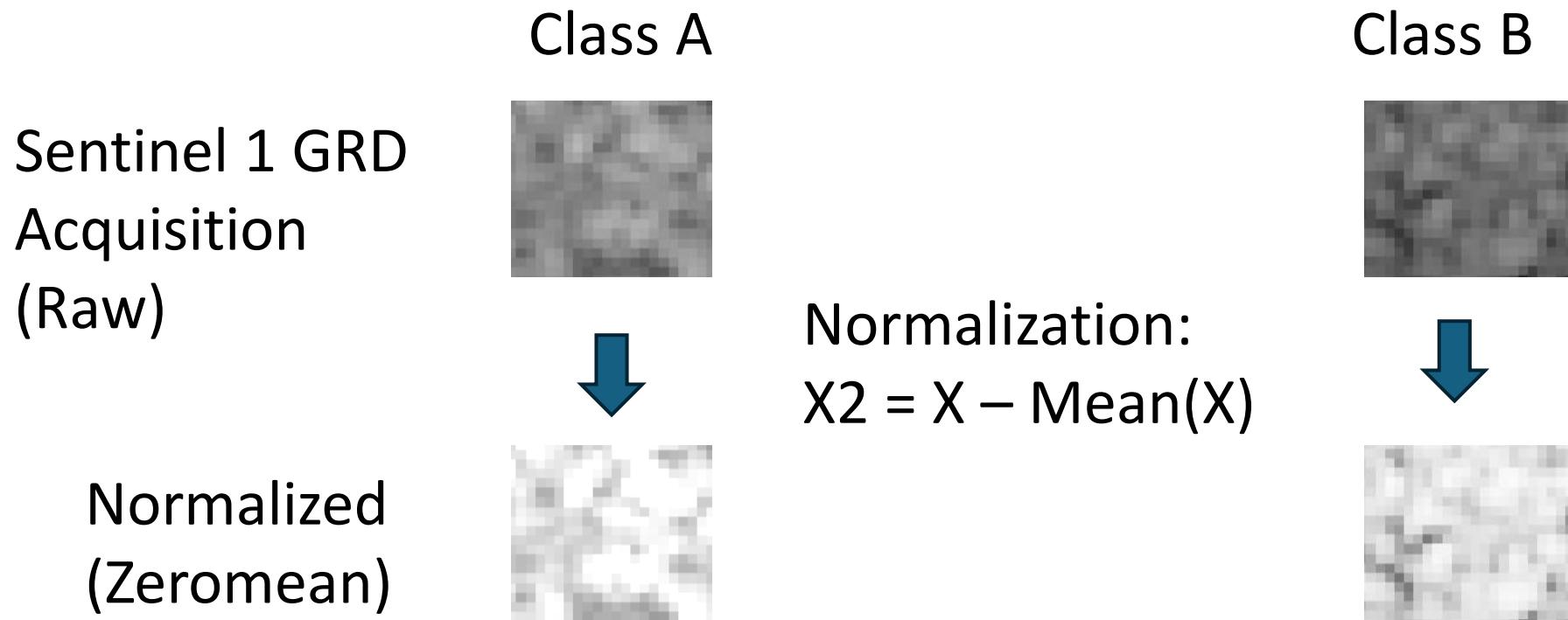


Are Speckle patterns crop-specific?

2nd Dec 2025

# Hypothesis

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



# Test setup:

Class selection:

