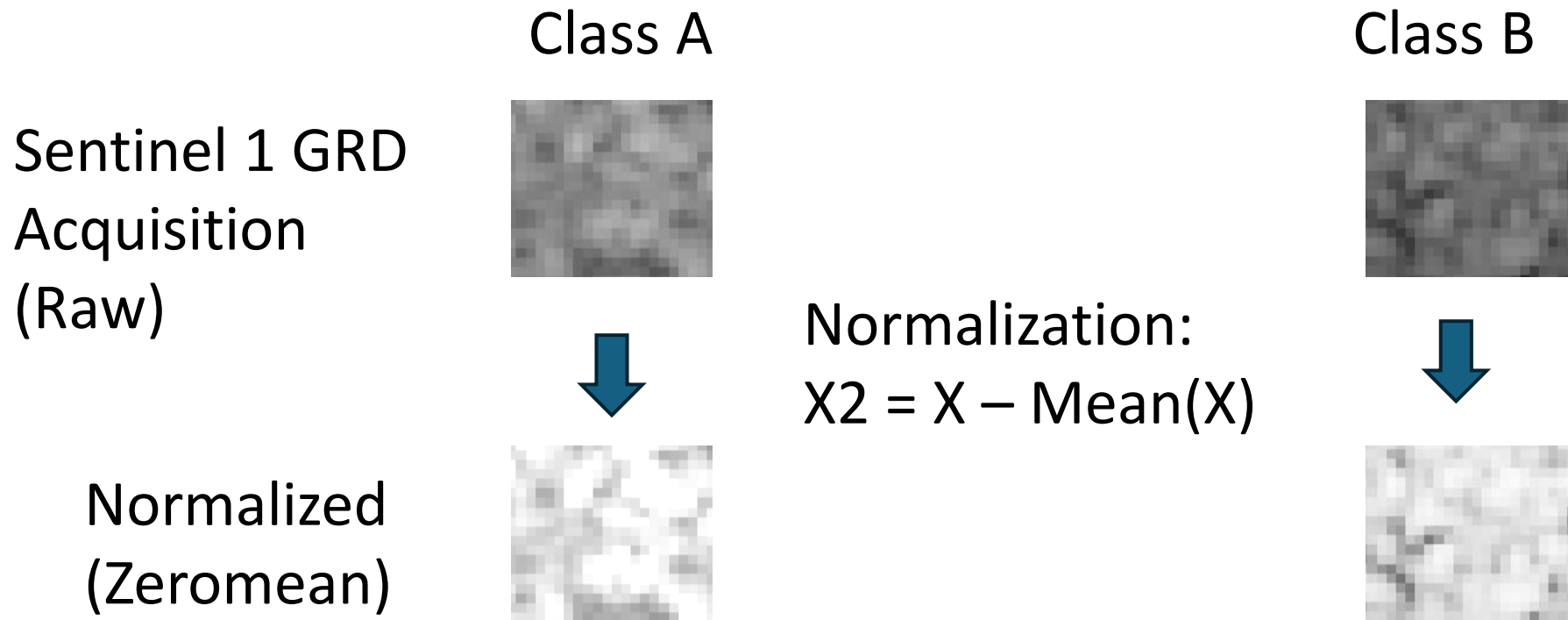


Are Speckle patterns crop-specific?

2nd Dec 2025

Hypothesis

A Neural Network can distinguish classes in normalized images.
→ This would mean distinguishing speckle patterns



Test setup:

Class selection:



