

INTRODUCTION

- Machine Learning Challenge provided by AI4EO [1]
- AI4EO aims to reduce the gap between Earth Observation and Artificial Intelligence
- Objective: classify crop types

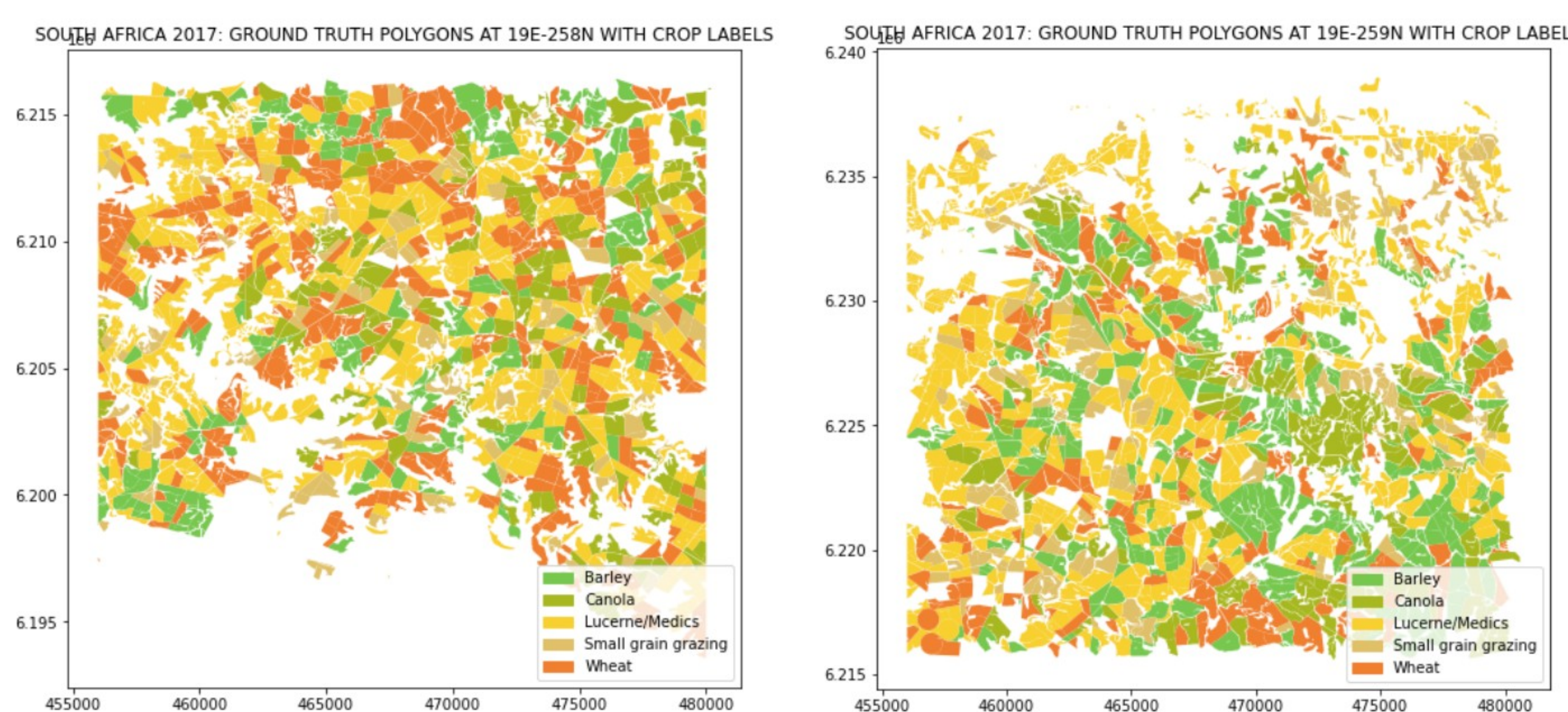


Fig.1: Training data

DATA

- Time series data from Sentinel-1, Sentinel-2 and Planet Fusion Monitoring Data.
- Within-season crop identification in the Republic of South Africa (19E-258N and 19E-259N)
- Five different winter crop types throughout an entire growing season (April - December 2017)