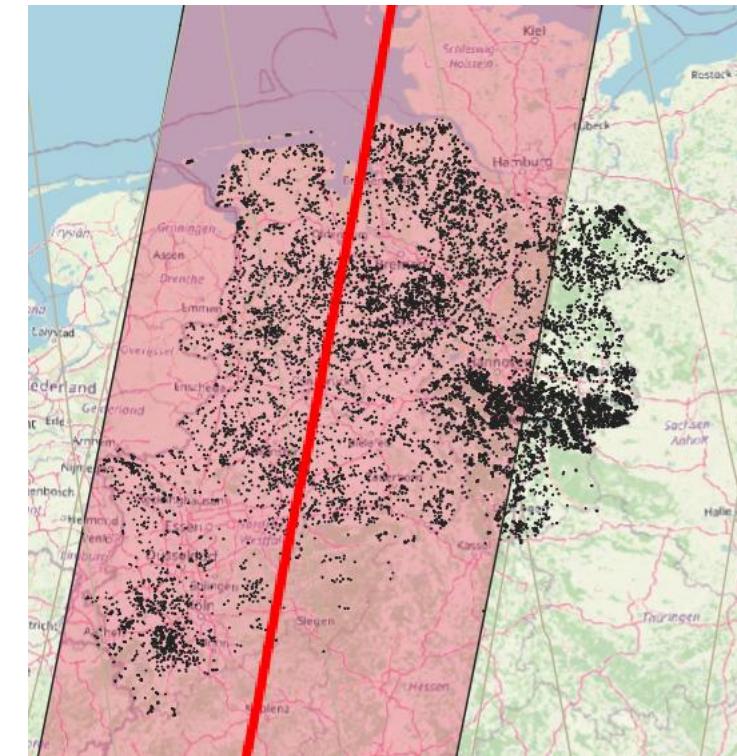


Meadows	Corn	Beet	Wheat
1	4	6	12

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

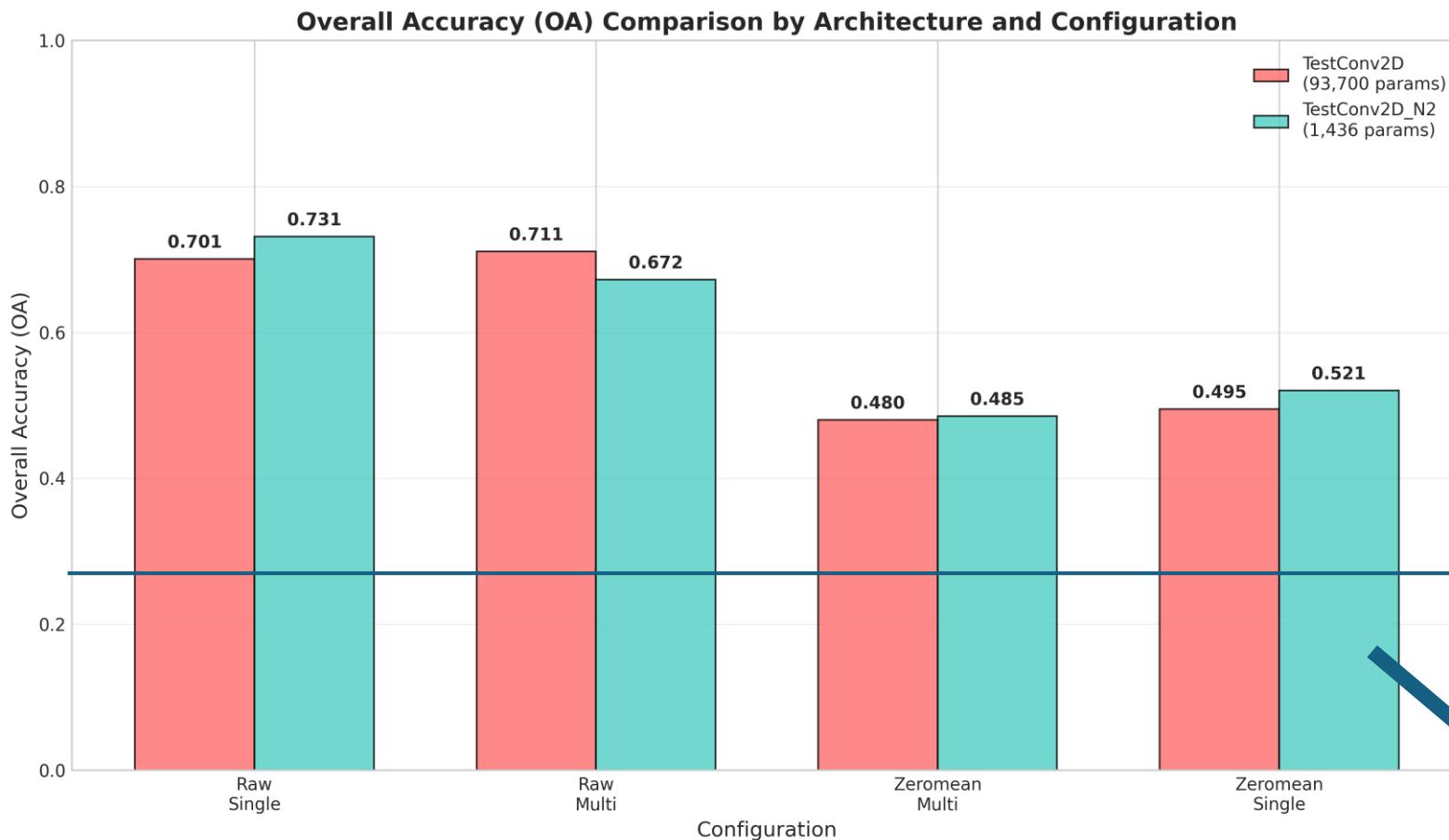
Layer (type)	Output Shape	Param #
Conv2d-1	[ -1, 8, 10, 10 ]	152
BatchNorm2d-2	[ -1, 8, 10, 10 ]	16
Conv2d-3	[ -1, 16, 10, 10 ]	1,168
BatchNorm2d-4	[ -1, 16, 10, 10 ]	32
AdaptiveAvgPool2d-5	[ -1, 16, 1, 1 ]	0
Dropout-6	[ -1, 16 ]	0
Linear-7	[ -1, 4 ]	68