Meadows
1



Corn
4



Beet
6



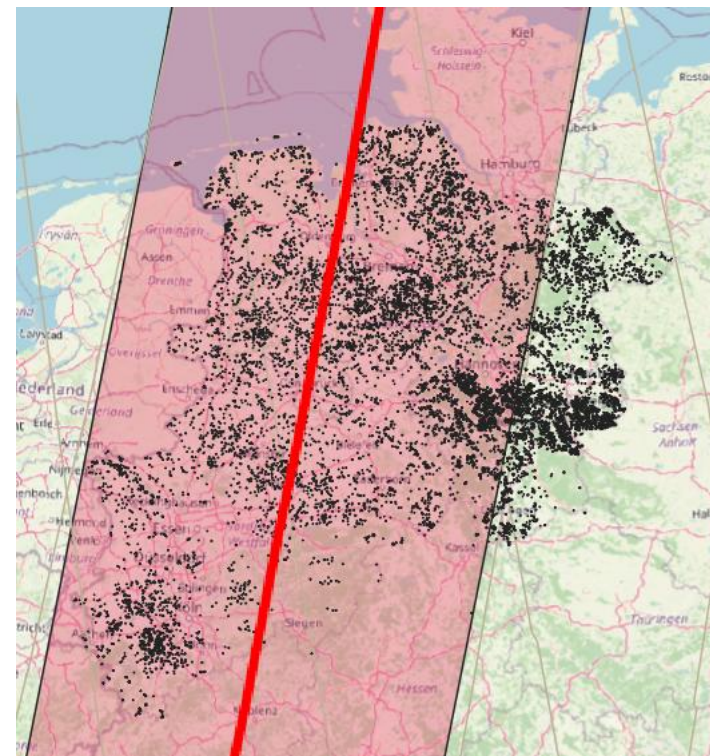
Wheat
12

Data: Sentinel 1 GRD Orbit D139

Date: 11. Juni 2022 (und 23. Juni 2022)

Region:

NRW + Niedersachsen



N training samples both dates:

```
"train_samples":      54 212  
"validation_samples": 17 756  
"test_samples":       17 864
```

NN network NR. 1; „test_conv2d“

Model Architecture: test_conv2d

Layer (type)	Output Shape	Param #
Conv2d-1	[-1, 32, 10, 10]	576
BatchNorm2d-2	[-1, 32, 10, 10]	64
Conv2d-3	[-1, 64, 10, 10]	18,432
BatchNorm2d-4	[-1, 64, 10, 10]	128
Conv2d-5	[-1, 128, 10, 10]	73,728
BatchNorm2d-6	[-1, 128, 10, 10]	256
AdaptiveAvgPool2d-7	[-1, 128, 1, 1]	0
Dropout-8	[-1, 128]	0
Linear-9	[-1, 4]	516

Total params: 93,700

Trainable params: 93,700

Non-trainable params: 0

NN network Nr. 2: „test_conv2d_n2“

Model Architecture: test_conv2d_n2

Layer (type)	Output Shape	Param #
Conv2d-1	[-1, 8, 10, 10]	152
BatchNorm2d-2	[-1, 8, 10, 10]	16
Conv2d-3	[-1, 16, 10, 10]	1,168
BatchNorm2d-4	[-1, 16, 10, 10]	32
AdaptiveAvgPool2d-5	[-1, 16, 1, 1]	0
Dropout-6	[-1, 16]	0
Linear-7	[-1, 4]	68

