5043 Advanced Machine Learning - HW 4

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1.1 Figure 1a

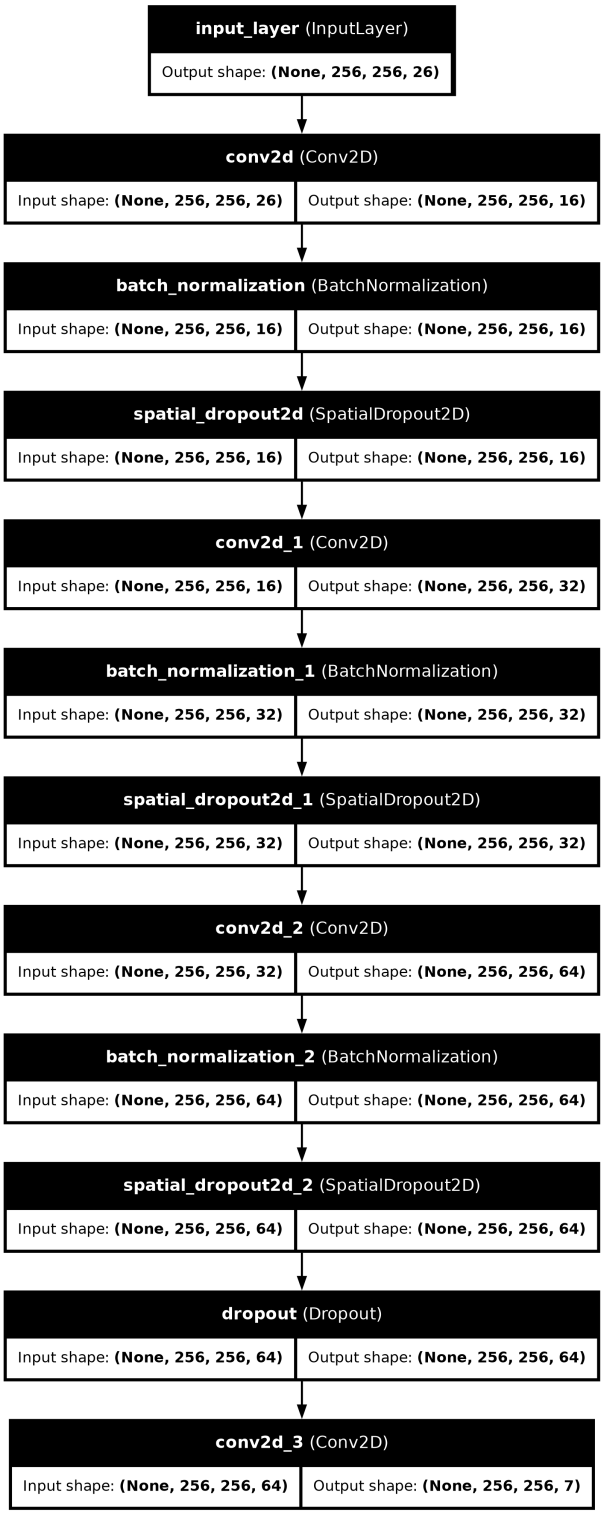
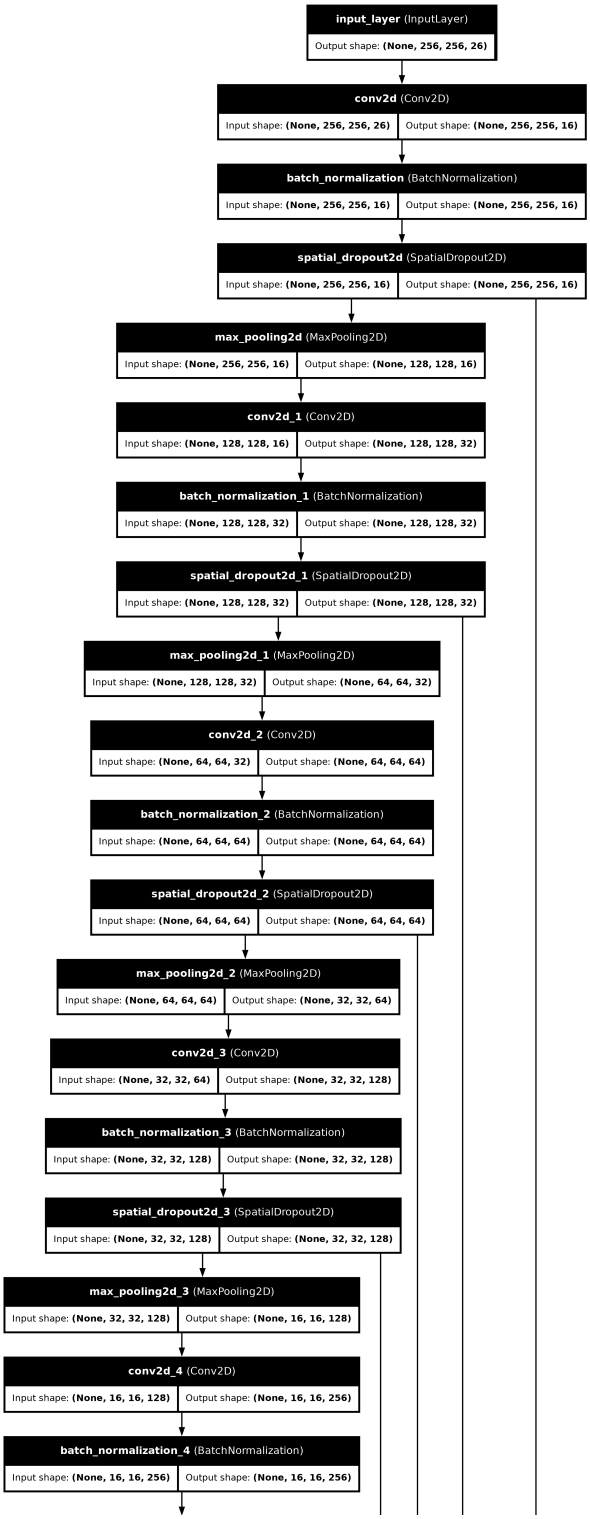
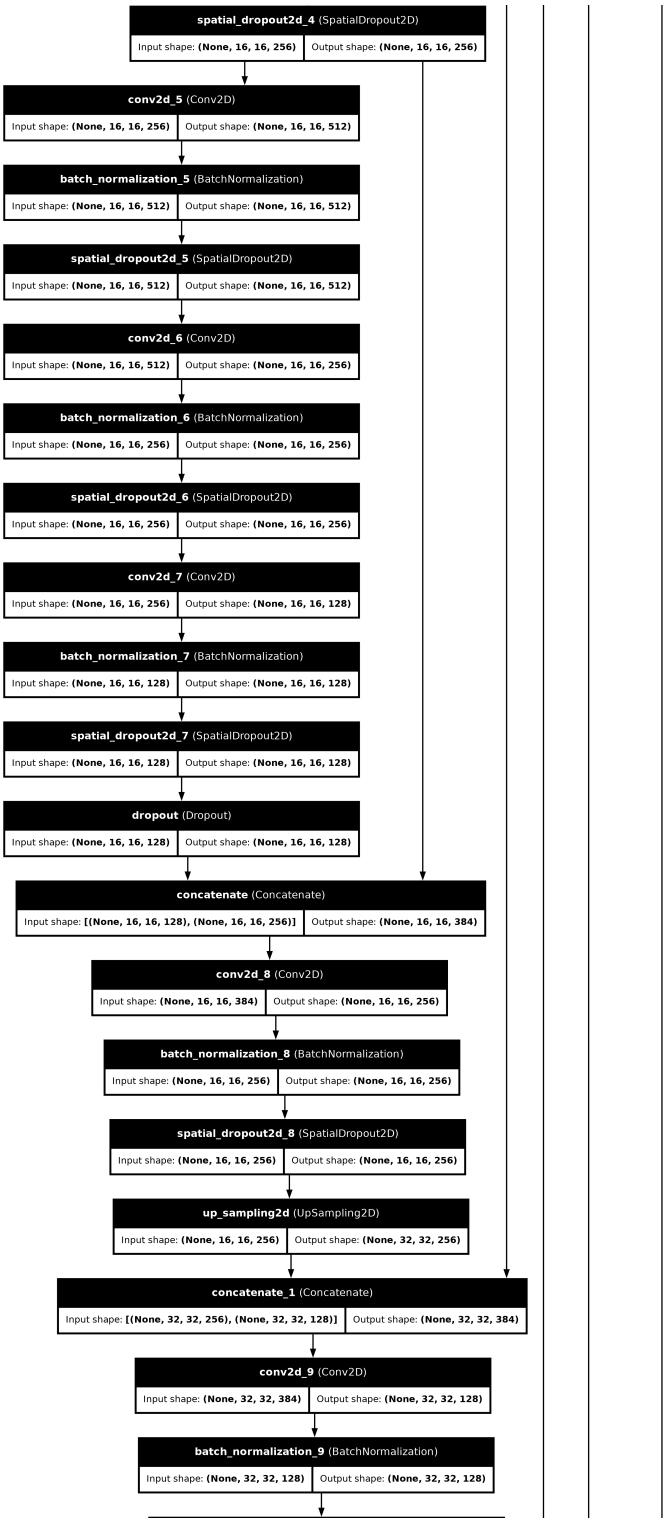