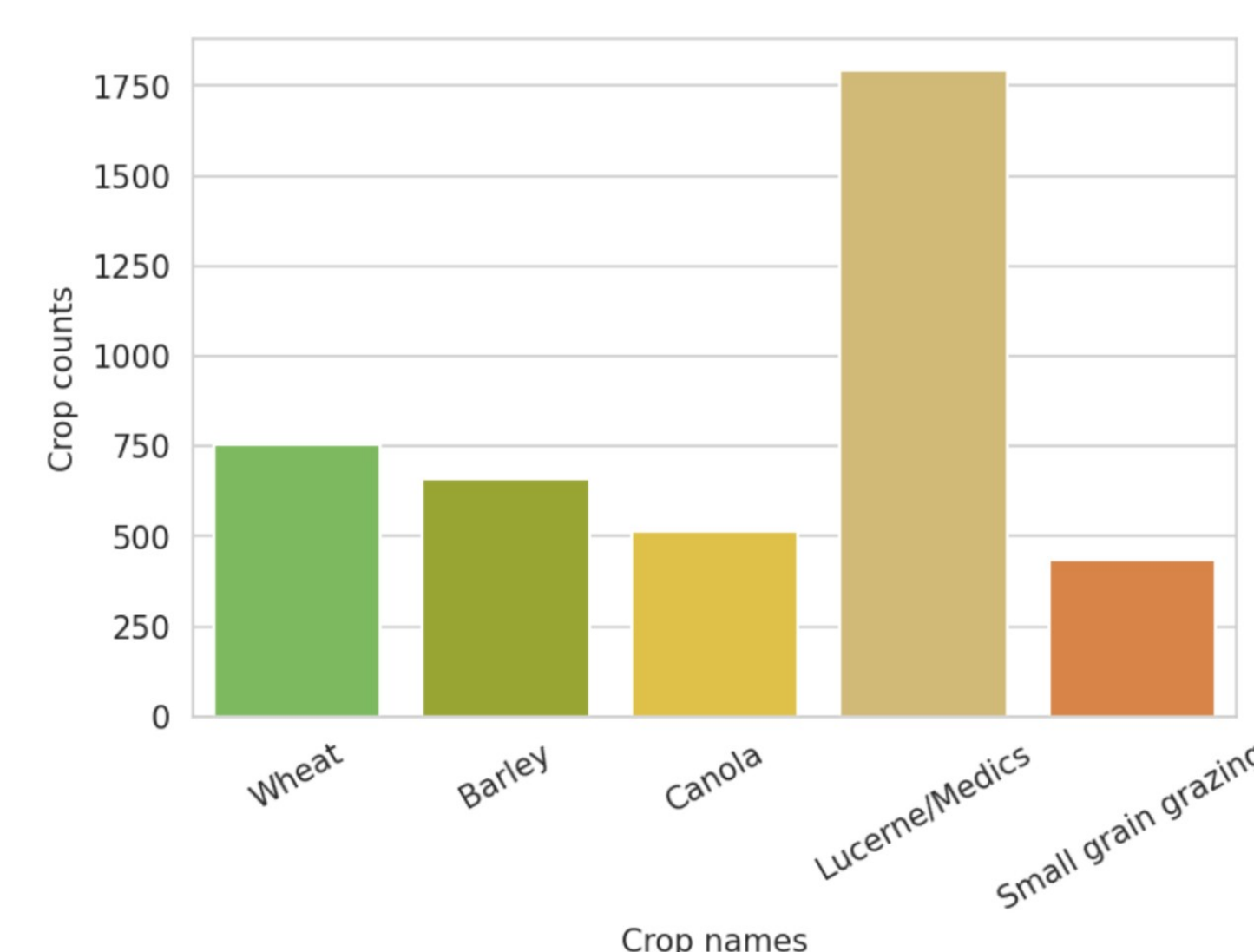


Fig.2: Distribution of crop types

MODELS

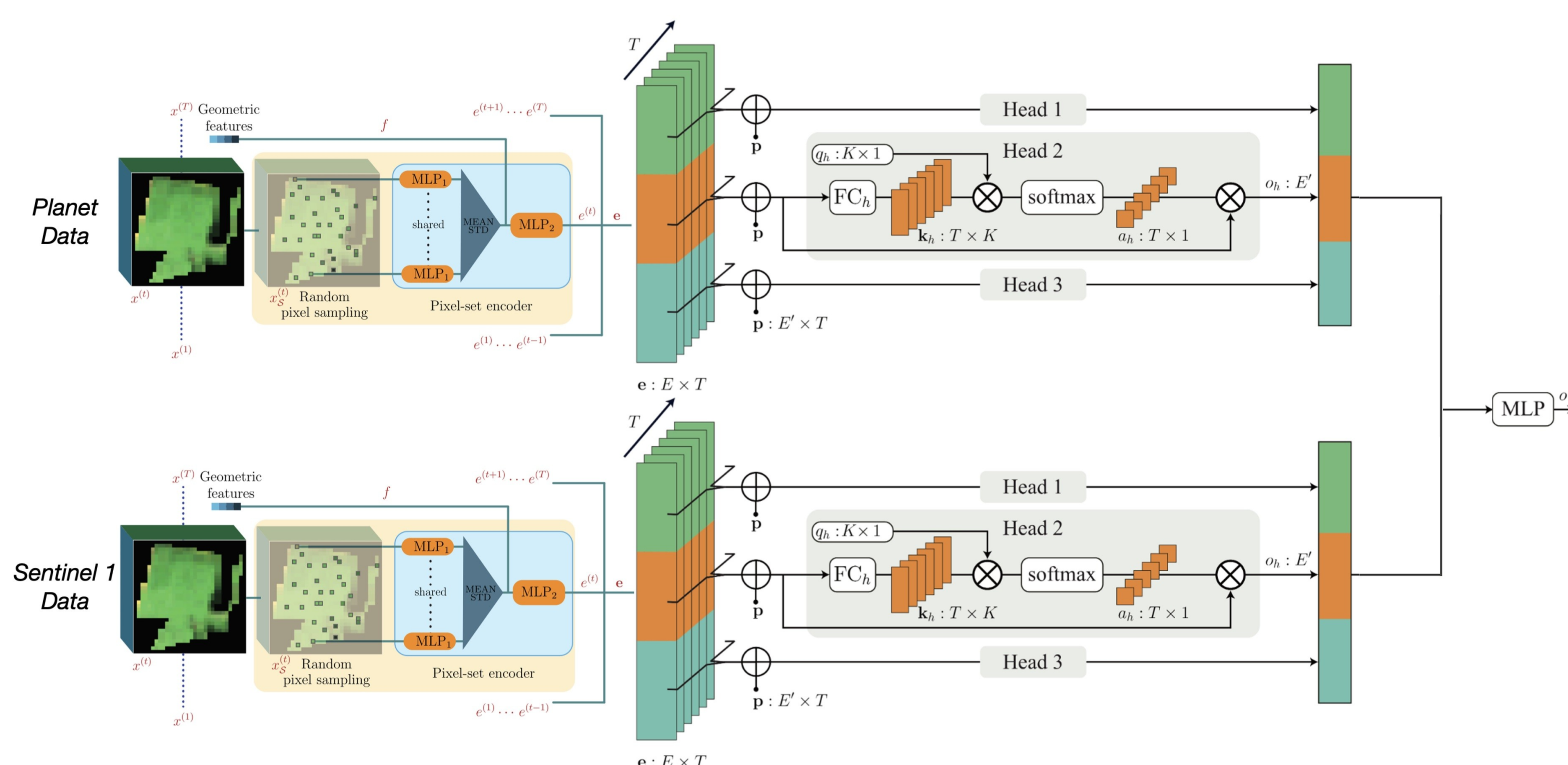


Fig. 3: PSELTAE: a modification of the Temporal Attention Encoder, [2], [3]. The code has been adapted from <https://github.com/Vsainteuf/lightweight-temporal-attention-pytorch>, Garnot, and Landrieu (2020) [2]. Figure is a modified combination from both sources.

- Spatio-temporal model
- 2 parallel PSELTAE models (for Sentinel-1, and for Planet data, third model for Sentinel-2 did not improve the results)
- Connected at final MLP layer
- Hyperparameter tuning using NNI was included (best results were achieved with the default settings)
- Ensemble of models with 10-fold cross validation of data
- General parameters:
 - Batch size: 8
 - Adam optimizer with learning rate 0.001 and weight decay 1e-6
 - Loss: focal loss

PREPROCESSING

- Selection of 640 pixels randomly from each field
- Additional features:
 - Normalized Vegetation Index
 - Radar Vegetation Index

EVALUATION

The evaluation metric is Cross Entropy with binary outcome for each crop (field level)

