# Project Description

# Introduction

The goal of this project is to perform a series of matrix transformations on a hand-drawn line sketch, which is digitized and converted into a dataset of x-y coordinates. The transformations include rotating the sketch by 90 degrees clockwise and flipping it horizontally. The final objective is to

visualize these transformations using scatter plots.

## Data Cleansing & Loading

* + **Objective**: We clean and transform the dataset into a 2D sparse matrix.

# Process:

* + - Loaded the CSV file into a pandas Data Frame and cleaned data.
    - Discretized the data to create a 1000x1000 Boolean matrix using NumPy.

## Transformation

* + **Objective**: We perform matrix operations to rotate and flip the image.

# Process:

* + - Rotated the 2D matrix by 90 degrees and flipped using NumPy.
    - Converted the transformed matrices back into X-Y coordinates.

## Visualization

* + **Objective**: We visualize the rotated and flipped images using scatter plots.

# Process:

* + - Generated scatter plots of the transformed X-Y coordinates using matplotlib.
    - Ensured image clarity by using a 1000x1000 matrix.

***Conclusion:***

This project demonstrated the ability to perform matrix operations to manipulate images programmatically. The original line sketch was successfully transformed by rotating it 90 degrees

clockwise and flipping it horizontally. These transformations were then visualized using scatter plots, confirming the correctness of the operations.

The entire process—from data acquisition to visualization—showcases the power of matrix operations and their applications in image processing, offering a robust method for manipulating and analyzing images mathematically.