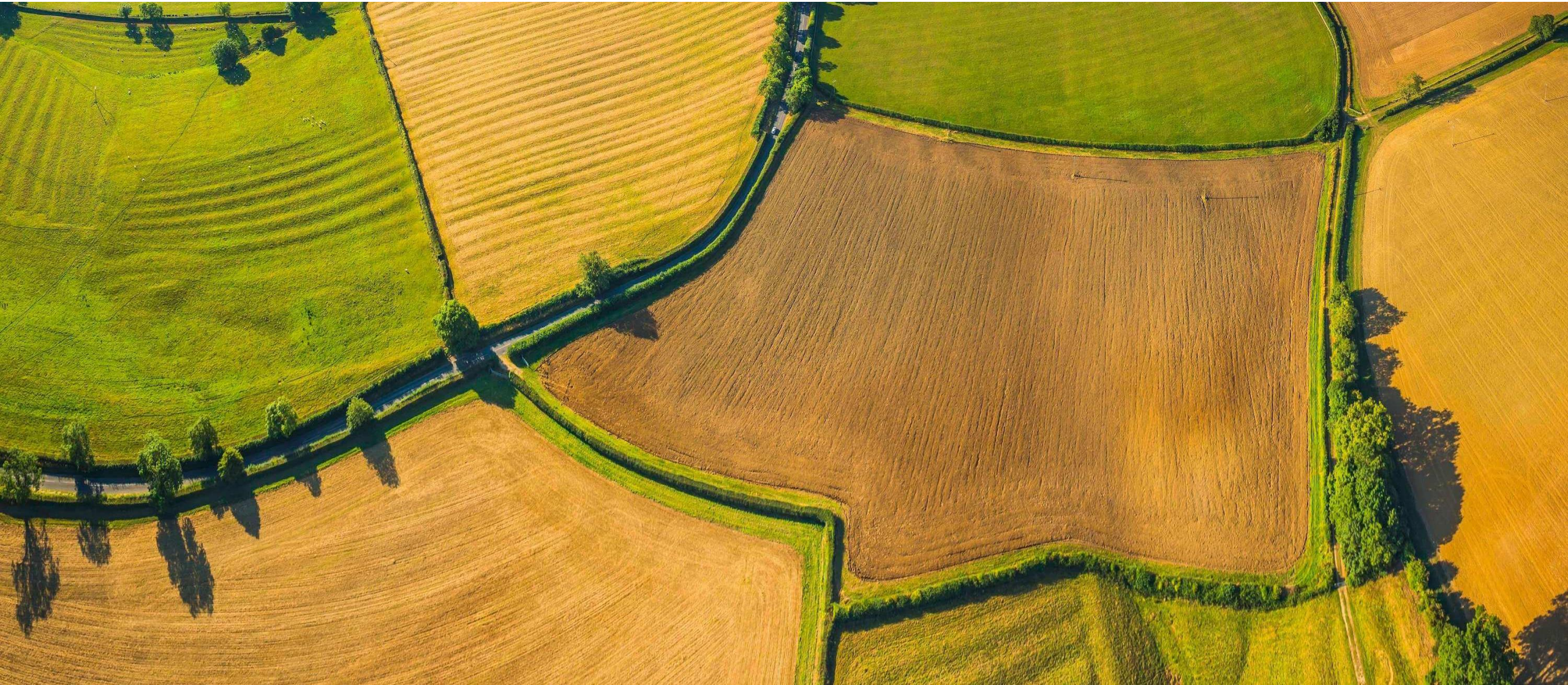
Field Boundary Detection

Experiments using DBSCAN Unsupervised Learning and H3 hexes



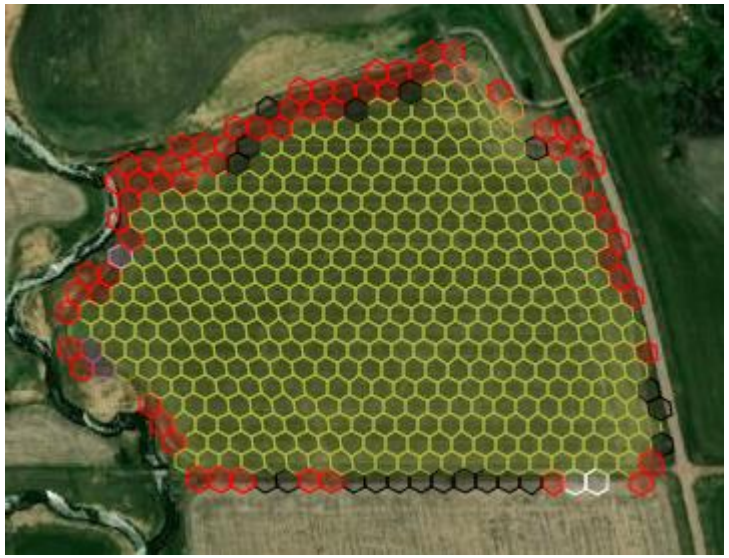
Methods Description

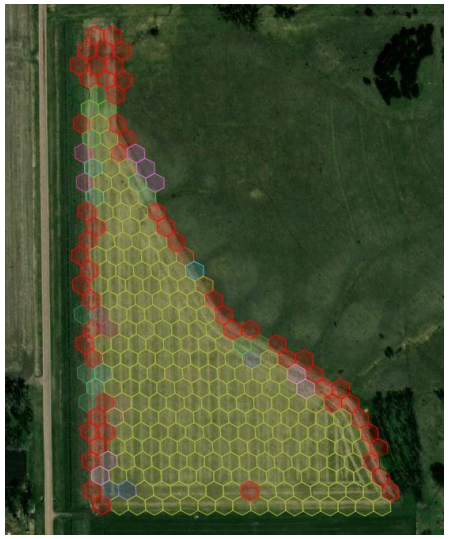
Summary of the methods followed to obtain further listed results

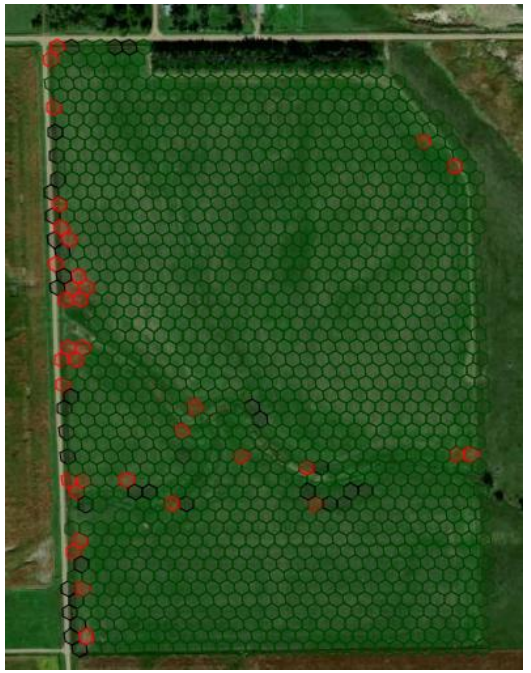
- Datasets extracted from fields in L3 hex 832600fffffffff from the S3 bucket in this link.
- Numeric values / Vectors based on Sentinel 2 band values from B01 to B12.
- Clustering using DBSCAN with two different metrics: Euclidean Distance and Cosine Similarity.
- Source Code available at https://github.deere.com/en89912/FieldBoundaryDetectionUnsupervised