Total params: 1,436

Trainable params: 1,436

Non-trainable params: 0

# Results : Overall accuracy



Raw = no Normalization

Zeromean = Normalized

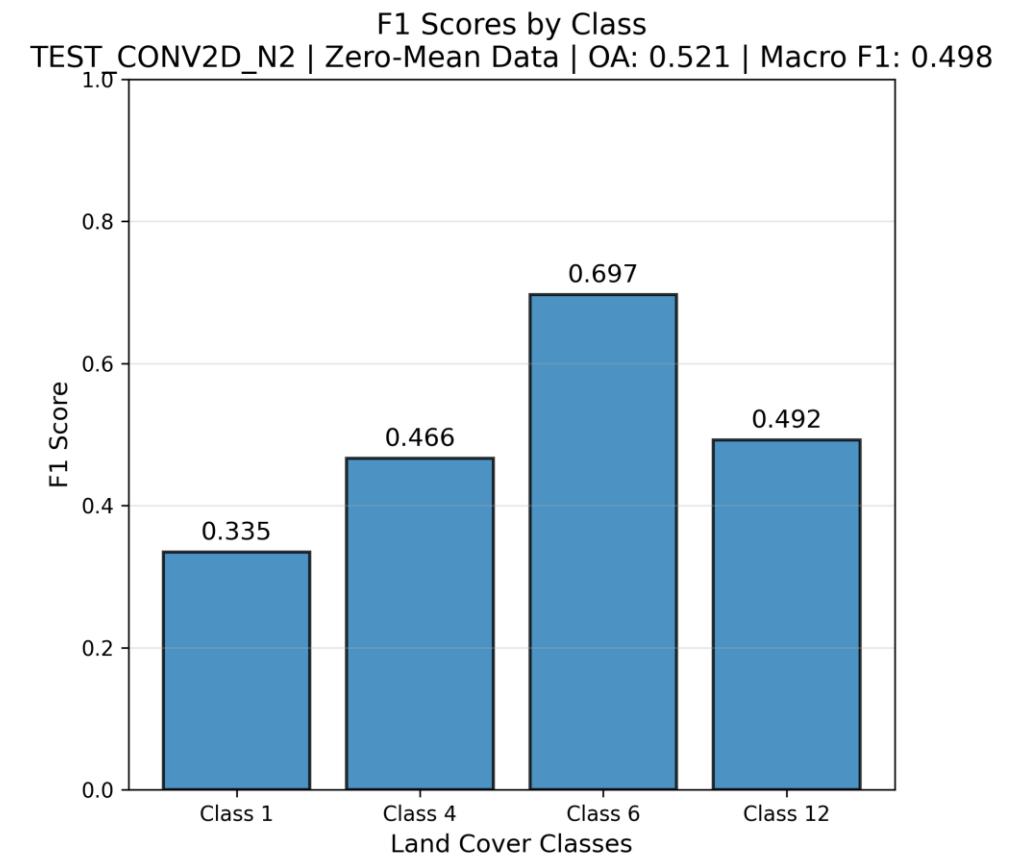
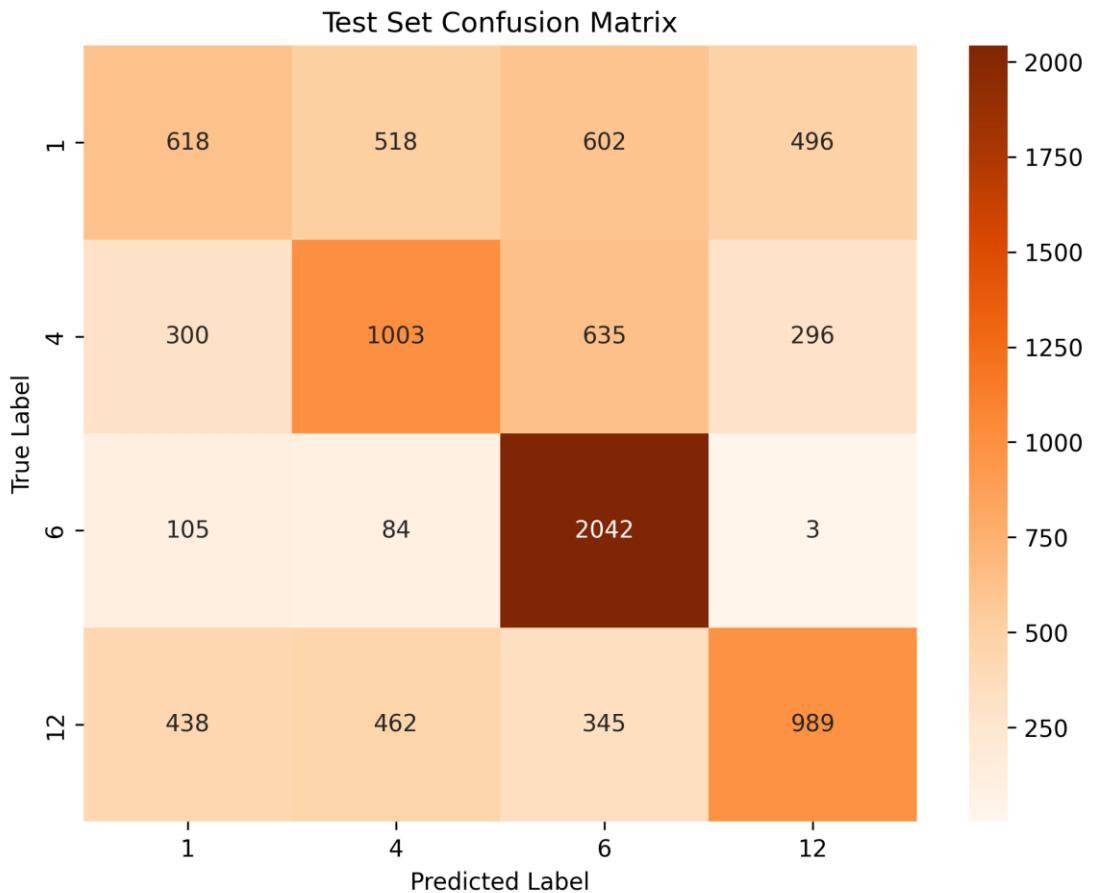
Single = 11.06.2022