LITERATURE

- [1] <https://platform.ai4eo.eu/ai4food-security-south-africa>
- [2] Lightweight Temporal Self-Attention for Classifying Satellite Image Time Series, Garnot, and Landrieu 2020, <https://doi.org/10.48550/arXiv.2007.00586>
- [3] Satellite Image Time Series Classification with Pixel-Set Encoders and Temporal Self-Attention, Garnot et al. 2019, <https://doi.org/10.48550/arXiv.1911.07757>

TEST SET PREDICTION

- Region: 20E-259N
- Time Period: April - December 2017
- Final Score on Test Set: 3.6

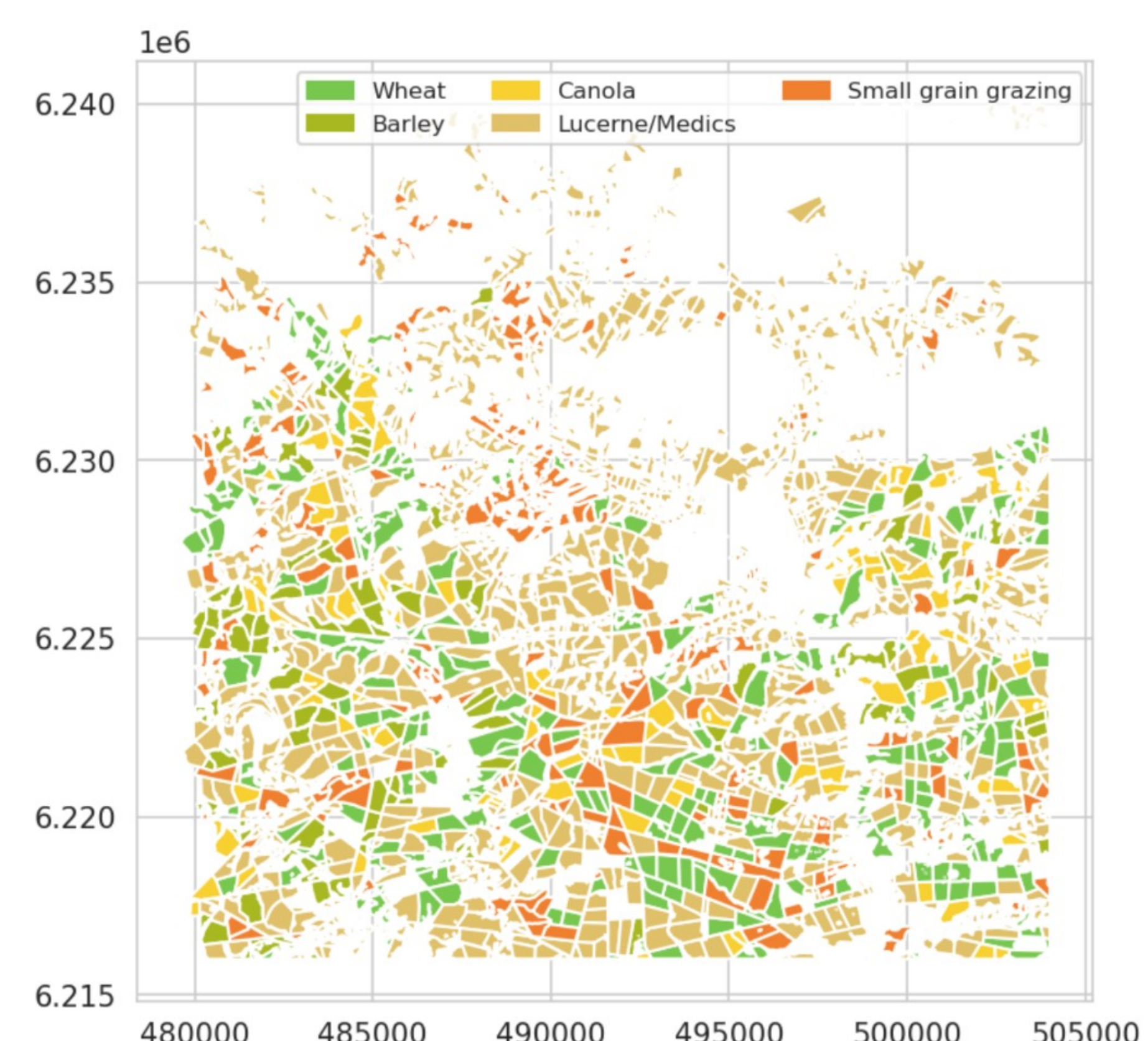


Fig.4: Crop classification on the test set