

6.2. Min-Max Scaling

Given a matrix $X \in \mathbb{R}^{m \times n}$, do the following:

Transform X to a matrix Z of the same size so that each column of Z ranges in $[0, 1]$.

Input Format

- A 2d numpy array of size $m \times n$ containing real numbers representing matrix X

Output Format

Output the resulting $m \times n$ matrix Z where each column ranges in $[0, 1]$.

Constraints

- $X \in \mathbb{R}^{m \times n}$
- $1 \leq m, n \leq 1000$
- All input values are real numbers in the range $[-1000, 1000]$
- Each column of X has at least 2 distinct values (to ensure non-zero range)

Sample Input

```
X =[[ 10,  8,  2],
     [88, -21, 55],
     [12, 55, -66],
     [-50,  5, -80]]
```

Sample Output

```
[[0.43478261, 0.38157895, 0.60740741]
 [1.         , 0.         , 1.         ]
 [0.44927536, 1.         , 0.1037037 ]
 [0.         , 0.34210526, 0.         ]]
```

Implementation

Goal: Fill in the following function:

```
def column_min_max_scaling(X):
    ...
    return ... # Return the min-max scaled matrix
exec("\n".join(iter(input, "#Exit"))) # Don't remove this line
```