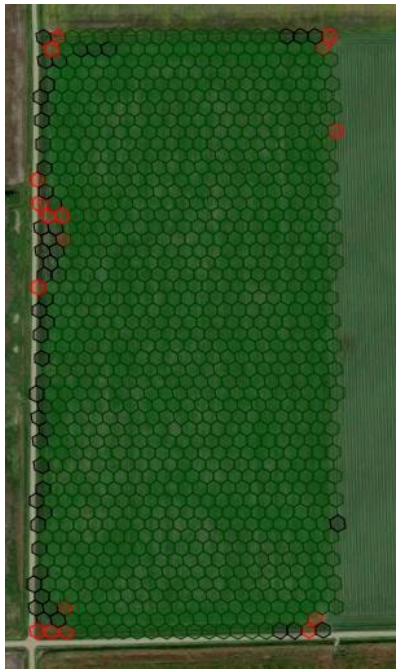
Metric: Cosine Similarity

Metric: Cosine **Similarity:** 0.004

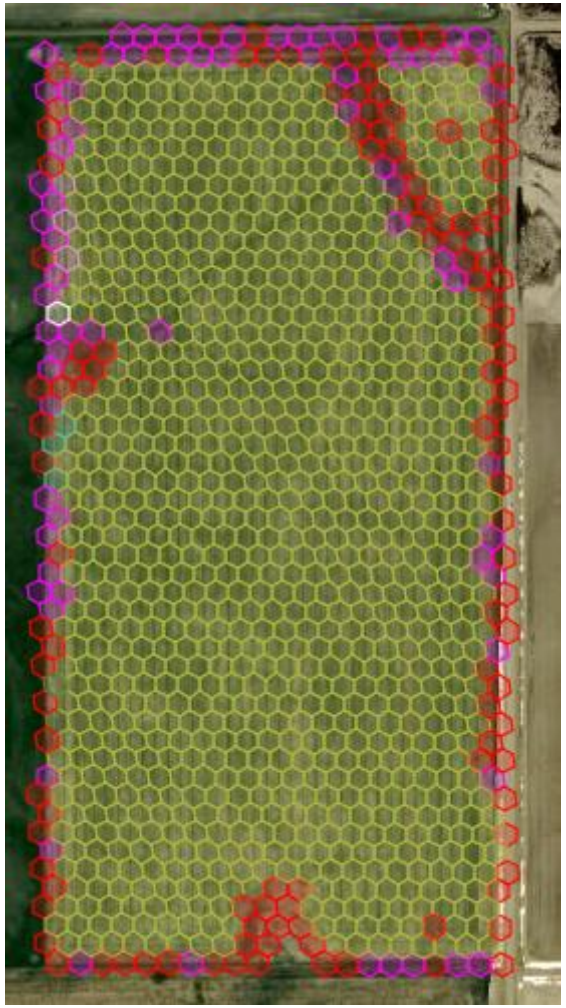


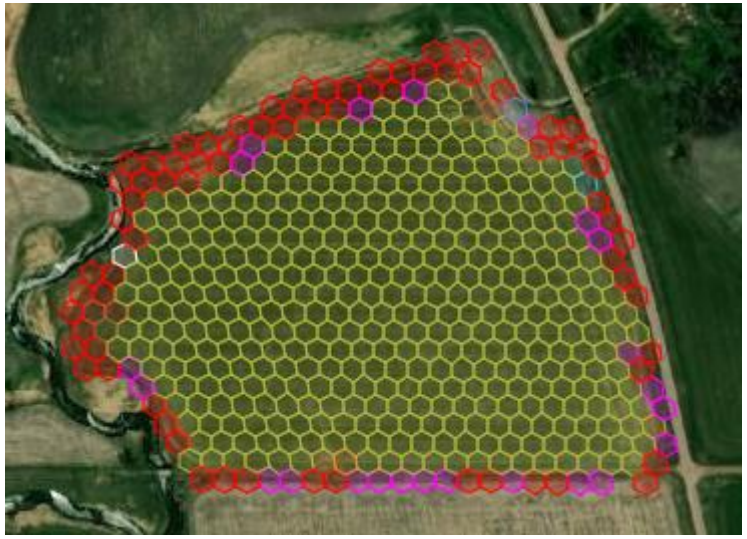


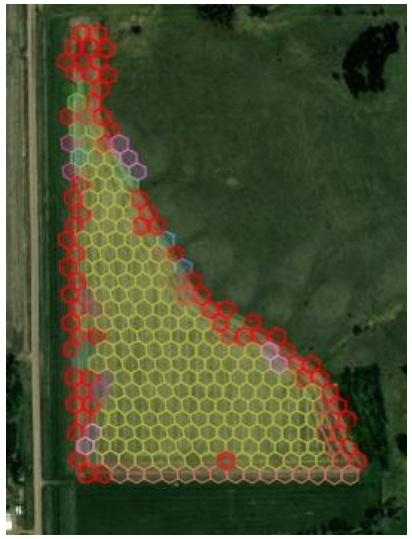


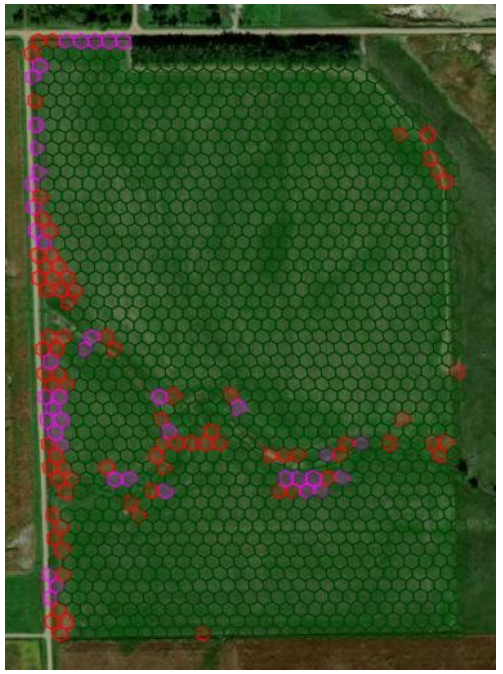


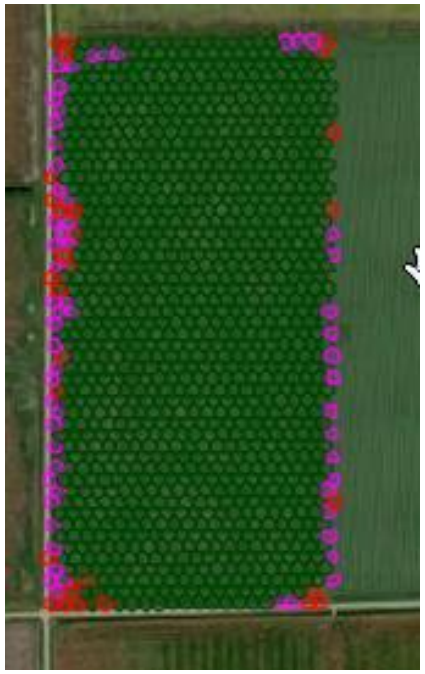
Metric: Cosine **Similarity:** 0.003

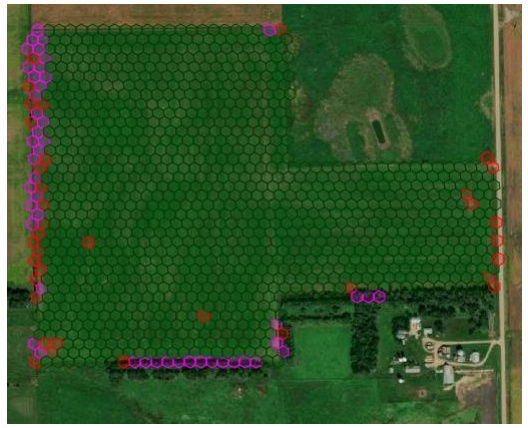




