Image Segmentation with Clustering (From Scratch)

This project implements image segmentation using clustering algorithms from scratch as part of the Foundations of Data Mining – Task 1.

Each image pixel is treated as a 3D feature vector [R, G, B], clustered using either k-means or DBSCAN, and then recolored using the mean RGB value of its assigned cluster.

Features:

- k-means clustering (from scratch)

- DBSCAN clustering (from scratch, O(n^2))

- Euclidean, Manhattan, and Chebyshev distances

- Image segmentation via cluster recoloring

- Optional downsampling for DBSCAN

- Command-line interface

Requirements:

- Python 3.8+

- numpy

- pillow

Usage examples:

k-means:

python segment.py --image input.jpg --algorithm kmeans --k 8 --distance euclidean --out out_kmeans.png

DBSCAN:

python segment.py --image input.jpg --algorithm dbscan --eps 12 --min-samples 8 --distance manhattan --out out_dbscan.png