# My Solution

Yuanbin Zhou

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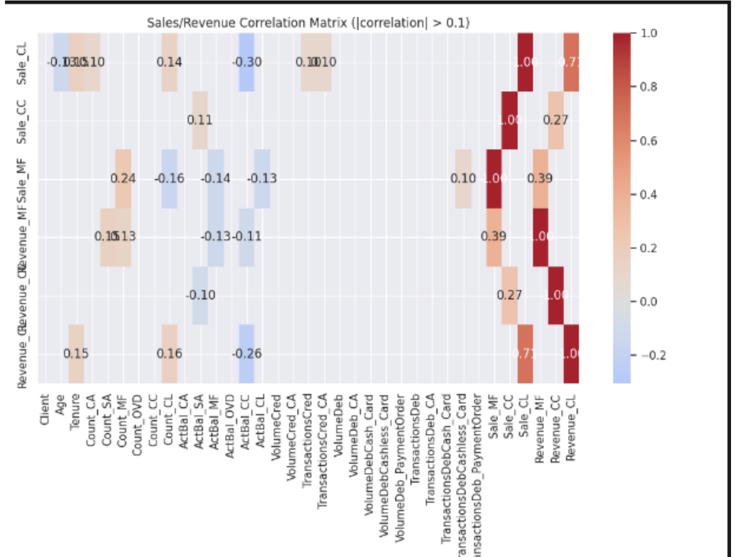
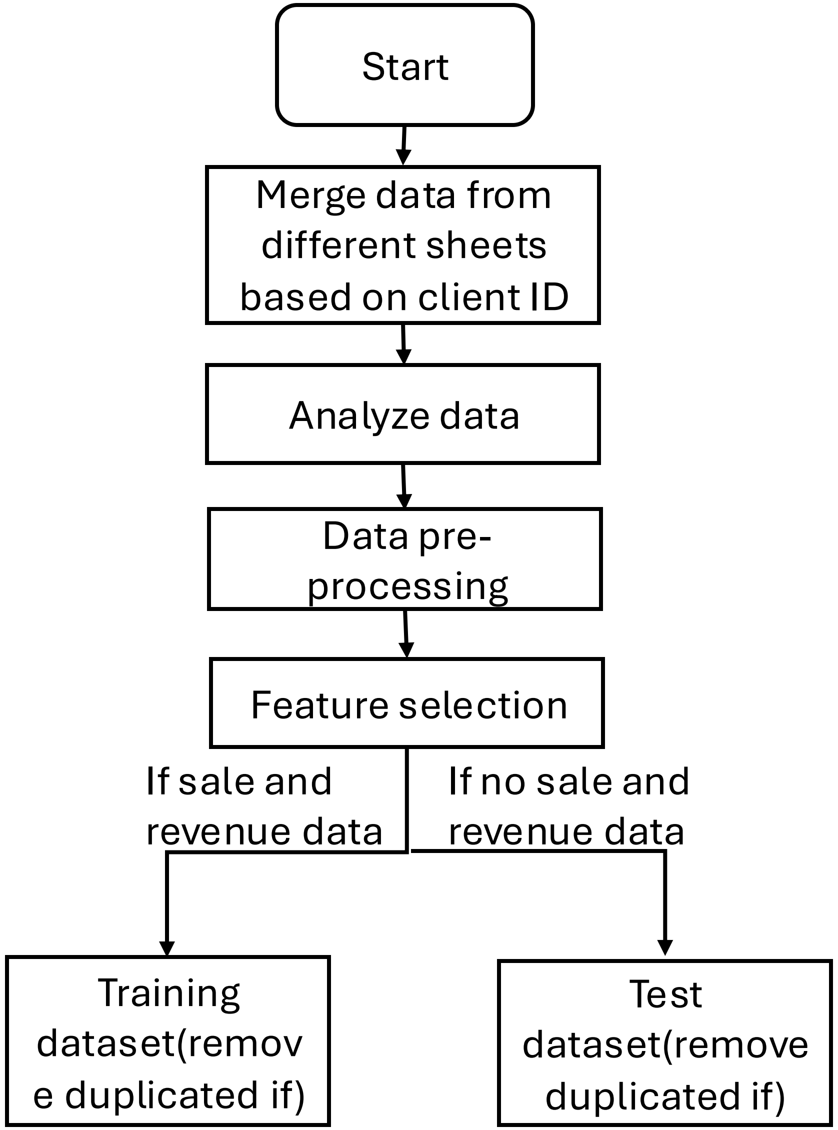
# Create Analytical Datasets