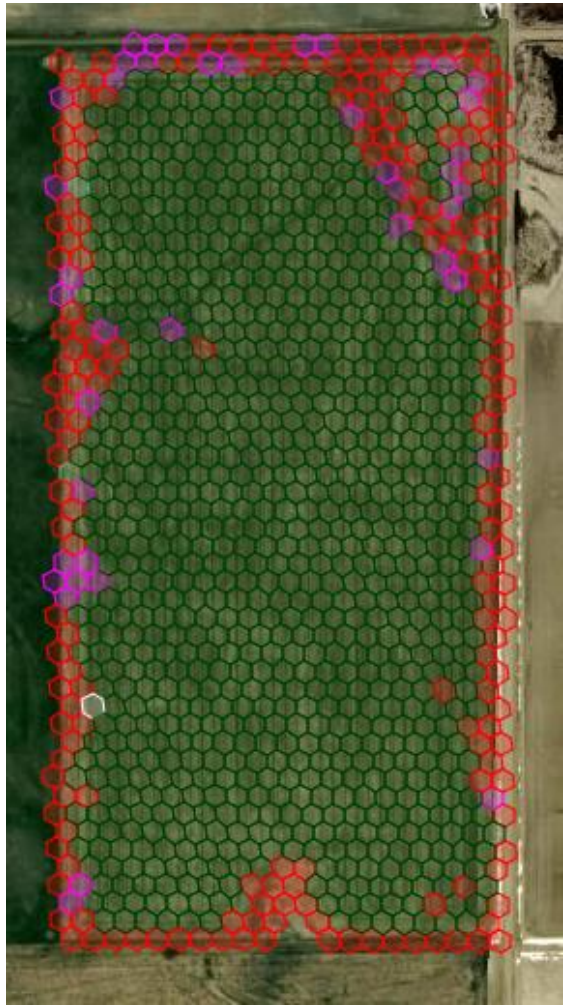


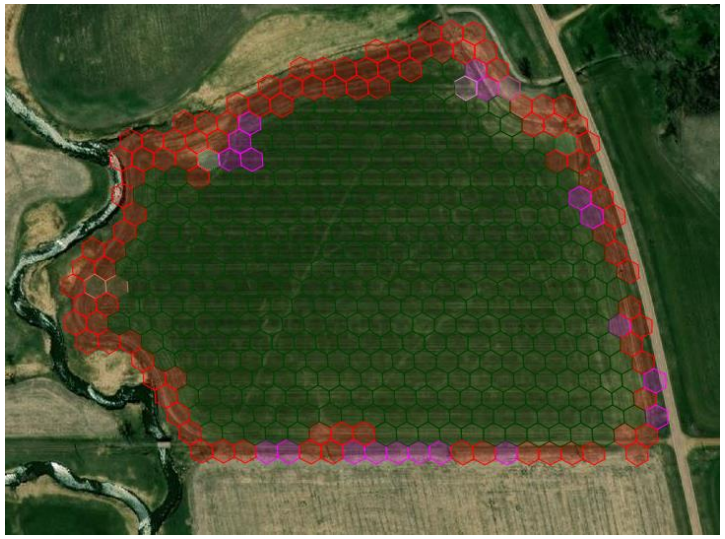


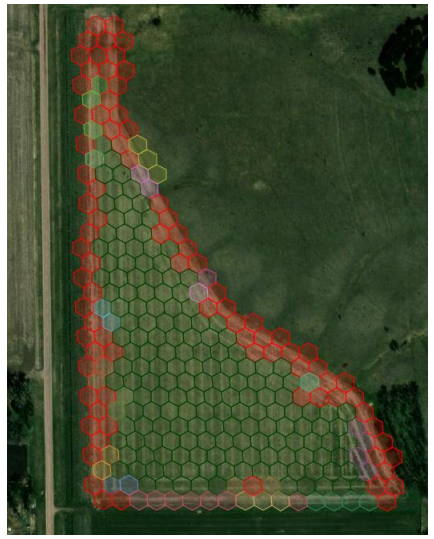


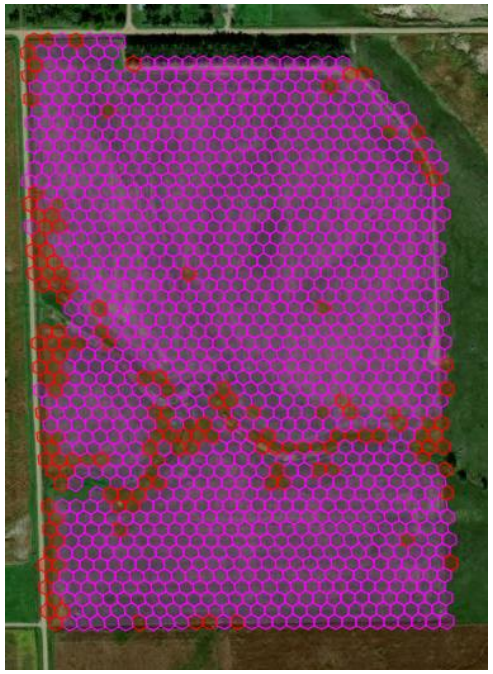


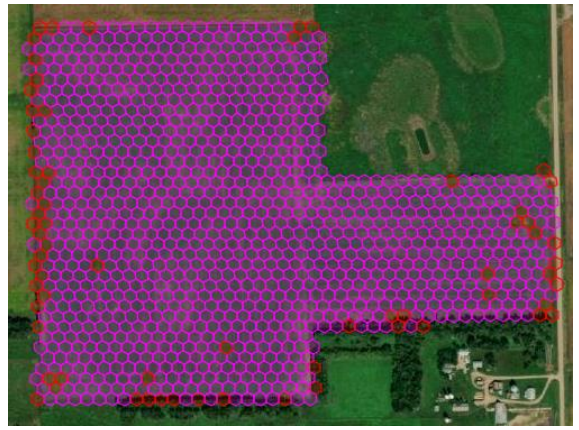
Metric: Cosine **Similarity:** 0.002



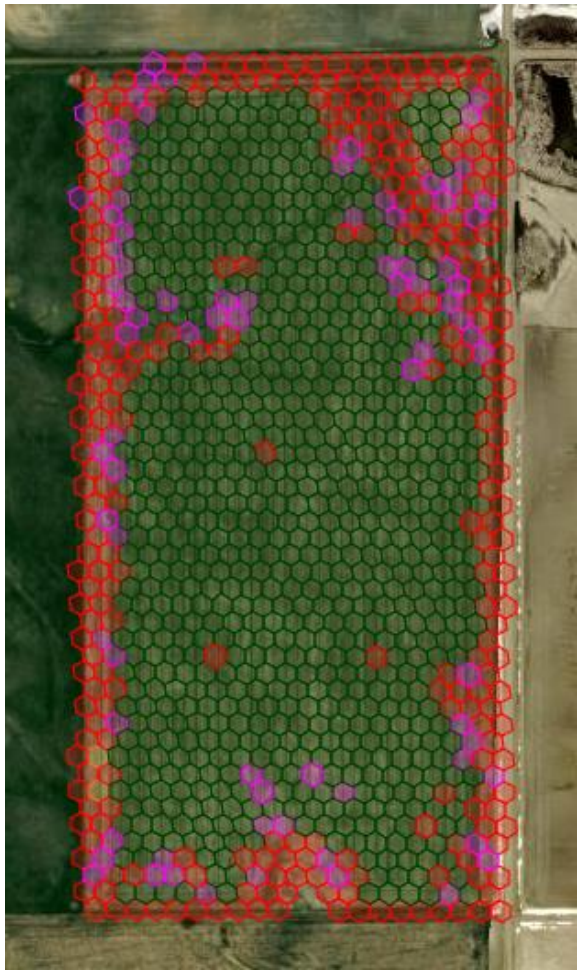


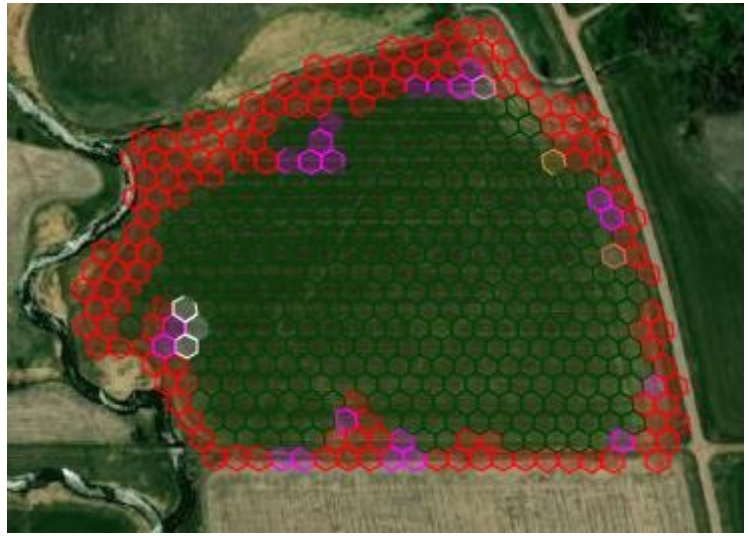


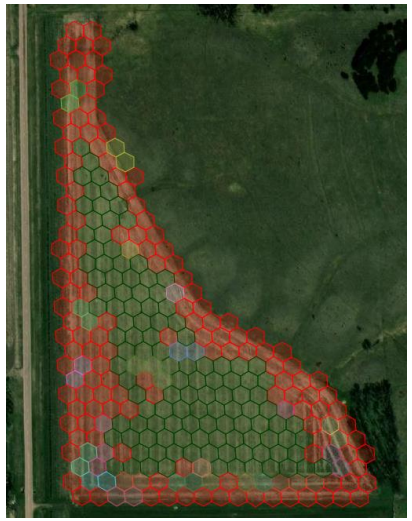


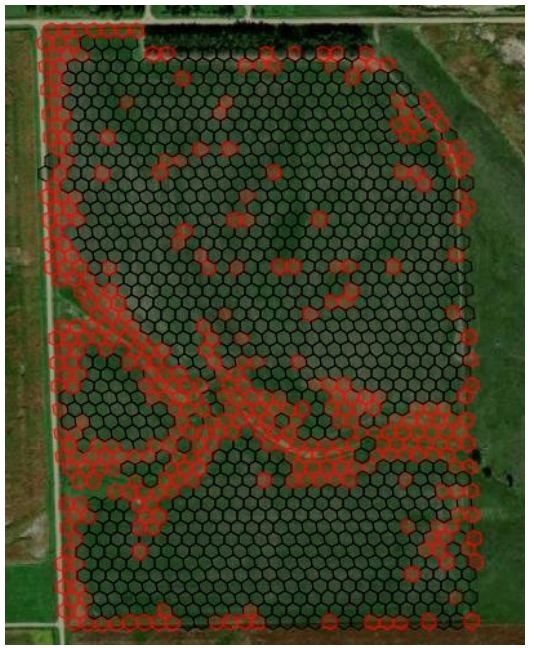