Fig. 1: Shallow Model Architecture

1.2 Figure 1b



1.2 Figure 1b


spatial_dropout2d_4 (SpatialDropout2D)
Input shape: (None, 16, 16, 256)
Output shape: (None, 16, 16, 256)
conv2d_5 (Conv2D)
Input shape: (None, 16, 16, 256)
Output shape: (None, 16, 16, 512)
batch_normalization_5 (BatchNormalization)
Input shape: (None, 16, 16, 512)
Output shape: (None, 16, 16, 512)
spatial_dropout2d_5 (SpatialDropout2D)
Input shape: (None, 16, 16, 512)
Output shape: (None, 16, 16, 512)
conv2d_6 (Conv2D)
Input shape: (None, 16, 16, 512)
Output shape: (None, 16, 16, 256)
batch_normalization_6 (BatchNormalization)
Input shape: (None, 16, 16, 256)
Output shape: (None, 16, 16, 256)
spatial_dropout2d_6 (SpatialDropout2D)
Input shape: (None, 16, 16, 256)
Output shape: (None, 16, 16, 256)
conv2d_7 (Conv2D)
Input shape: (None, 16, 16, 256)
Output shape: (None, 16, 16, 128)
batch_normalization_7 (BatchNormalization)
Input shape: (None, 16, 16, 128)
Output shape: (None, 16, 16, 128)
spatial_dropout2d_7 (SpatialDropout2D)
Input shape: (None, 16, 16, 128)
Output shape: (None, 16, 16, 128)
dropout (Dropout)
Input shape: (None, 16, 16, 128)
Output shape: (None, 16, 16, 128)
concatenate (Concatenate)
Input shape: [(None, 16, 16, 128), (None, 16, 16, 256)]
Output shape: (None, 16, 16, 384)
conv2d_8 (Conv2D)
Input shape: (None, 16, 16, 384)
Output shape: (None, 16, 16, 256)
batch_normalization_8 (BatchNormalization)
Input shape: (None, 16, 16, 256)
Output shape: (None, 16, 16, 256)
spatial_dropout2d_8 (SpatialDropout2D)
Input shape: (None, 16, 16, 256)
Output shape: (None, 16, 16, 256)
up_sampling2d (UpSampling2D)
Input shape: (None, 16, 16, 256)
Output shape: (None, 32, 32, 256)
concatenate_1 (Concatenate)
Input shape: [(None, 32, 32, 256), (None, 32, 32, 128)]
Output shape: (None, 32, 32, 384)
conv2d_9 (Conv2D)
Input shape: (None, 32, 32, 384)
Output shape: (None, 32, 32, 128)
batch_normalization_9 (BatchNormalization)
Input shape: (None, 32, 32, 128)
Output shape: (None, 32, 32, 128)