Multi = 11.06.2022 and 23.06.2022

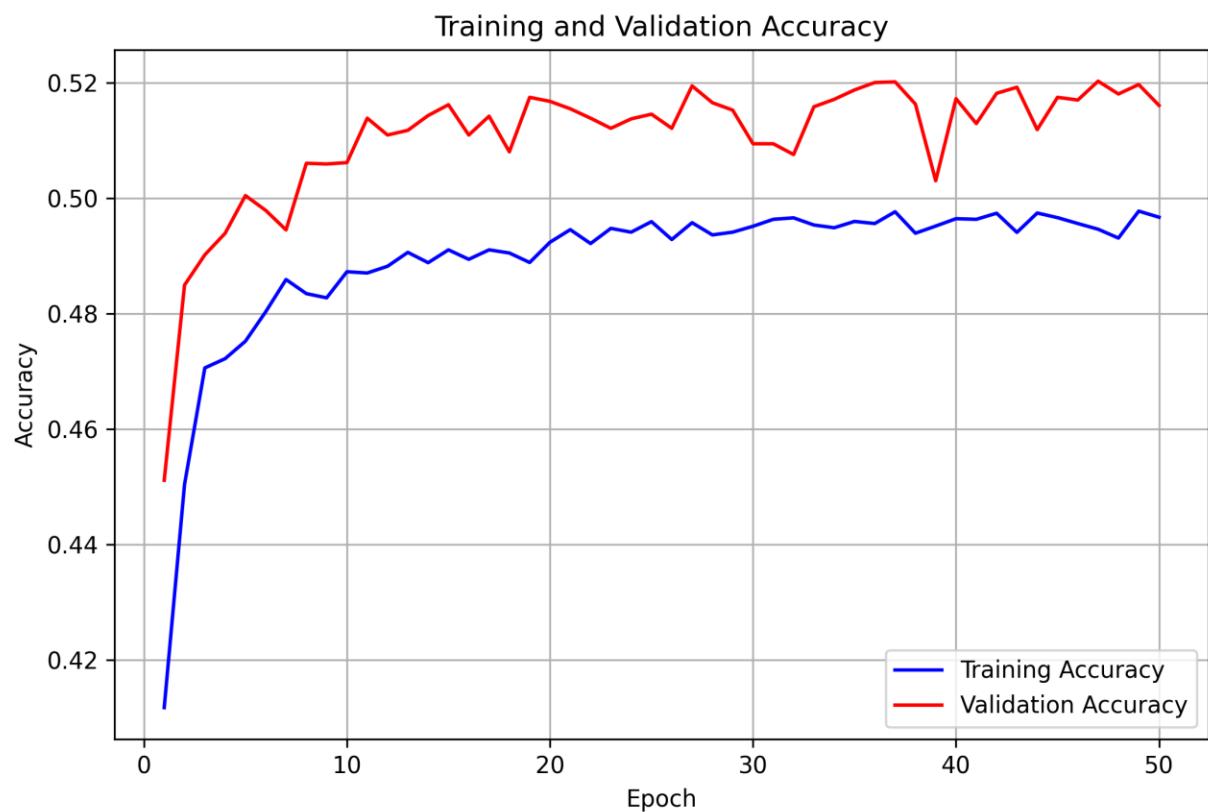