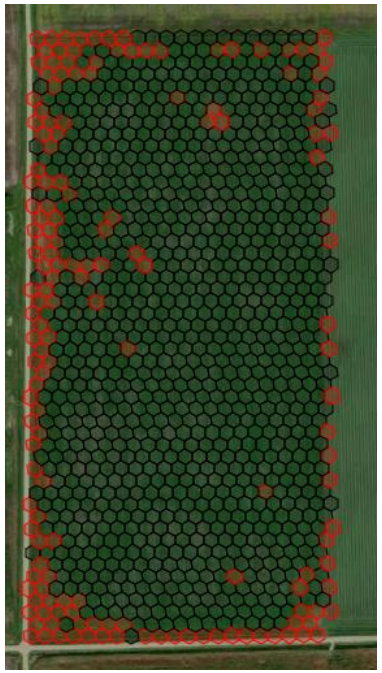
Metric: Cosine **Similarity:** 0.001



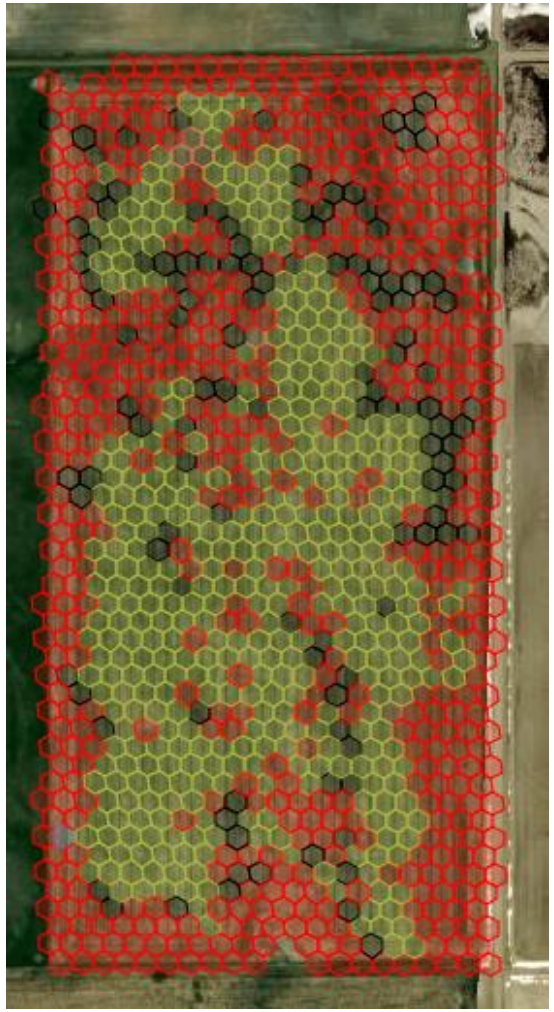


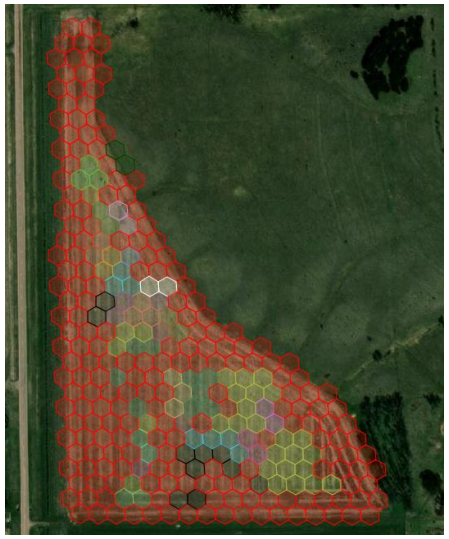


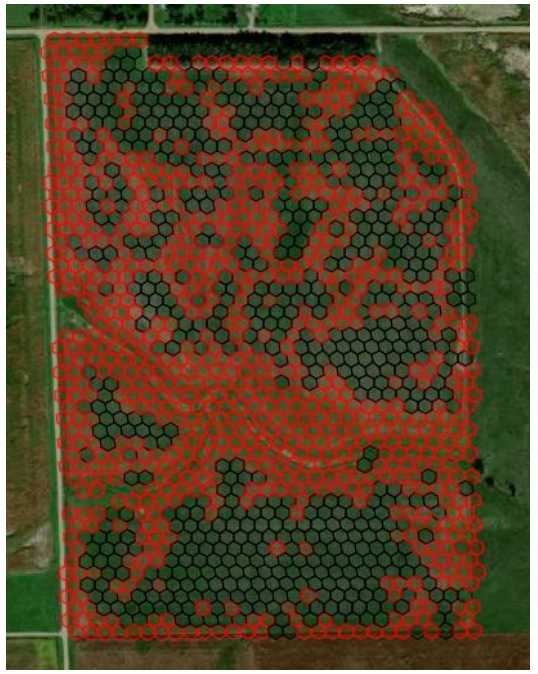




Metric: Cosine **Similarity:** 0.0005

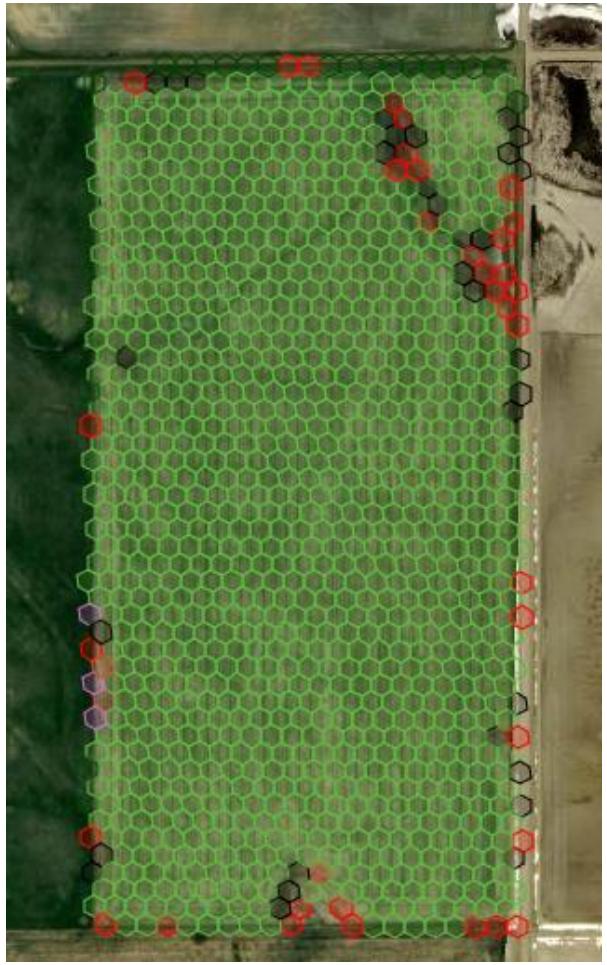


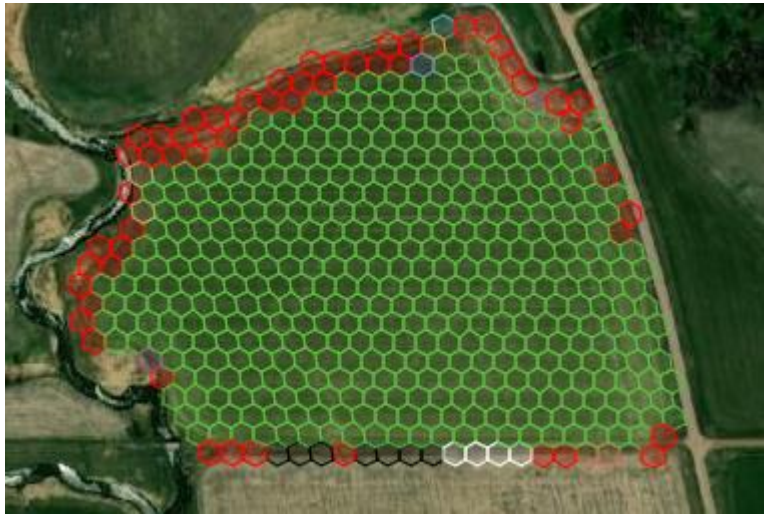


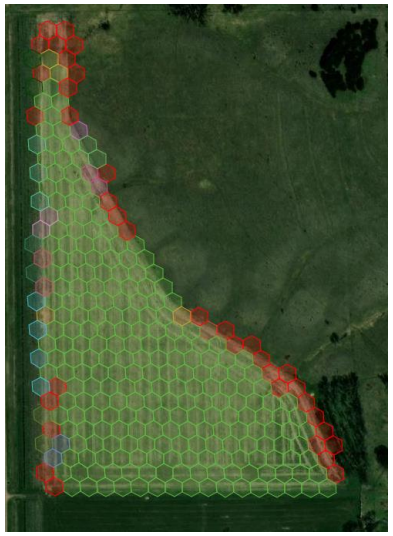


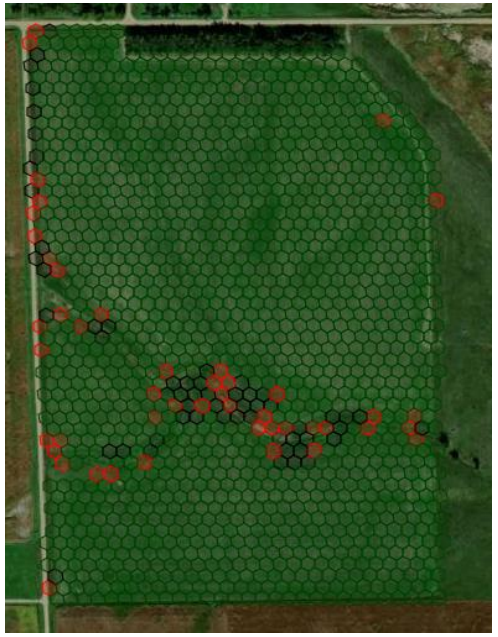
