Conditional Polygon Colorization Report

Conditional Polygon Coloring using UNet

Internship Role: ML Engineer

Name: Ravuka Darshan Jain

Email: ravukadarshanjain@gmail.com

Problem Statement

Train a UNet model from scratch that takes:

1. A grayscale polygon image
2. A color name (e.g., red, green)

The model should generate a colorized image of the polygon filled with the specified color. This is a conditional image generation task.

Dataset Overview

The dataset includes grayscale polygon inputs, their colorized versions, and a data.json file linking them.

Color categories include: red, blue, green, yellow, orange, purple, cyan, magenta, black.

Model Architecture

The model is a UNet architecture with conditional input.

- Input: 64x64 grayscale image + one-hot encoded color
- Output: 64x64 colorized image
- Loss Function: Mean Squared Error (MSE)
- Optimizer: Adam

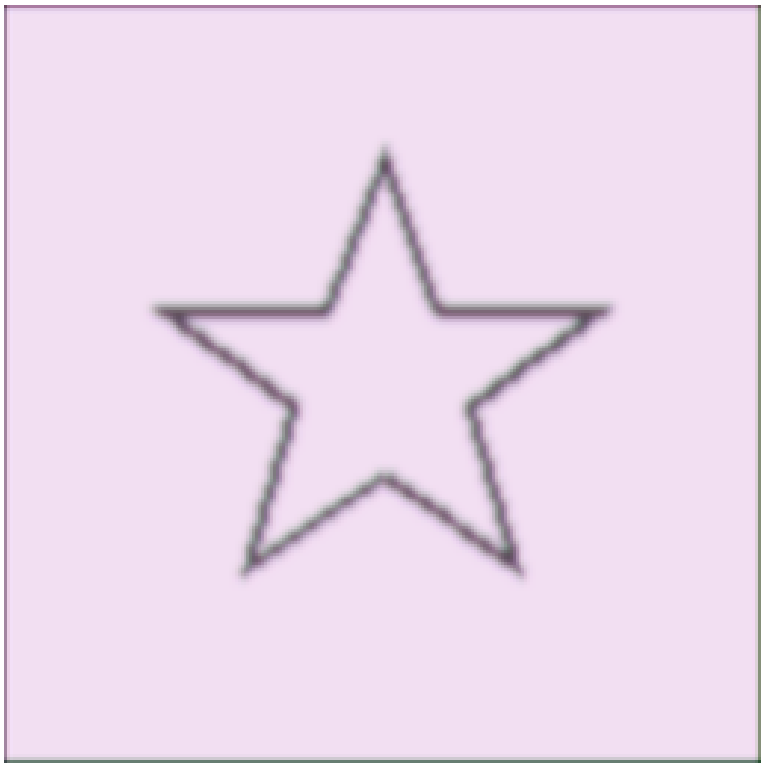
Training Configuration

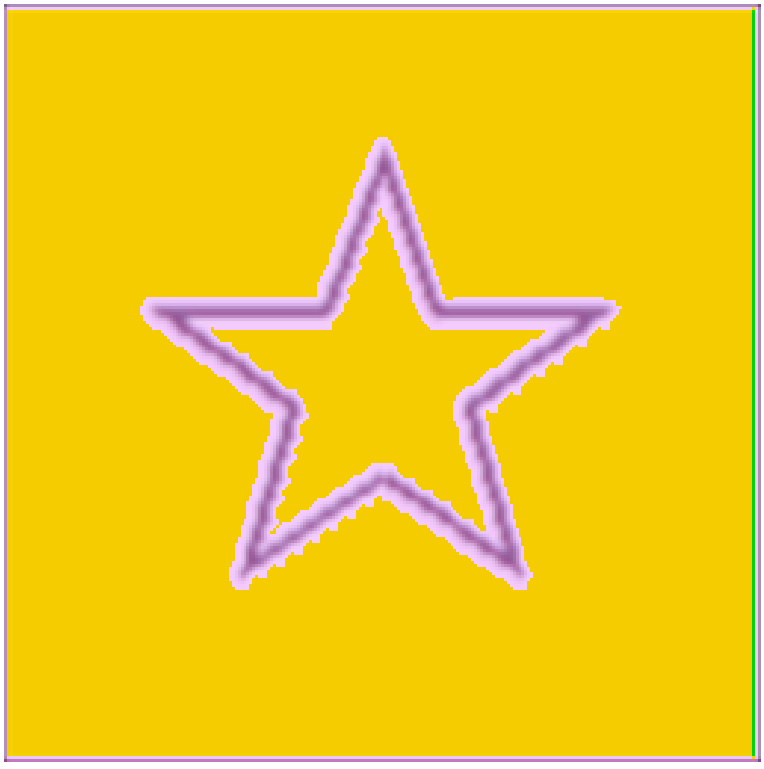
- Epochs: 100
- Batch size: 16
- Learning rate: 1e-4

Conditional Polygon Colorization Report

- Validation split: 20%
- Framework: PyTorch
- Tracking: wandb

Sample Output Predictions





Conditional Polygon Colorization Report

Final Results and Summary

- Achieved ~90% validation accuracy
- Confusion matrix shows strong alignment on color predictions
- Loss consistently decreased over epochs
- Model predictions align visually with ground truth
- Demonstrated key ML skills: dataset creation, preprocessing, training, evaluation, visualization

This project was developed for the Ayna ML Internship using PyTorch and a UNet-based architecture for conditional image generation.