1.2 Figure 1b

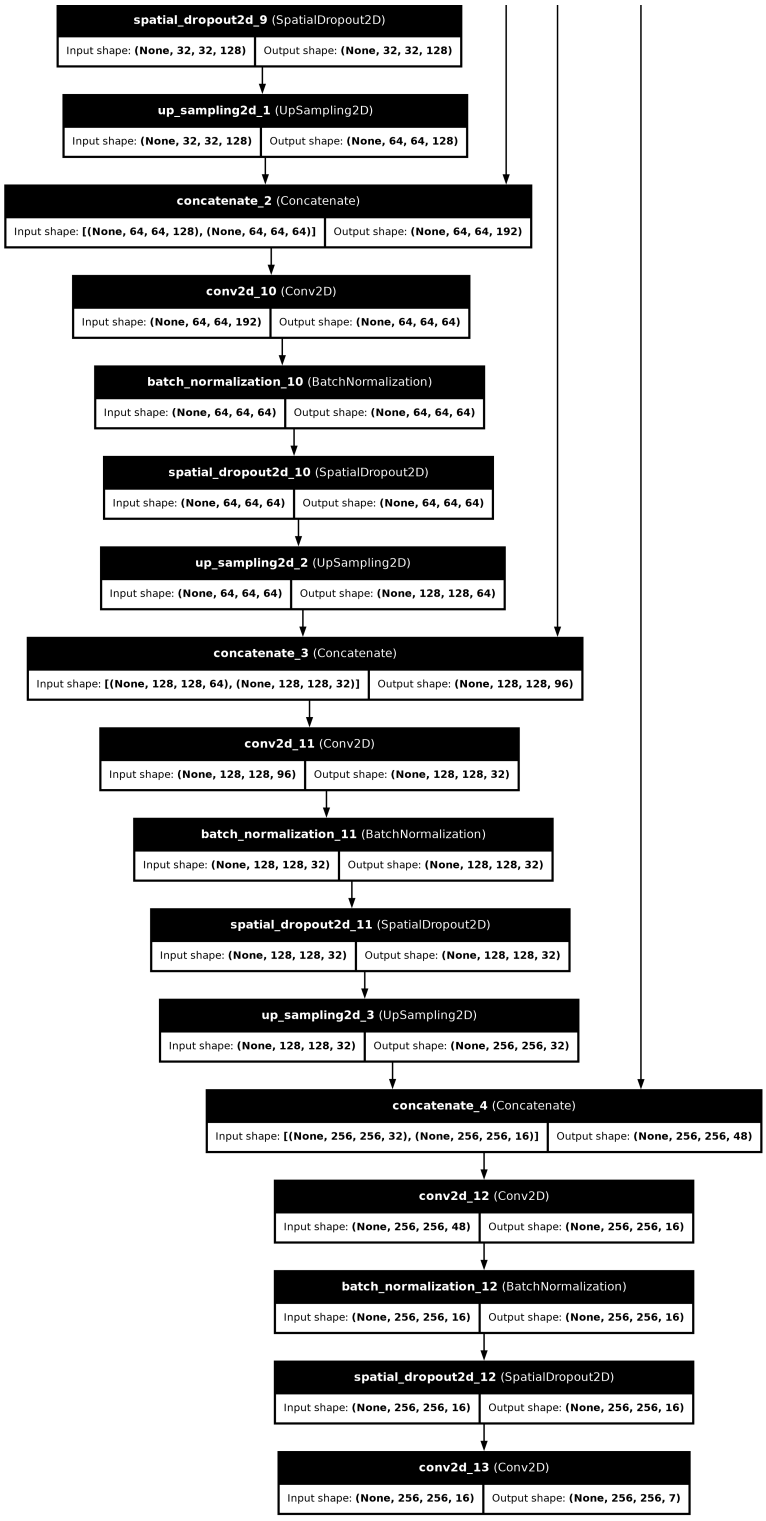


Fig. 2: Deep Model Architecture

1.3 Figure 2a

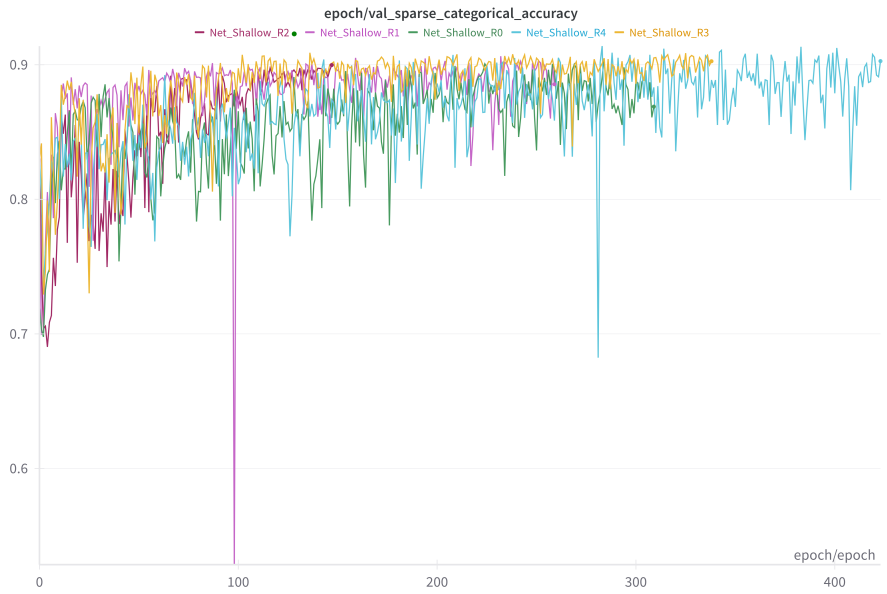


Fig. 3: Validation Accuracy as a function of epoch for the Shallow model

1.4 Figure 2b