Metric: Euclidean Distance

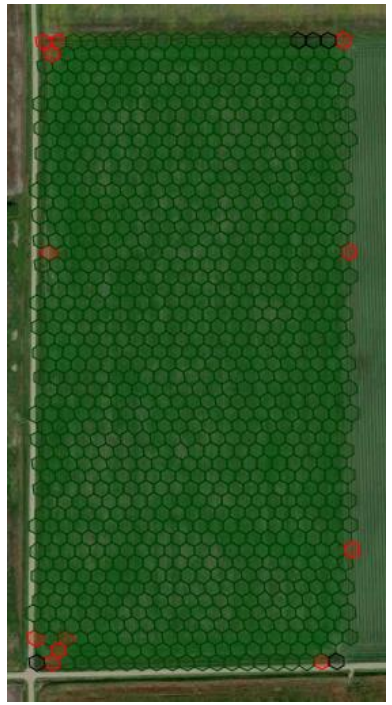
Metric: Euclidean **Distance:** 300

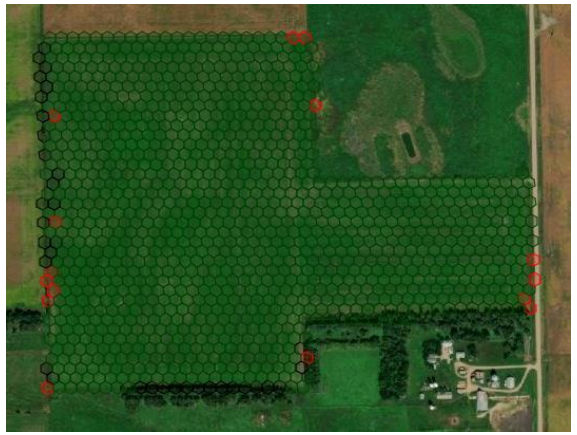




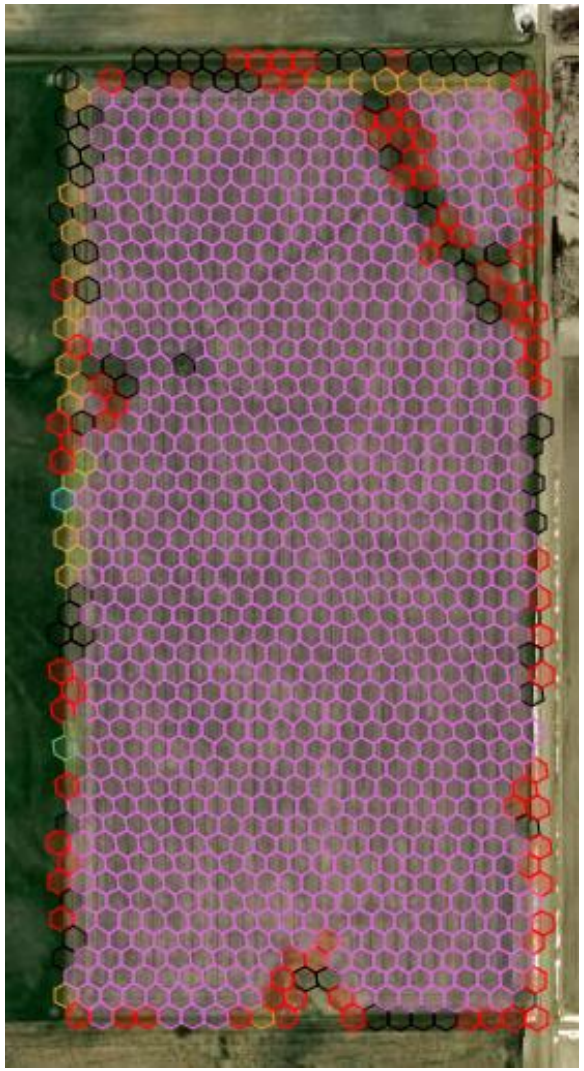


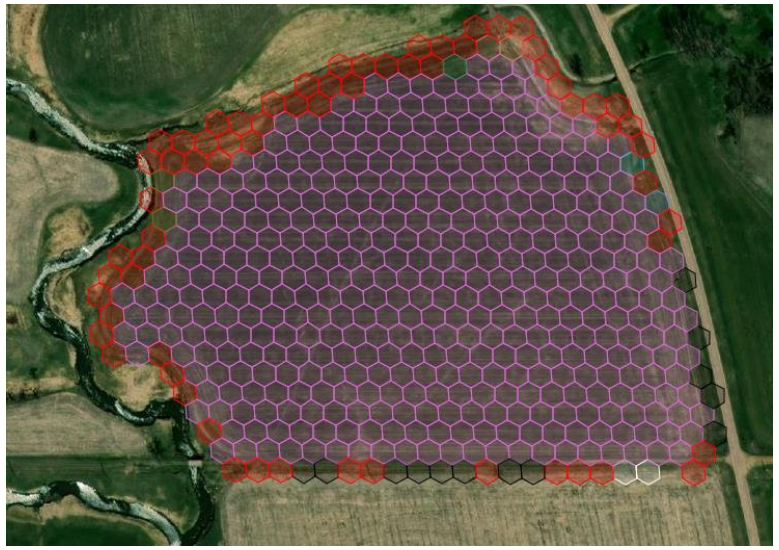


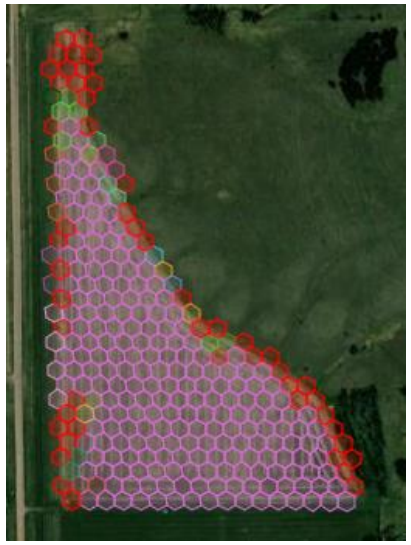


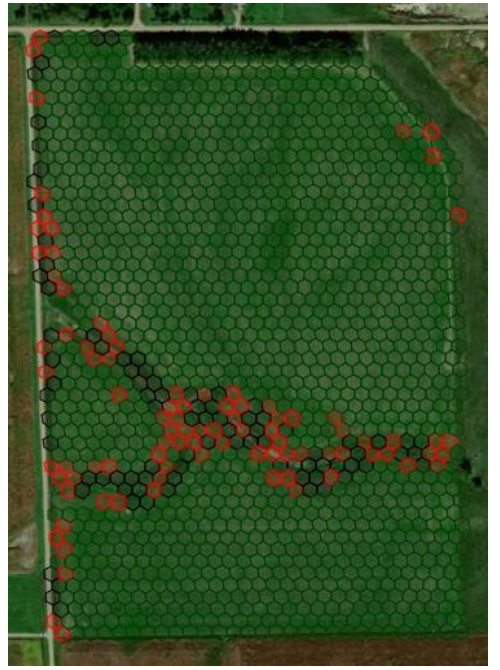


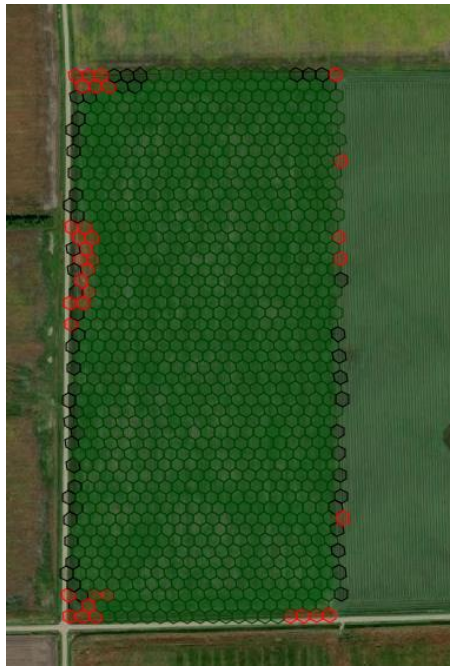
Metric: Euclidean **Distance:** 250