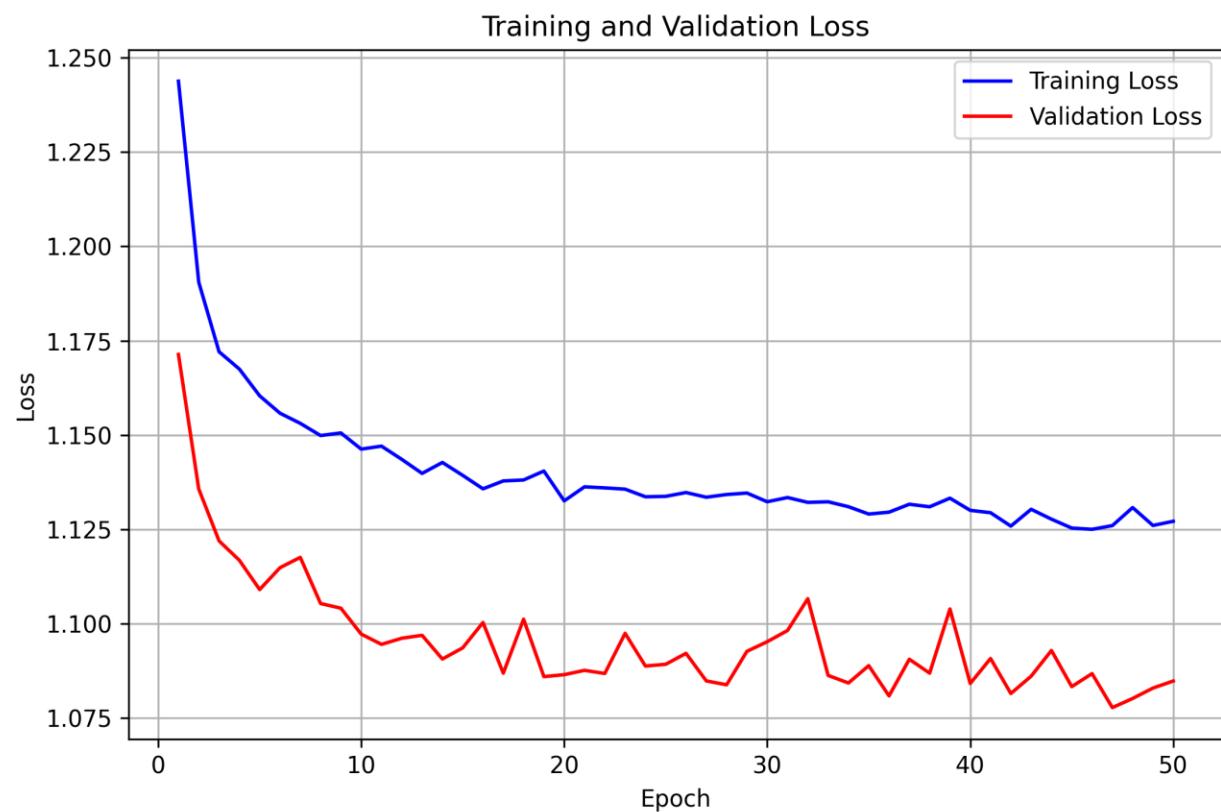
25% → Accuracy of  
a random classifier