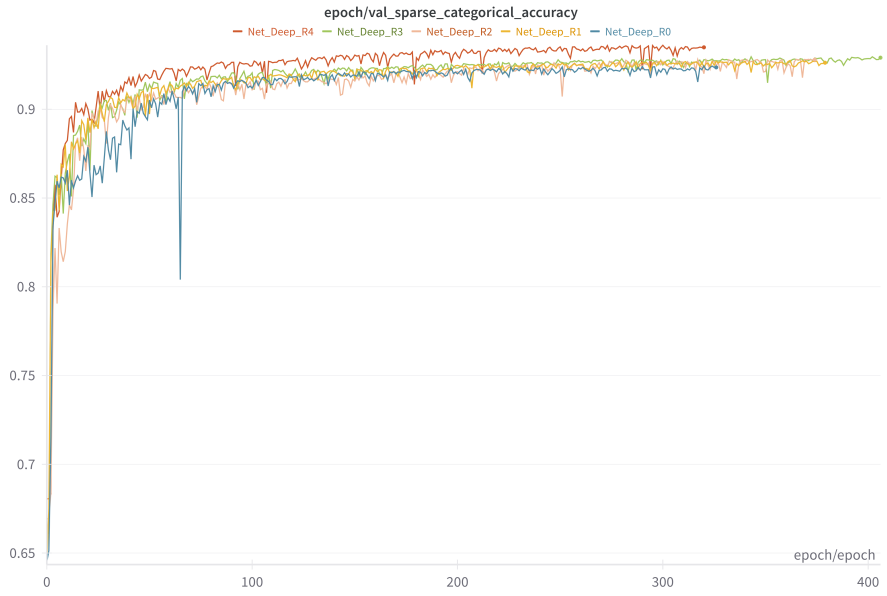


Fig. 4: Validation Loss as a function of epoch for the Deep models

1.5 Figure 3a

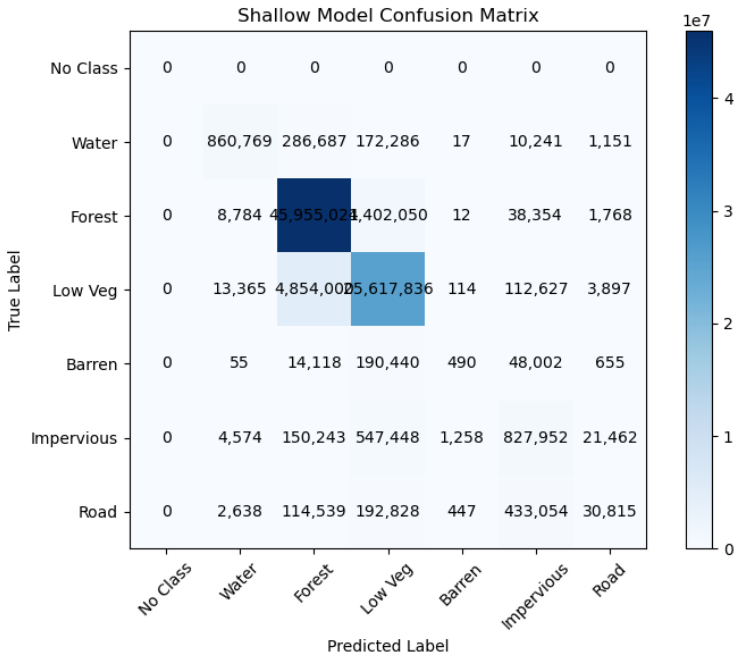


Fig. 5: Confusion Matrix of the test set data across all rotations for the Shallow model