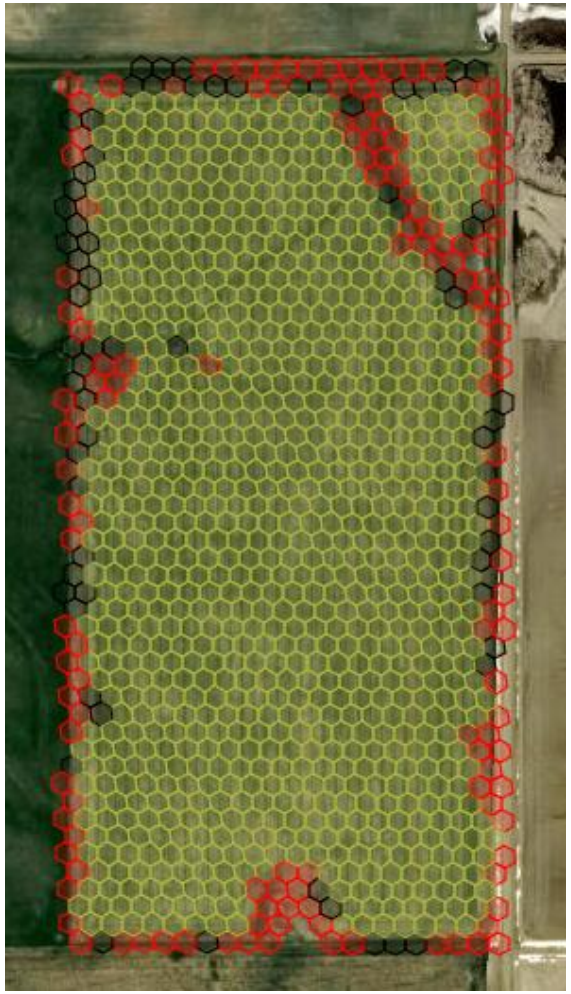


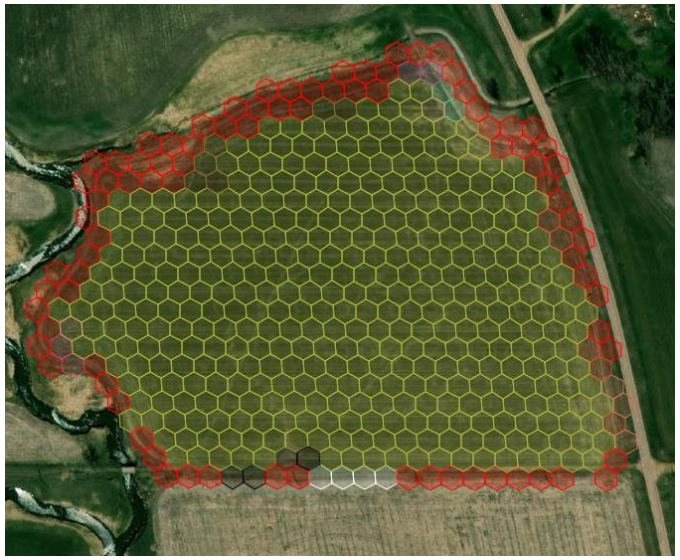


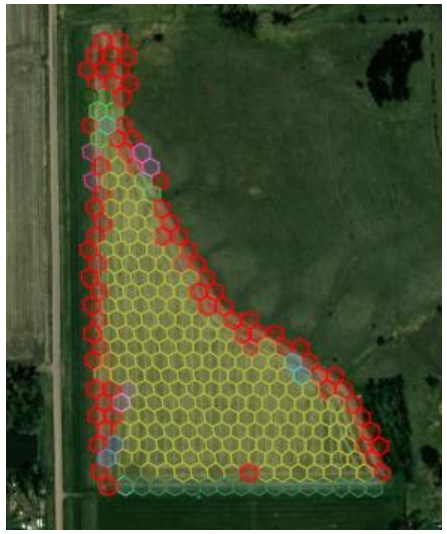


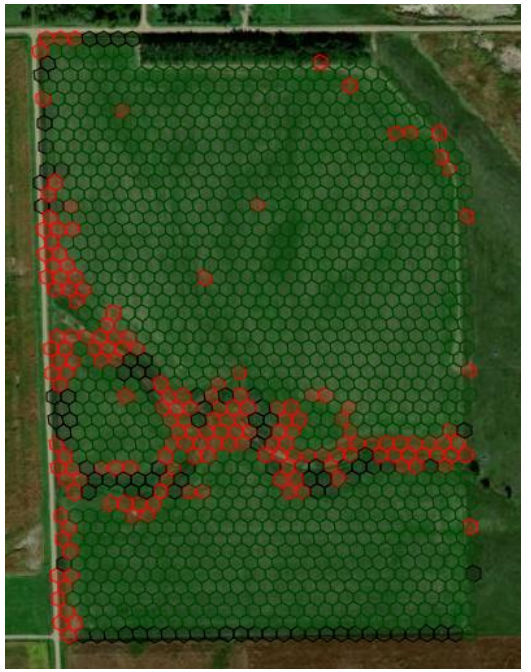


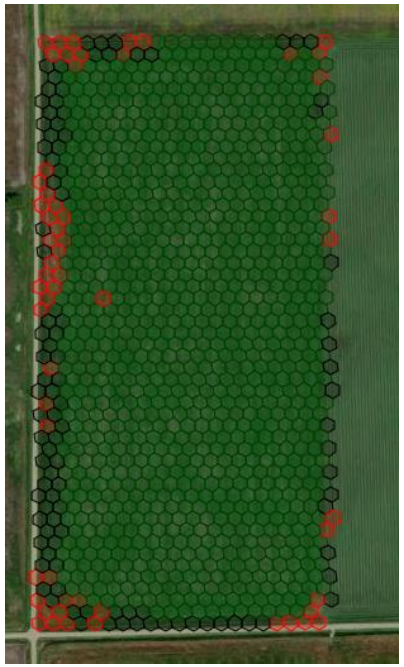
Metric: Euclidean **Distance:** 200

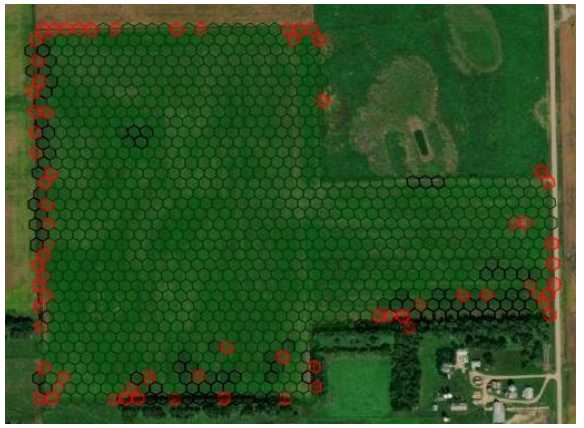




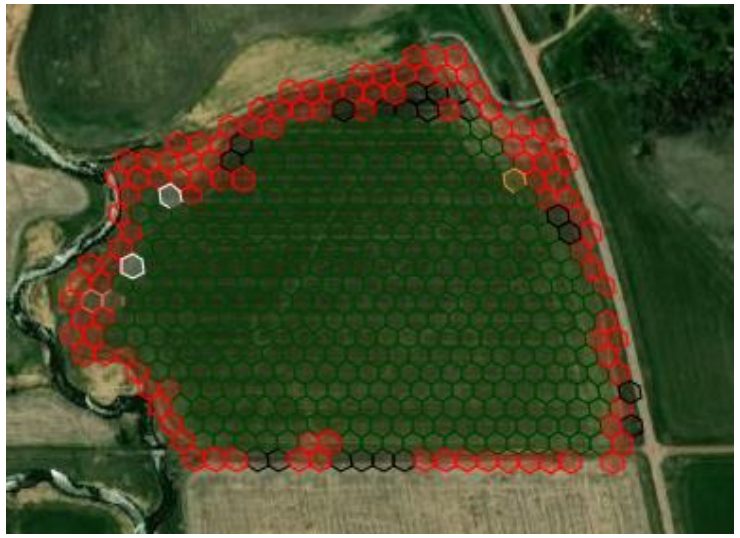


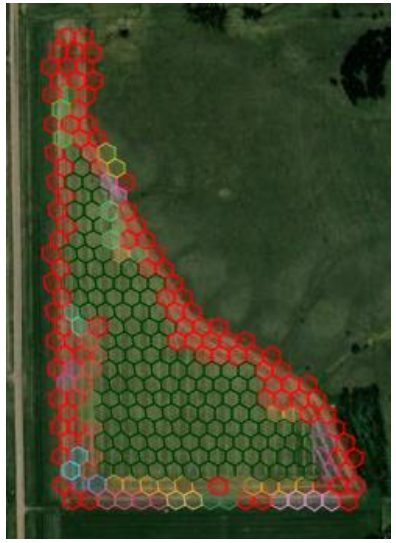


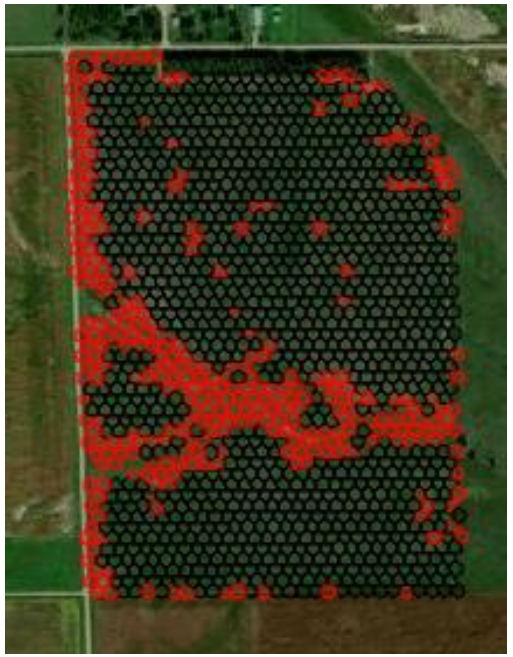