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

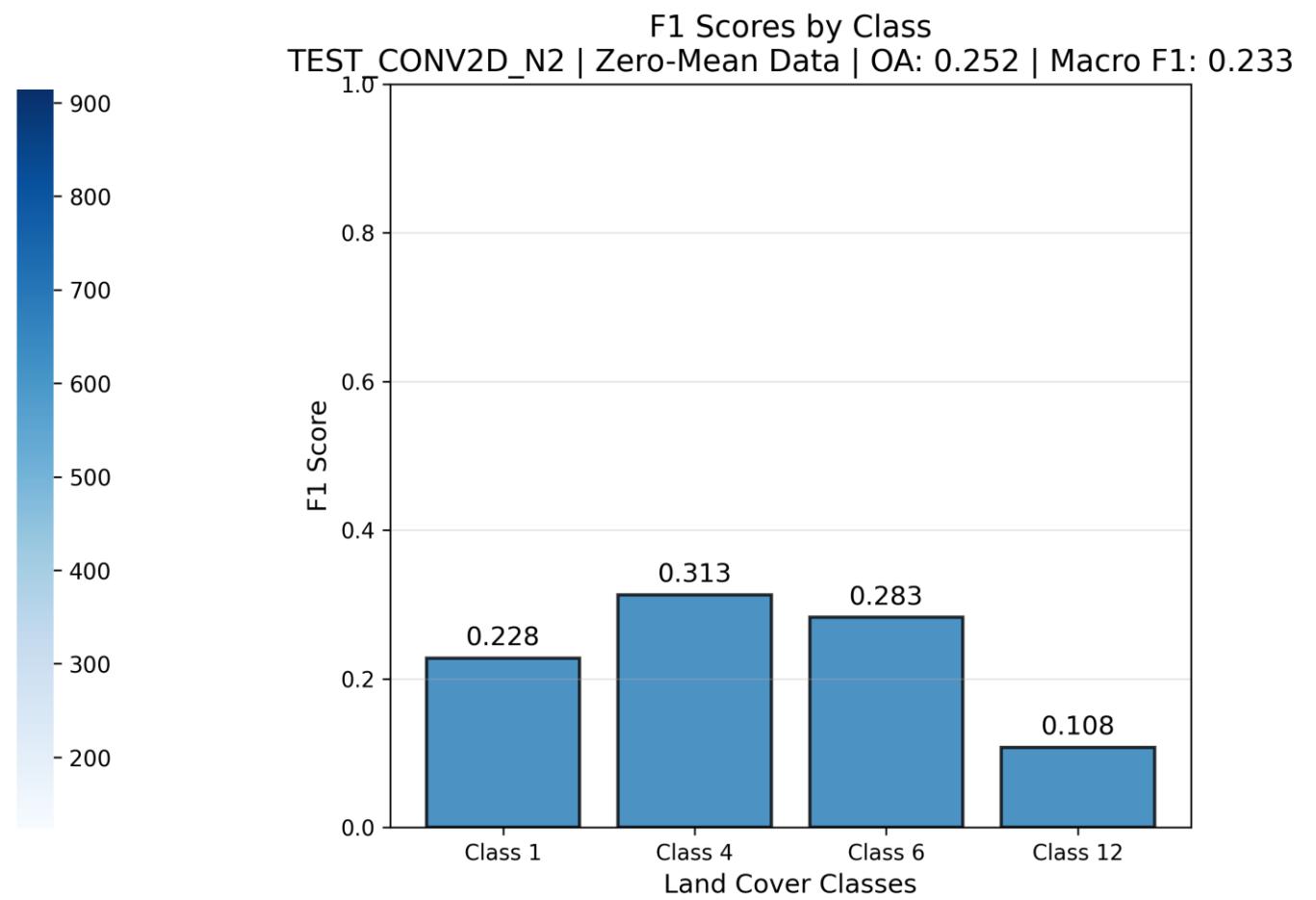