1.6 Figure 3b

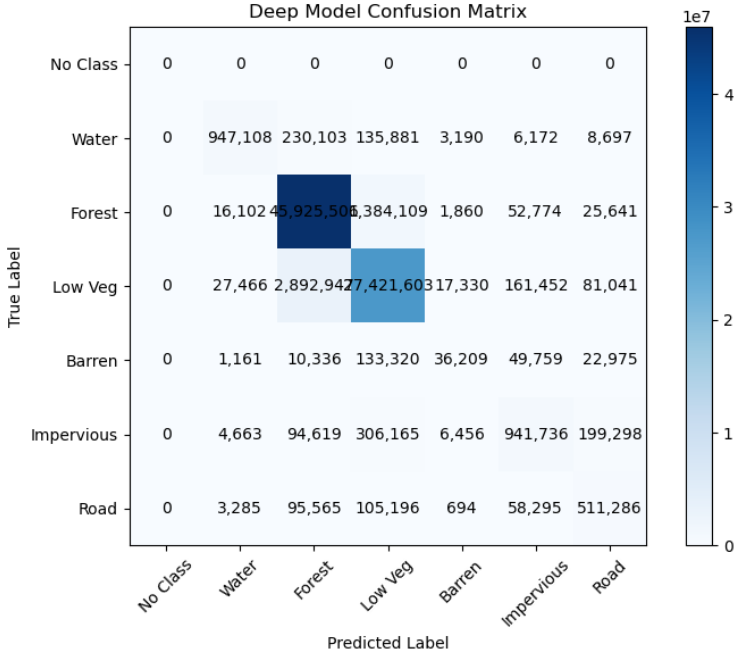


Fig. 6: Confusion Matrix of the test set data across all rotations for the Deep model