- Merge data from different sheets, based on client ID
- [in the next slide]Analyze data and its distribution
- Data pre-processing:
  - Remove anomalies data, for example, age<18, tenure>12*age
  - Use zero, median or KNN to fill missing values depends on concrete cases
  - Use log function to handle right-skewed data
- Feature selection
  - Use Recursive Feature Elimination to select top 10 features
  - Filter out highly co-related features
- For data that has sale and revenue data, keep as training data
- For data that don’t have sale and revenue data, keep as test dataset
- Remove duplicated data if any





Start

Merge data from different sheets based on client ID

Analyze data

Data pre-processing

Feature selection

If sale and revenue data

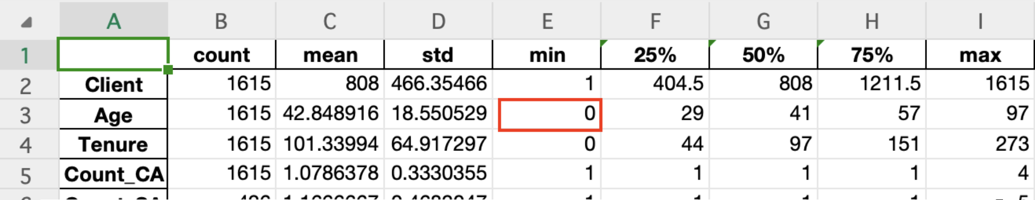
If no sale and revenue data

Training dataset(remove duplicated if)

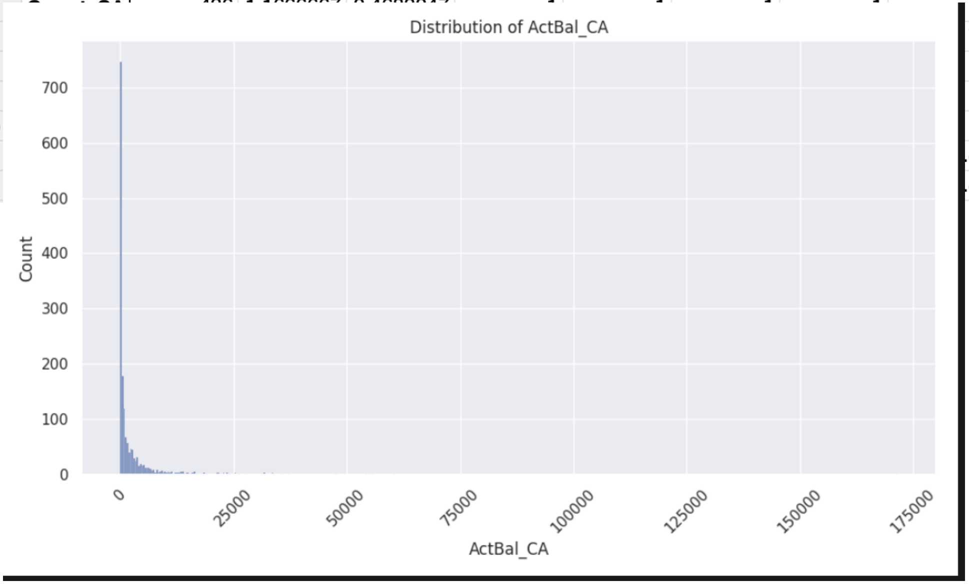
Test dataset(remove duplicated if)