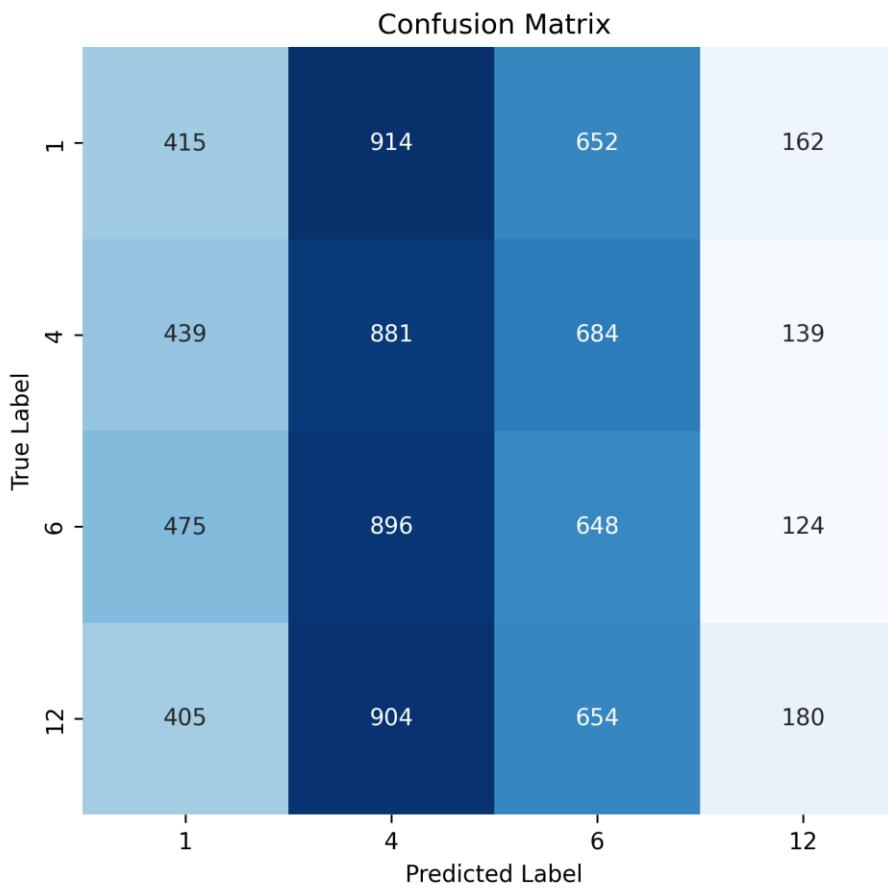
Results:

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