1.7 Figure 4

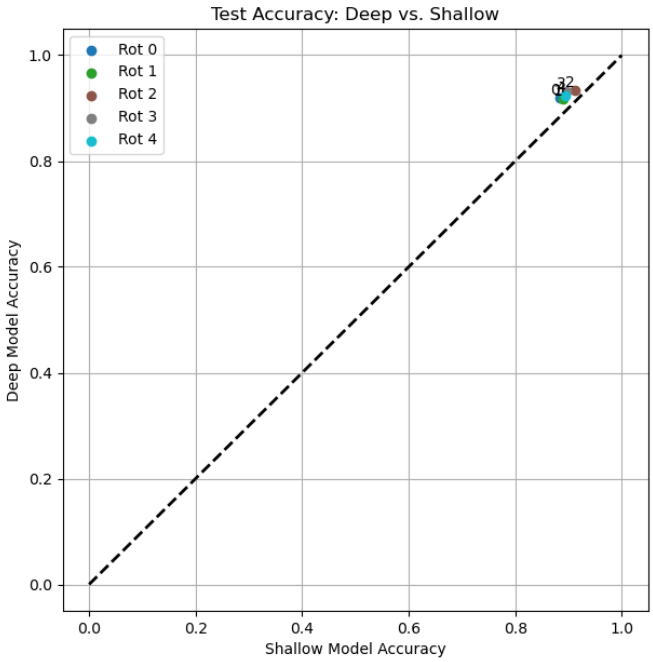


Fig. 7: Test set accuracy for the deep vs shallow networks

1.8 Figure 5a

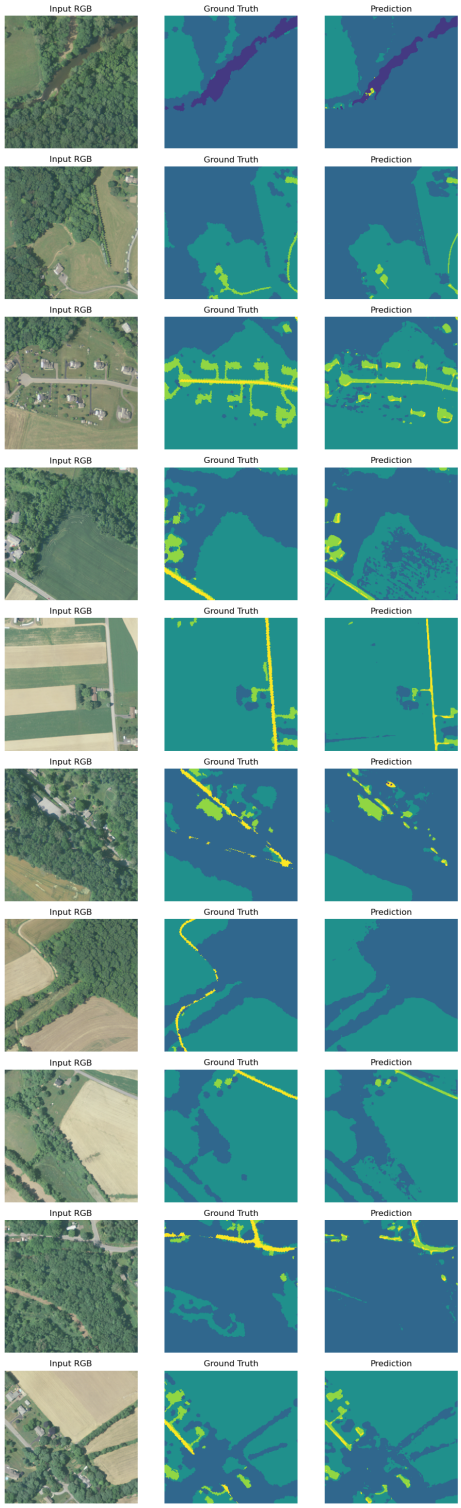


Fig. 8: Example Predictions for Shallow Model

1.9 Figure 5b

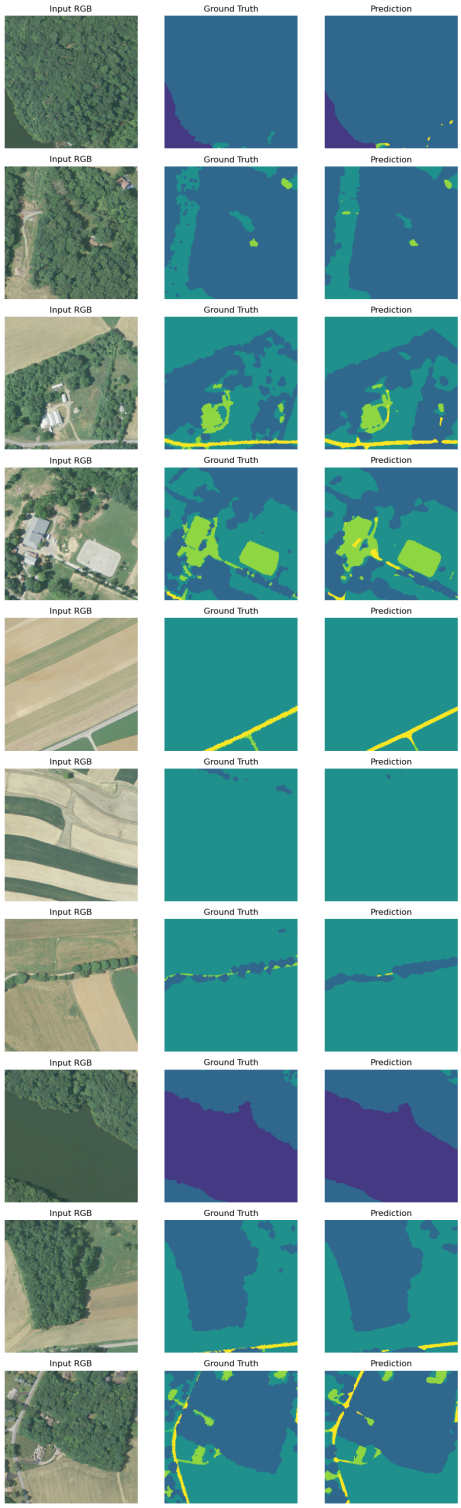


Fig. 9: Example Predictions for Deep Model

2 Analysis & Discussion

2.1 Deep Network Test Sparse Categorical Accuracy

Table 1: Deep Model Sparse Categorical Accuracy accross all Rotations

	Rot 0	Rot 1	Rot 2	Rot 3	Rot 4
Sparse Categorical Accuracy	0.9191	0.91768	0.9332	0.9318	0.92368