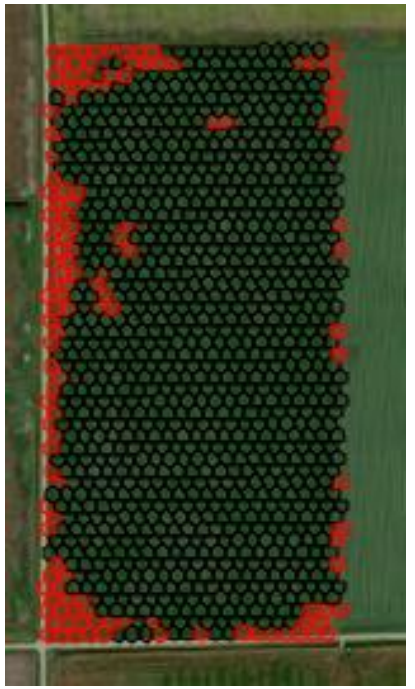


Metric: Euclidean **Distance:** 150









Discussion

- Even machine learning methods based only on the average values of sentinel 2 maps resulted in interesting / promising results to detect crop fields.
- With the right hyperparameters it was possible to group in different clusters the hexes inside field from hexes in the border, specially those with greater portion outside the field.
- Cosine similarity and Euclidean Distance produced equivalent results as metrics for DBSCAN.
- No numeric evaluation of accuracy was produced during this quick exploratory test.
- Self-supervised methods using this data to train MLP / CNN models should produce even better results given their better suitability to the problem.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