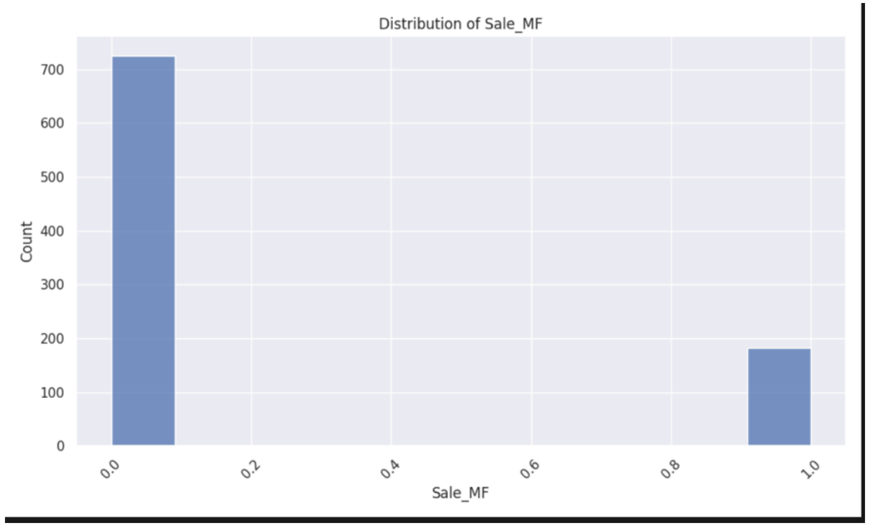
# Analyze Data

- Anomaly data: age with zero,  tenure>12*age:
- Data missing in the dataset
  - If Count_CA/SA… missing, ActBal_CA/SA… also missing
    - Safe to fill with zero for empty data
  - 5 Count_CC is not empty, but ActBal_CC missing
    - Use median value to fill
  - Data missing in Inflow_Outflow
    - Use KNNImputer
  - Sex only has one missing
- Right-skewed data: balance and transactions data (e.g., ActBal_CA in the second pic)
  - Use log function to handle, may also possible use sqrt, Yeo-Johnson
- Slightly imbalance data: output class Sale_MF
  - Use over-sampling techniques



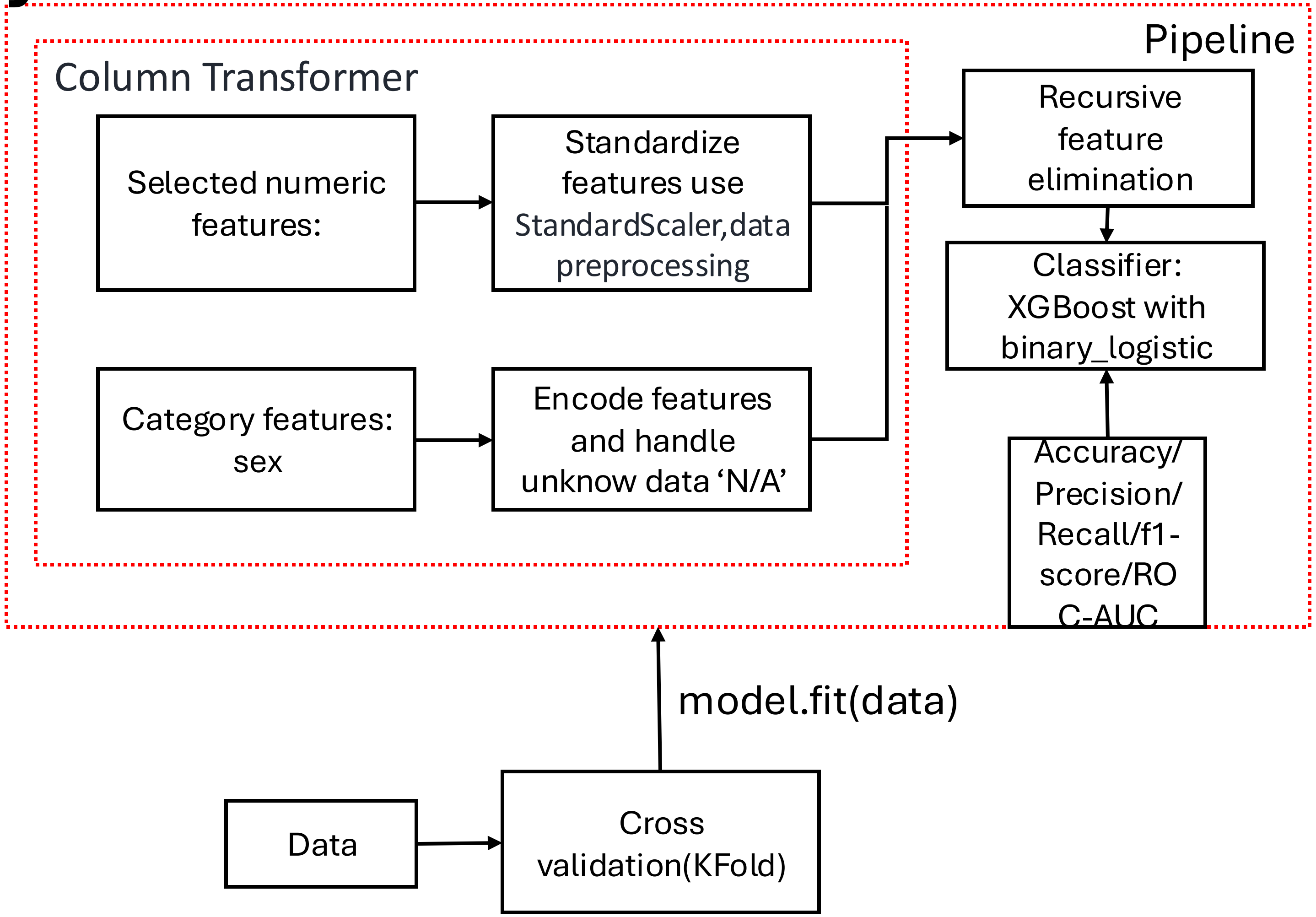
| | count | mean | std | min | 25% | 50% | 75% | max |
|---|---|---|---|---|---|---|---|---|
| Client | 1615 | 808 | 466.35466 | 1 | 404.5 | 808 | 1211.5 | 1615 |
| Age | 1615 | 42.848916 | 18.550529 | 0 | 29 | 41 | 57 | 97 |
| Tenure | 1615 | 101.33994 | 64.917297 | 0 | 44 | 97 | 151 | 273 |
| Count_CA | 1615 | 1.0786378 | 0.3330355 | 1 | 1 | 1 | 1 | 4 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 5 |
| | | | | | | | | 79 |
| | | | | | | | | 1 |
| | | | | | | | | 1 |
| | | | | | | | | 5 |
| | | | | | | | | .89 |
| | | | | | | | | .83 |