Total params: 1,436

Trainable params: 1,436

Non-trainable params: 0

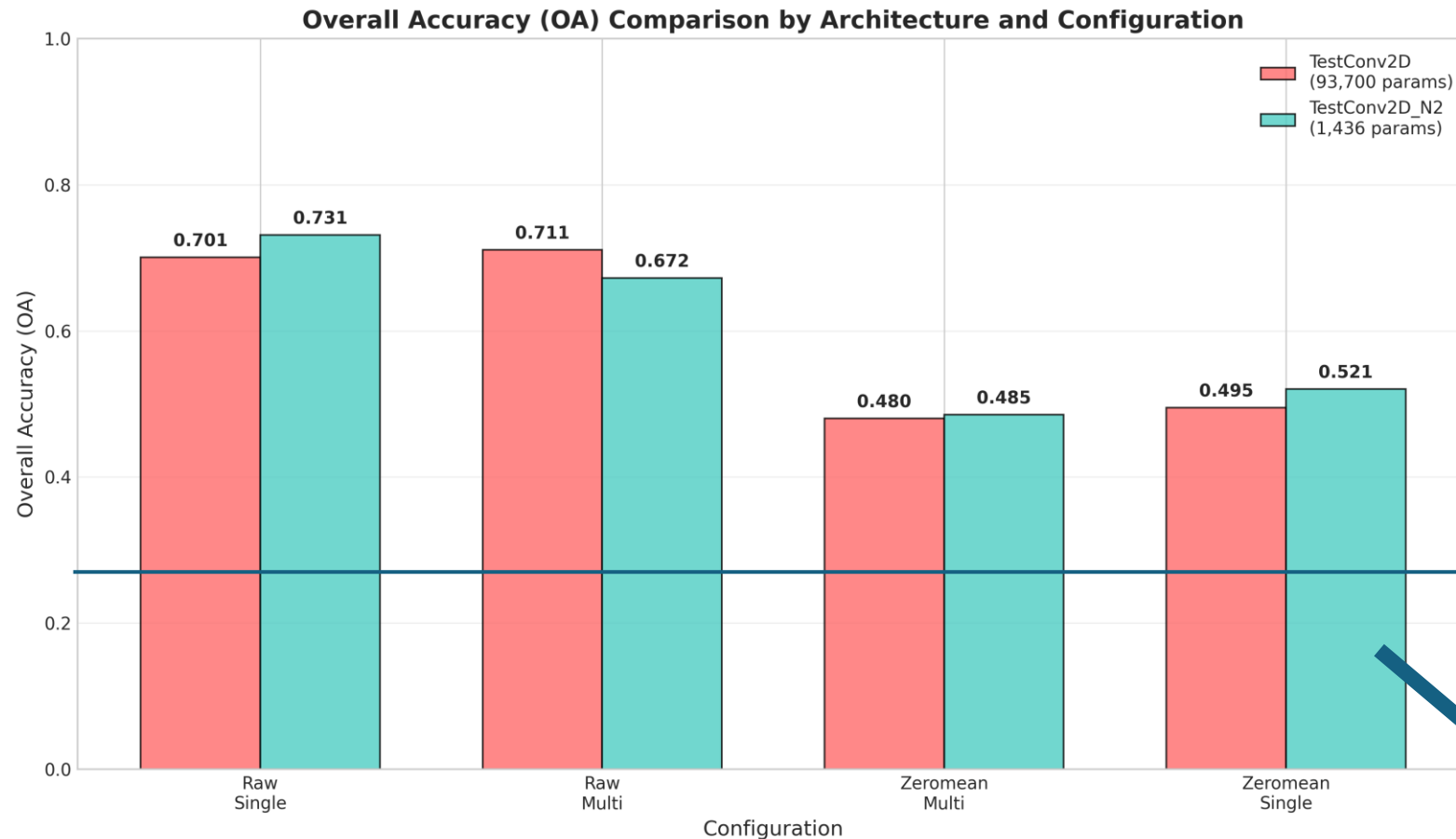
Results : Overall accuracy

Raw = no Normalization

