Ahmedabad University

CSE623 Machine Learning

Weekly Report 1

Feature-Based Global Wheat Full Semantic Segmentation using Classical Machine Learning and Contour Analysis

Submitted to faculty: Prof. Mehul Raval

Date of Submission: 14-02-2026

Student Details

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2026-2027 (Winter Semester)

Aim:

Understanding the Problem Statement and Acquisition of the dataset

Introduction:

Wheat is a significant cereal grain and an essential source of carbohydrates. A leading global source of vegetable protein. Wheat phenotyping, the process of analyzing the growth and health of wheat, is necessary for increasing grain yield and improving crop management.

This project will apply Classical Machine Learning and its interpretability to segment wheat components and classify them at the pixel level. Instead of using a black box, Deep Learning, we will work with hand-crafted feature extraction, such as texture, edges, and colors, combined with Contour fitting to refine the boundaries. This approach will provide clarity into the model's decision-making process, providing clear insights into plant architecture and its health.

Work Completed:

- Initial team meeting to distribute tasks.
- Understood the concept of Contour and how it will help to refine the boundaries.
- Configured the Python environment.
- Acquired the dataset from the Zenodo.

Next steps and goals:

- Study of in-depth structural analysis of the Global Wheat Dataset to understand the metadata format and annotations for semantic segmentation.
- Perform a detailed review of the provided reference to identify various challenges.

Conclusion:

A structured starting point for the project has been established, dataset is accquired and environment is setup. The next phase will concentrate on understanding the dataset.

References:

1. **Global Wheat Head Dataset (2020)**
   https://zenodo.org/records/5092309
2. David et al. (2020): Global Wheat Head Dataset: A Large and Diverse Dataset of High-Resolution RGB-Images to Develop and Benchmark Wheat Head Detection Methods
   https://www.sciencedirect.com/science/article/pii/S2643651524000359?via%3Dihub
3. Kass, M., et al. (1988): Snakes: Active contour models. (Standard for geometric boundary refinement)
   https://link.springer.com/article/10.1007/bf00133570