categorized in to [0-1, 1-2, 2-3, 3-4, 4-5, 5-6, 6-7, 7-8]

Data imputation block

- Columns, *title, revol_util, last_payment_d, last_credit_pull_d, emp_length and pub_rec_bankruptcies* are filled with their mode values.

Correlation block

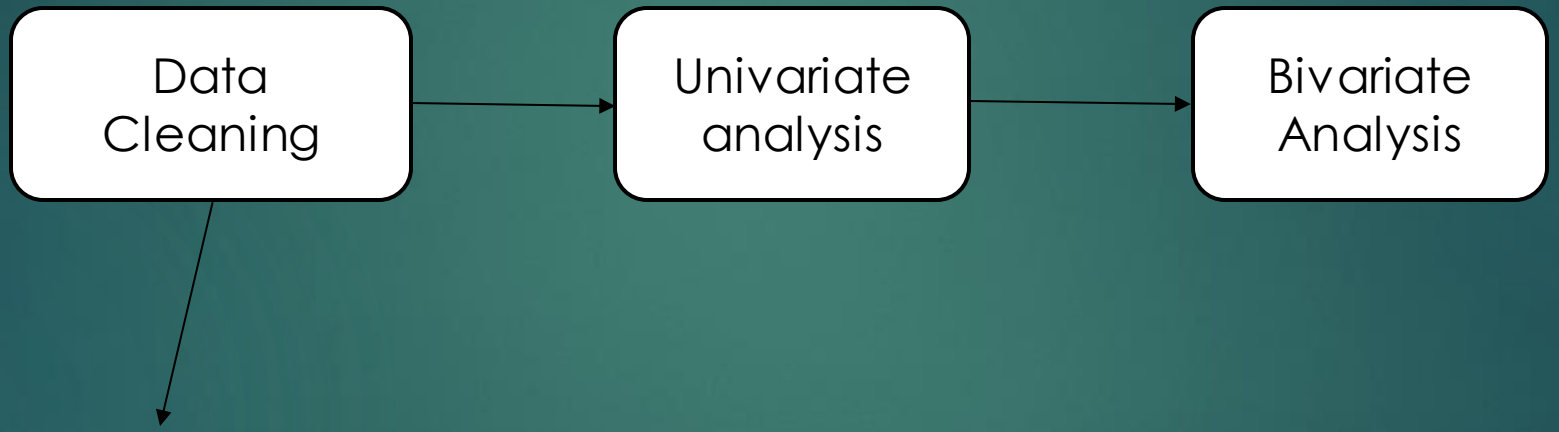
- A heatmap is plotted for the correlation matrix and only one variable of a strongly correlated group is kept and others are discarded.
- Eg: loan_amnt, funded_amnt, funded_amnt_inv are strongly correlated. So we drop loan_amnt, funded_amnt_inv and only keep funded_amnt.
- Following metric is used to determine strength of correlation:
  - $|r| < 0.3 \Rightarrow\Rightarrow$ None or Very Weak
  - $0.3 < |r| < 0.5 \Rightarrow\Rightarrow$ Weak
  - $0.5 < |r| < 0.7 \Rightarrow\Rightarrow$ Moderate
  - $|r| > 0.7 \Rightarrow\Rightarrow$ Strong

Outlier Detection block

- We use box plots and IQR analysis to detect outliers.
- For this data, however, many rows in the top 1% seem to have charged off loans, fully paid and currently running loans.
- This is observed across all columns.
- Dropping all of these rows will shrink the data drastically, therefore, we retain them because it might contain important information needed for analysis.

Data Analysis Blocks

Once data cleaning is done, we can move to data analysis section



Univariate Analysis block

- We first split the columns in to categorical and continuous.
- We then use box plots of every continuous column with hue on loan_status and obtain inferences.
- We then plot probability distribution of certain columns with seaborn's displot.
- The observations obtained from univariate analysis is mentioned in the section III.1.1. Box Plots of III.1. Univariate analysis in the notebook.

Bivariate Analysis block

- We already looked at correlation block, now we will do bivariate analysis with a keen focus on loan_status.
- Following columns are compared against loan_status:
  - Grade: Borrowers with bad credit ratings tend to borrow more money and they tend to default more often.
  - Home Ownership
  - Verification Status
  - Purpose: Borrowers borrowing money for Small business tend to default more often than other purposes.
  - Emp_length(experience)
  - Annual Income: Lower income borrowers are defaulting more often than higher income borrowers.
  - Funded amount: Higher the amount, more is the charged off percentage

Bivariate Analysis Block(cont.)

- Rate of interest: Higher interest rates, attract more defaults.
- Public records
- Inq_last_6mths: Borrowers who have inquired more in the past 6 months are more likely to default
- State address: Borrowers from the state of Nebraska(NE) are more likely to default than others.
- Loan Term: 5 year loans have more defaults than 3 year loan terms. Also interest rate is higher for 5 year loans.
- Delta_bins(time elapsed from loan issue date): Percentage of payment received in conjunction with delta bins give us a good indicator of potential loan defaults. Since the bank only has two terms, it is best to check at the term boundaries. i.e. For the 3 year loan, check bin = 2-3 and percent_payment_bin = 0-80

Driver Variables identified

- Percentage of payment received(quite useful especially when used in conjunction with delta bins)
- Grade
- Purpose
- Annual Income
- Funded amount
- Interest Rate
- Inquiries since last 6 months
- State Address
- Delta_bins(Time elapsed since loan issue date)

Bivariate analysis in between other columns(minus loan_status)

- Grade vs interest Rate:
  - Interest rate is really high for grade G borrowers
- Purpose vs interest Rate:
  - Small businesses end up defaulting more. We can see that the interest is also on the higher side for these borrowers.
- State Address vs Interest rate
- Funded amount vs interest rate:
  - Higher the funded amount, higher is the interest rate
- Interest Rate vs Term:
  - 5 year loans, the LC has decided that the rate of interest should be around 15% and for the 3 year loan, it is around 11%

(cont.)

- Funded amount vs Term:
  - larger funded amounts go with 5 year loan repayment plan. But there are so many outliers in the 3 year boxplot! Can't really say for sure.
- Annual income vs Grade:
  - Grade G borrowers are earning the higest salary while grade A borrowers have the lowest salary.
- Annual income vs Sub grade:
  - Sub-Grade x5 borrowers are earning the higest salary while grade x1 borrowers have the lowest salary.(where x in set (A, B, C, D, E, F, G)