Zeromean = Normalized

Single = 11.06.2022

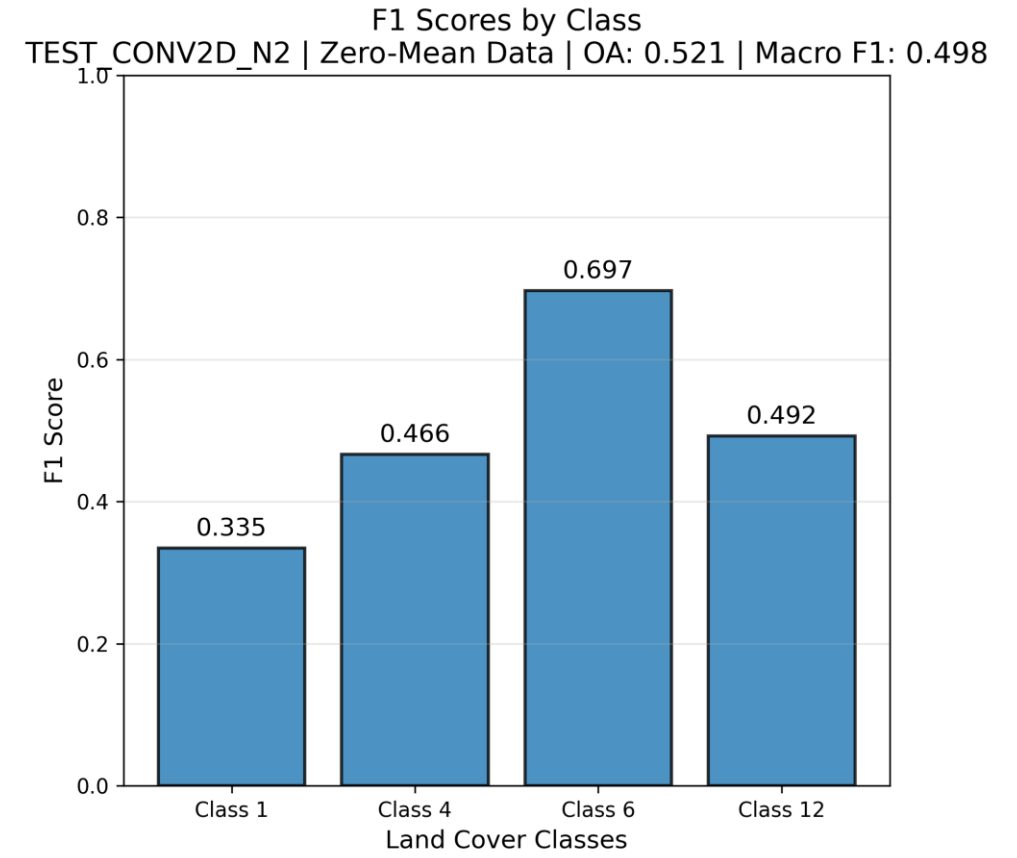
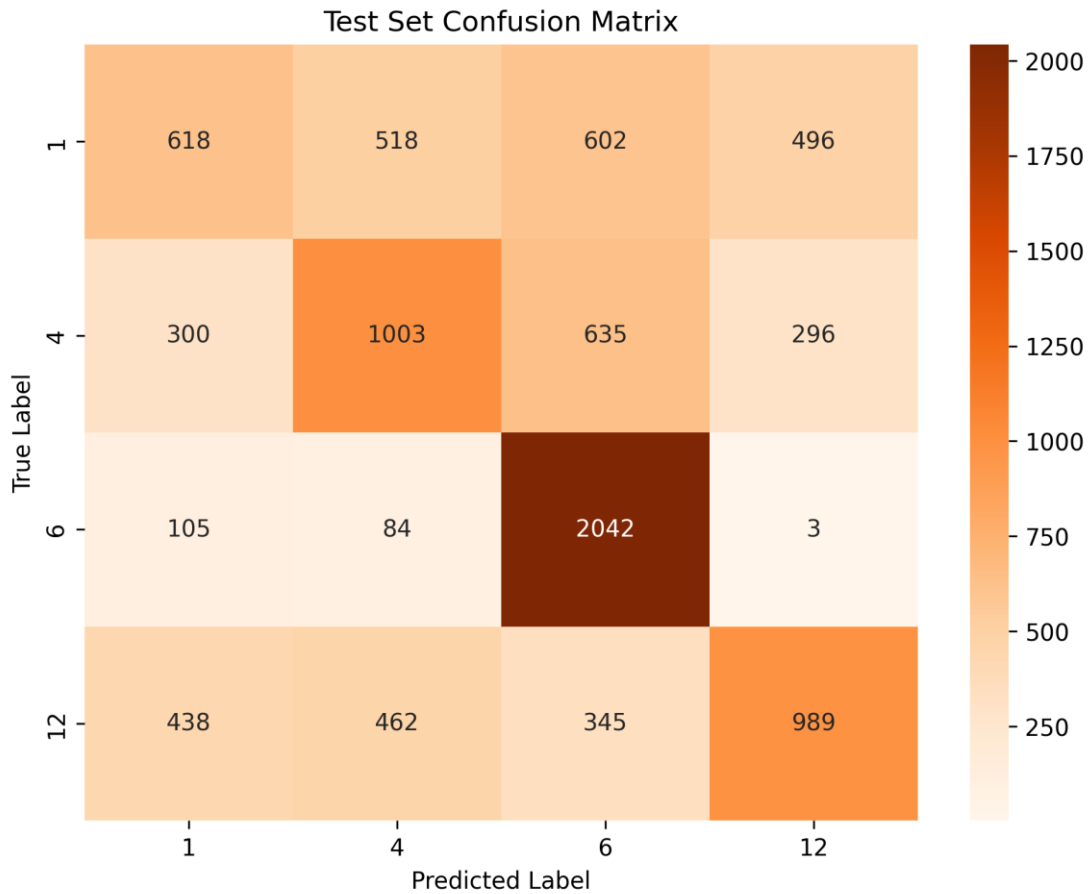
Multi = 11.06.2022 and 23.06.2022