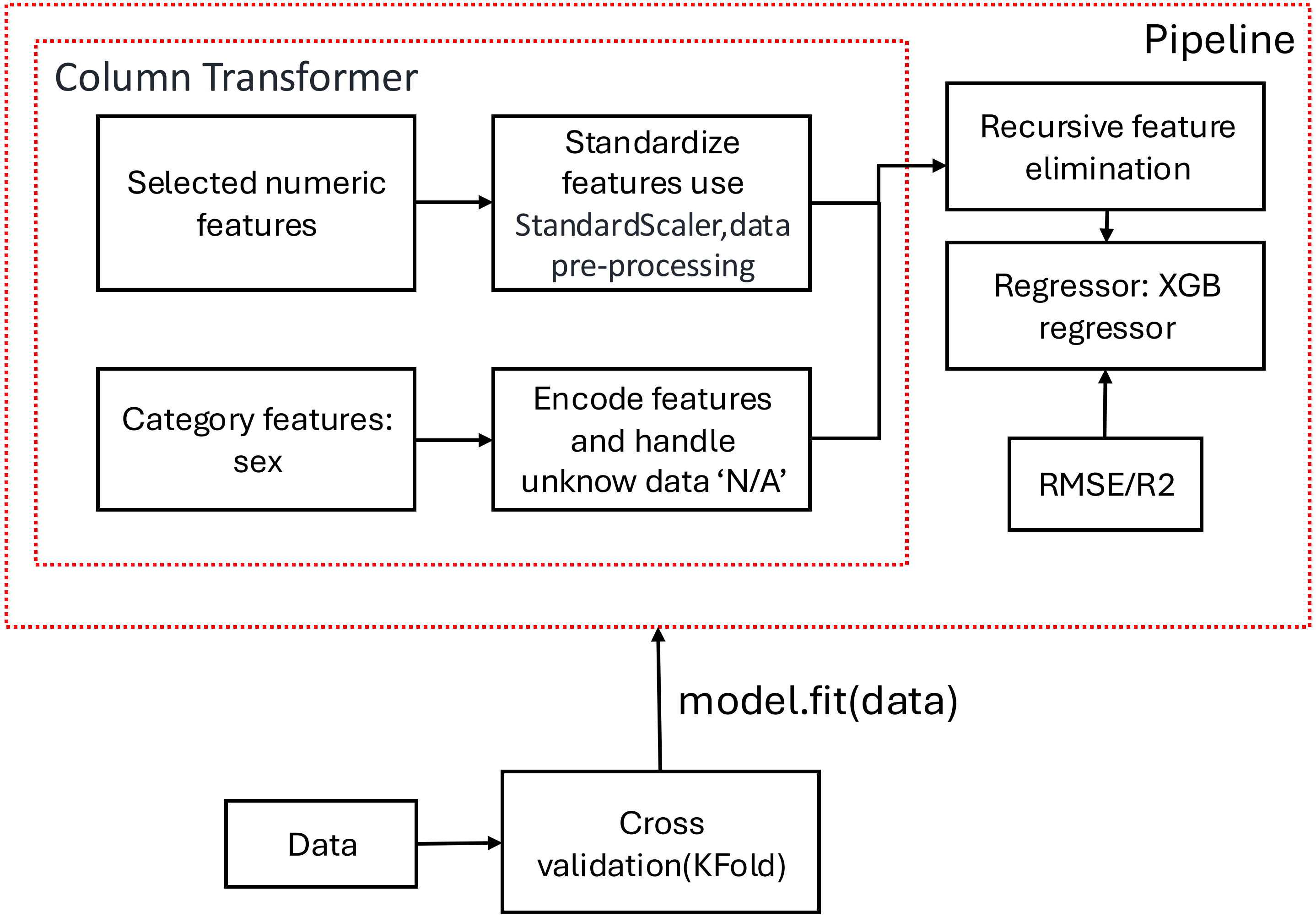
# Develop Propensity Models

- Include numeric and category features
- Numeric features: to standardize features, using StandardScaler method,
    - Use KNN/zero to fill empty data
- Category features: encode as a one-hot numeric array
- Different features concatenated into a single feature space use columntransformer
- Apply the pipeline to preprocess the data and with a final classifier
- Handle imbalance data use over-sampling SMOTE
- Use cross validation to split training and validation data set
- Classifier use XGBoost with binary_logistic


Pipeline
Column Transformer
Selected numeric features:
Standardize features use StandardScaler,data preprocessing
Category features: sex
Encode features and handle unknow data 'N/A'
Recursive feature elimination
Classifier: XGBoost with binary_logistic
Accuracy/ Precision/ Recall/f1-score/ROC-AUC
model.fit(data)
Data
Cross validation(KFold)

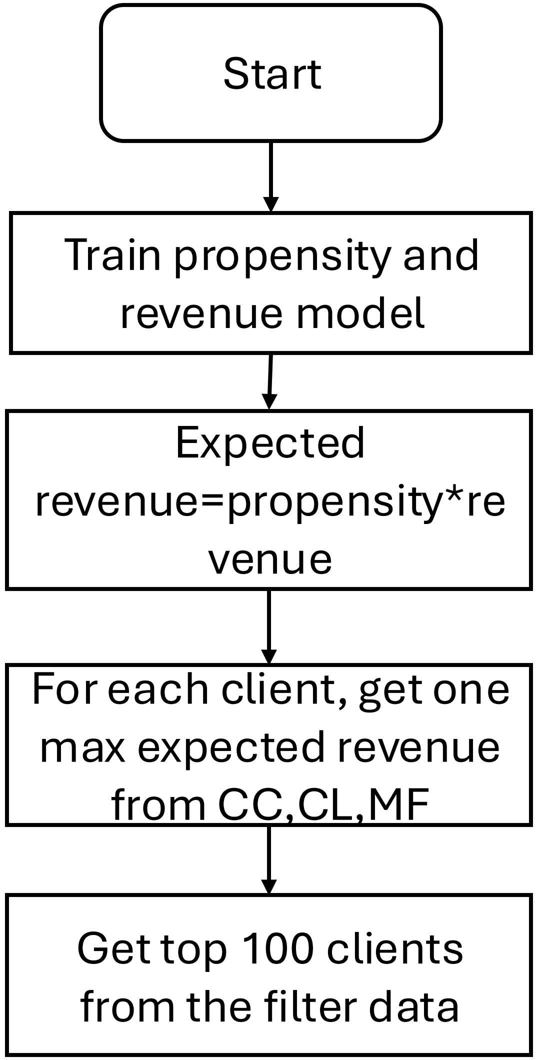
# Optimize Targeting Strategy

- Pipeline is similar to the previous
- Use regression model instead of classification model
- Evaluation metrics: RMSE


Pipeline
Column Transformer
Selected numeric features
Standardize features use StandardScaler,data pre-processing
Category features: sex
Encode features and handle unknow data 'N/A'
Recursive feature elimination
Regressor: XGB regressor
RMSE/R2
model.fit(data)
Data
Cross validation(KFold)

# Maximize Revenue

- Calculate expected revenue=likelihood*revenue
- For each client, get the maximum expected revenue from either CC, CL, MF
- Based on the above data, get top 100 clients that maximize revenue
- May also possible to use ILP to solve the problem if constraints put to the number of each type of offer.



Start

Train propensity and revenue model

Expected revenue=propensity*revenue

For each client, get one max expected revenue from CC,CL,MF

Get top 100 clients from the filter data