

Data Engineering W24 - Milestone 3 Description

DEADLINE: WEDNESDAY 11 Dec 2024 @ 11:59 pm

1 Objectives:

1. Loading the dataset (5%)
2. Perform some simple cleaning (30%)
 - Column renaming: 10%
 - Detect missing: 35%
 - Handle missing: 35%
 - Check missing : 20%
3. Perform some analysis on the dataset (30%)
4. Add new columns with feature engineering (15%)
5. Encode categorical columns (10%)
6. Create a lookup table for encoding only (5%)
7. Saving Cleaned datasets and lookup table (5%)
8. ***Bonus:** Saving the output into a postgres database (5%)

2 Datasets:

This milestone you will be working with parquet files, so in the following [Dataset Link](#), you can find your datasets in parquet format.

3 Deliverables:

1. Python Notebook with the following naming m3_spark.id.ipynb eg. m3_spark_52_XXXX.ipynb
2. Cleaned Parquet file named: fintech_spark_52_XXXX_clean.parquet
3. Lookup table named: lookup_spark_52_XXXX.parquet
4. Incase of doing the bonus: Screenshots from PGAdmin showing the cleaned table (some of the rows) and another one showing the lookup table.

Note: All these files should reside in a folder for milestone 3, inside the root drive folder created previously in milestone 1.

4 Requirements:

4.1 Loading the dataset

Simply load the dataset from the parquet format given in the google drive above

- Load the dataset.
- Preview first 20 rows.
- How many partitions is this dataframe split into?
- Change partitions to be equal to the number of your logical cores

4.2 Cleaning

- Rename all columns (replacing a space with an underscore, and making it lowercase)
- Detect missing:
 - Create a function that takes in the df and returns any data structure of your choice(df/dict,list,tuple,etc) which has the name of the column and percentage of missing entries from the whole dataset.
 - Tip : storing the missing info as dict where the key is the column name and value is the percentage would be the easiest.
 - Printout the missing info
- Handle missing:
 - For numerical features replace with 0.
 - For categorical/strings replace with mode
- Check missing:
 - Afterwards, check that there are no missing values

4.3 Encoding

Encode only the following categorical values

- Emp Length: Change to numerical
- Home Ownership: One Hot Encoding
- Verification Status: One Hot Encoding
- State: Label Encoding
- Type: One Hot Encoding
- Purpose: Label Encoding
- For the grade, only discretize it to be letter grade, no need to label encode it further

DO NOT Encode the employment title of description or any other column that is not mentioned above

4.4 Feature Engineering

Write a function that adds the 3 following features. Try as much as you can to use built in functions in PySpark from the functions library (check lab 8). Avoid writing UDFs from scratch.

- Previous loan issue date from the same grade
- Previous Loan amount from the same grade
- Previous loan date from the same state and grade combined
- Previous loan amount from the same state and grade combined

4.5 Analysis SQL vs Spark

Answer each of the following questions using both SQL and Spark:

1. Identify the average loan amount and interest rate for loans marked as "Default" in the Loan Status, grouped by Emp Length and annual income ranges.
Hint: Use SQL Cases to bin Annual Income into Income Ranges
2. Calculate the average difference between Loan Amount and Funded Amount for each loan Grade and sort by the grades with the largest differences.
3. Compare the total Loan Amount for loans with "Verified" and "Not Verified" Verification Status across each state (Addr State).
4. Calculate the average time gap (in days) between consecutive loans for each grade using the new features you added in the feature engineering phase
5. Identify the average difference in loan amounts between consecutive loans within the same state and grade combination.

4.6 Lookup Table & Saving the dataset

- Create a lookup table for the encodings only
- Finally load (save) the cleaned PySpark df and the lookup table to parquet files

4.7 BONUS: Loading to Postgres

- Load the cleaned parquet file and lookup table into a Postgres database.
- Take Screenshots showing the newly added features in the feature engineering section
- Take a screenshot from the lookup table

5 Submission guidelines

Upload all the deliverables in your google drive milestone folder.

Best of luck!