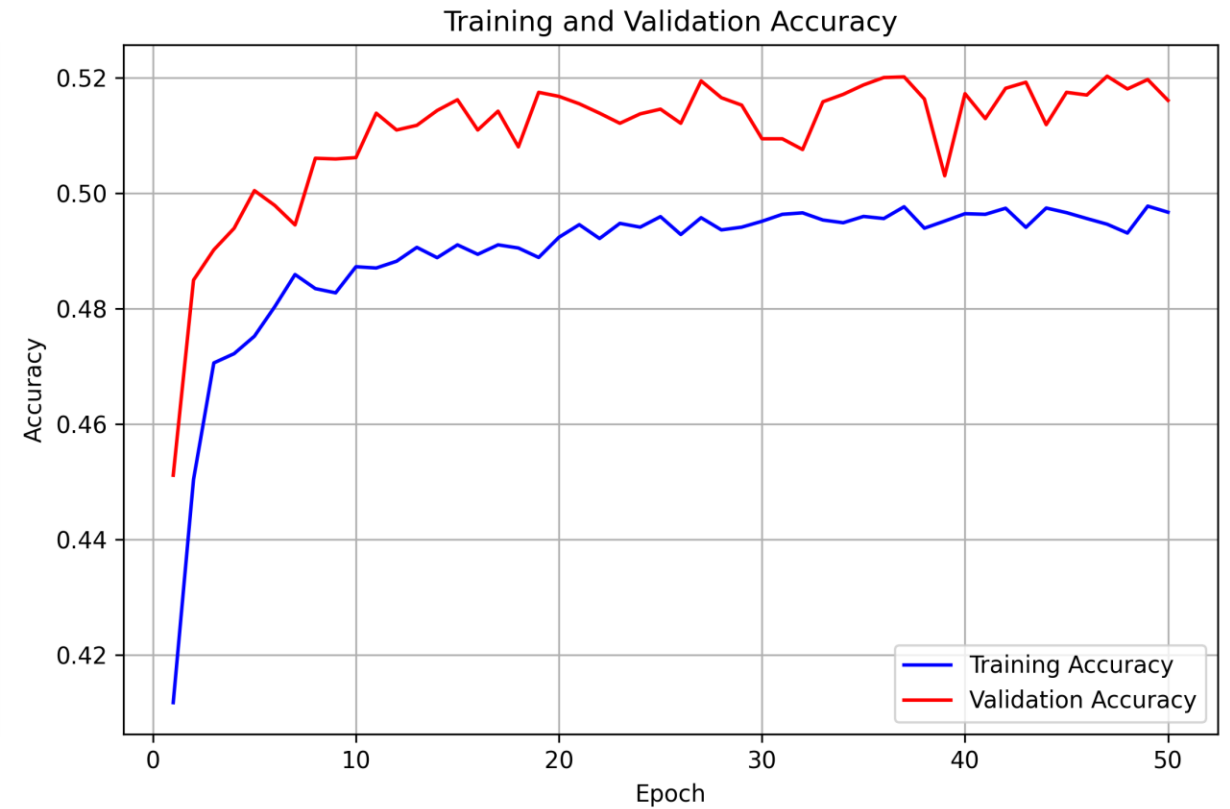
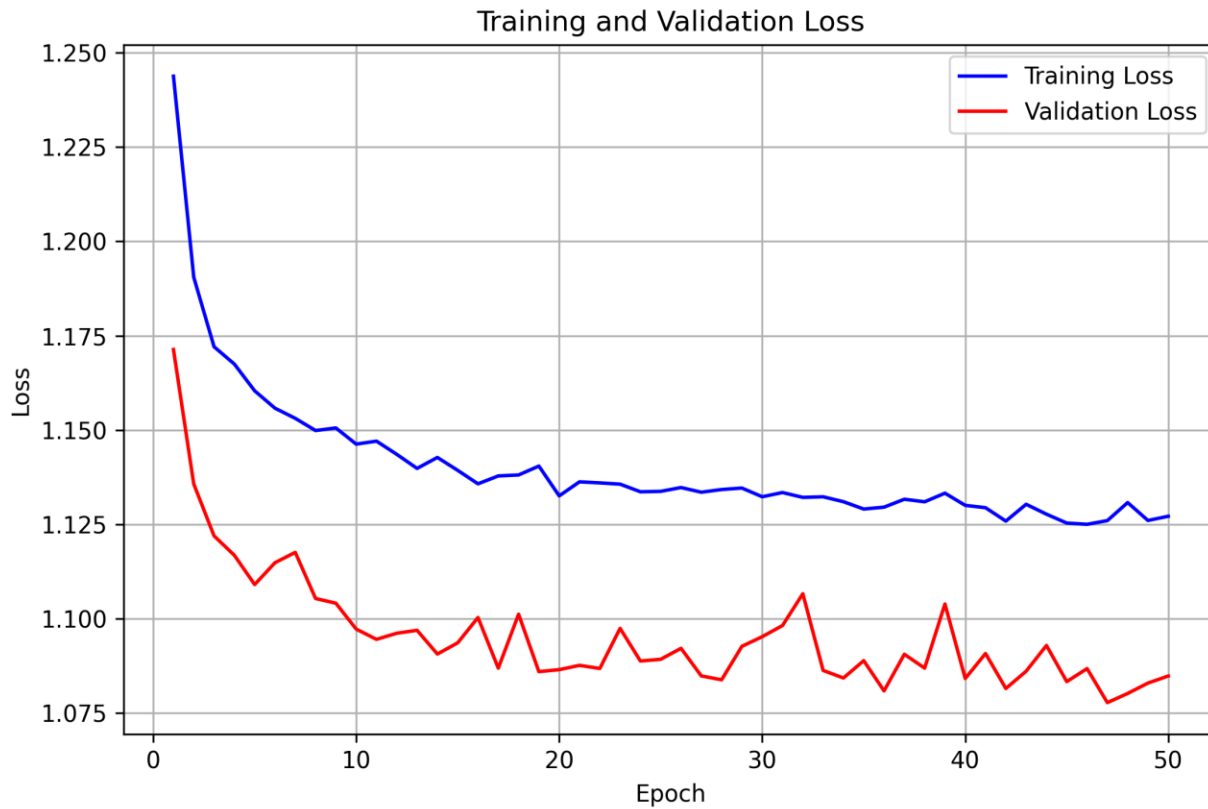
25% → Accuracy of
a random classifier

