Anomaly Detection Using Auto-Encoders

1. Trained an auto-encoder model on data of a particular label (grassland/trees) and
2. Plotted mean squared error (MSE) after testing the model on both the previous label and a new, unfamiliar label (barren land/no trees)
3. Observed the presence / lack of groups which could indicate what the auto-encoder sees as unfamiliar and therefore an anomaly

Forest Color Histogram Analysis

1. Processed images using b64 decode to find BGR values in images
2. Flipped values using cv2, so images look correct and are RGB
3. Plotted density and range of pixel values per pixel using pyplot

Overall Process

1. Conduct research into literature reviews on forest health issues solved with remote sensing
   a) Pest Detection (ex. Emerald Ash Borer)
   b) Forest Fire detection (an issue in Indiana)
2. Narrowed focus to identifying signs of tree infestation
   1. Sudden tree death
   2. Color change
   3. Out of Season Behavior
3. Working with Unsupervised Data
   1. Manually find anomalies
   2. No distinct labels without additional work
   3. No confirmation labels are fully correct

Goal:
Implement a model using both low and high-resolution satellite data to identify anomalies in tree health
1. Once anomalies are identified, determine whether it indicates that a tree is unhealthy or healthy.
2. Alert landowner of the severity of the problem in the tree(s)
3. Track and continue to monitor issues

Objectives

Goal: Implement a model using both low and high-resolution satellite data to identify anomalies in tree health
1. Once anomalies are identified, determine whether it indicates that a tree is unhealthy or healthy.
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3. Track and continue to monitor issues

Sentinel 2 Dataset

- Gathered from large forests in Indiana from March – August each year from 2018 to 2022
- Over 300 images tiled to over 1,000 256x256 images
- Unable to identify anomalies without further steps
- 10 meter – 60 meter per pixel resolution
- Intelinair’s imagery is 10cm per pixel resolution

Sentinel Imagery – Low Resolution

References and Acknowledgements

References:
- Copernicus Sentinel 2 data (2018-2022), processed by ESA.

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