Next slide

Results: zeromean, 1 date, test_conv2d_n2



Results: zeromean, 1 date, test_conv2d_n2



Data leak check

Model: zeromean, 1 date, test_conv2d_n2

All class labels are shuffled at the raw-data level

→ The whole script is run to test if a data leak causes the high accuracies

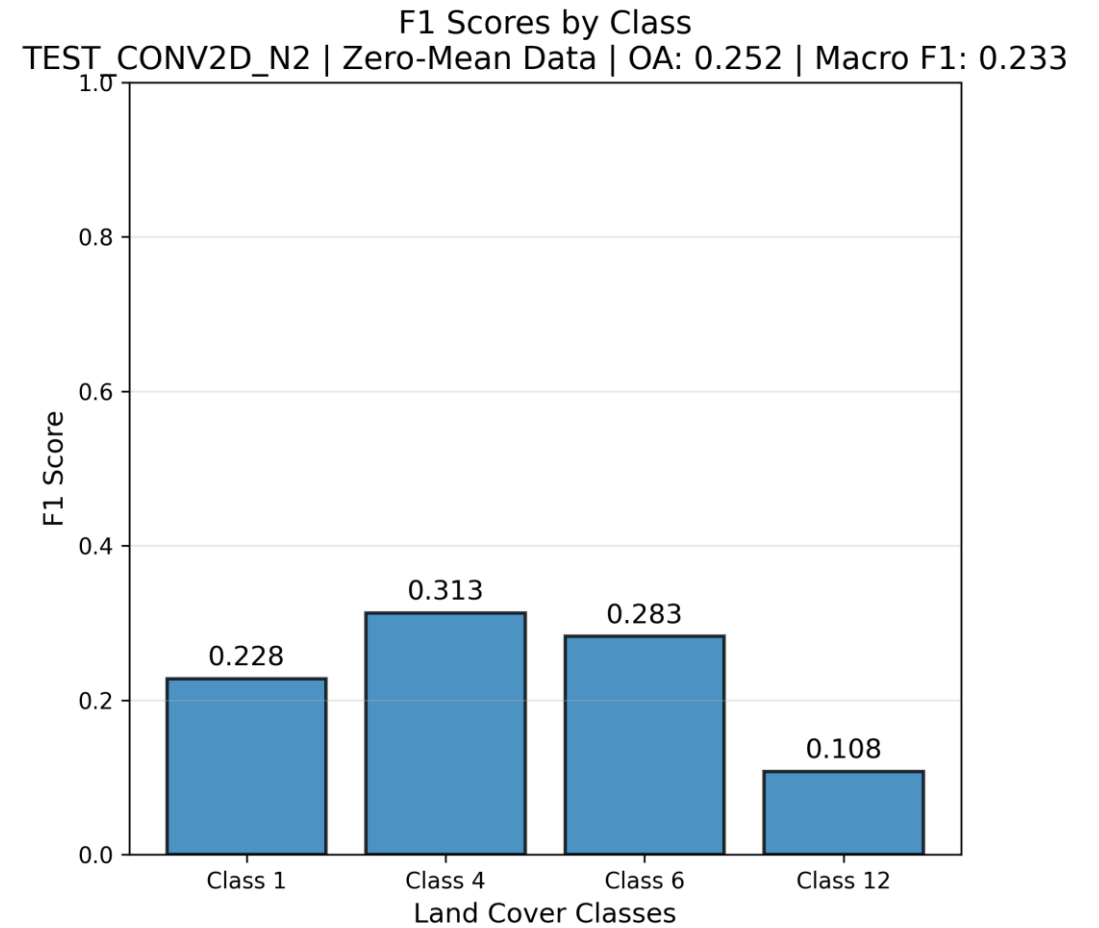
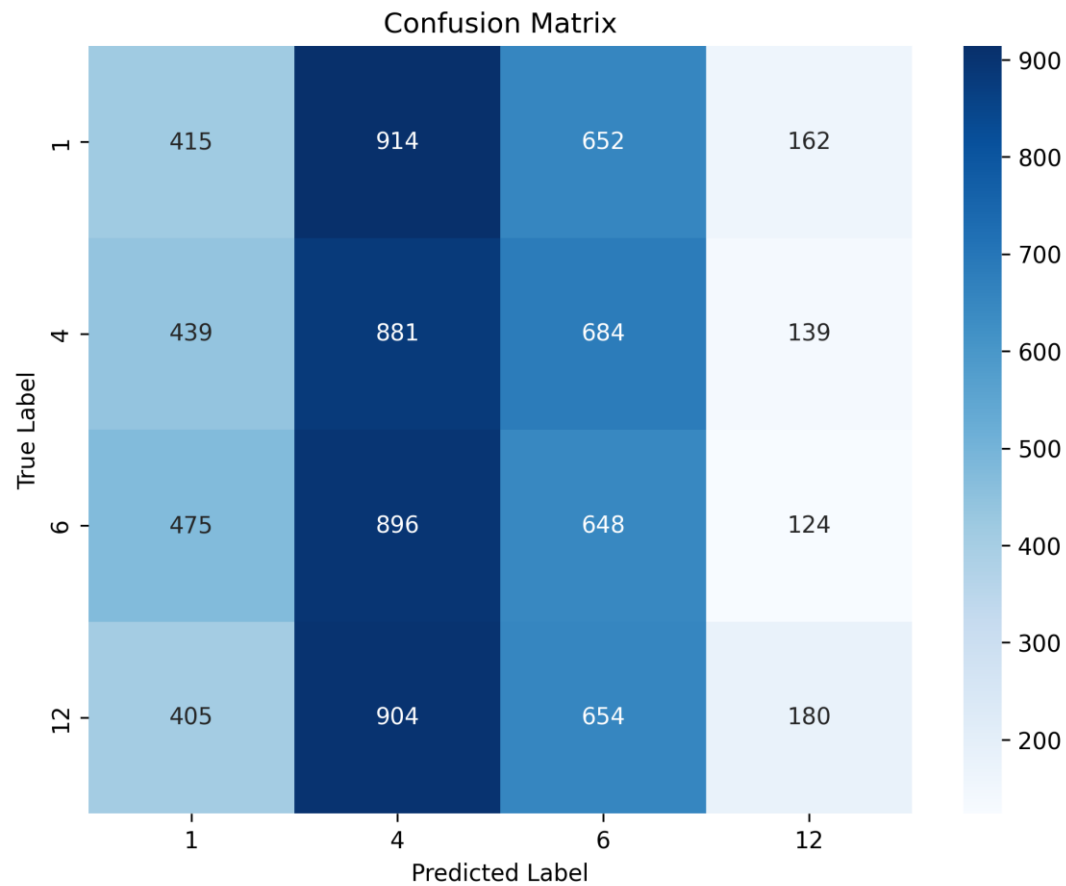
Results:

Overall accuracy: 25.2 %

Mean F1 score: 23.3 %

Data leak check

Model: zeromean, 1 date, test_conv2d_n2



F1 score gain best model vs random model

