



WARDIERE, INC.

HOME

ABOUT

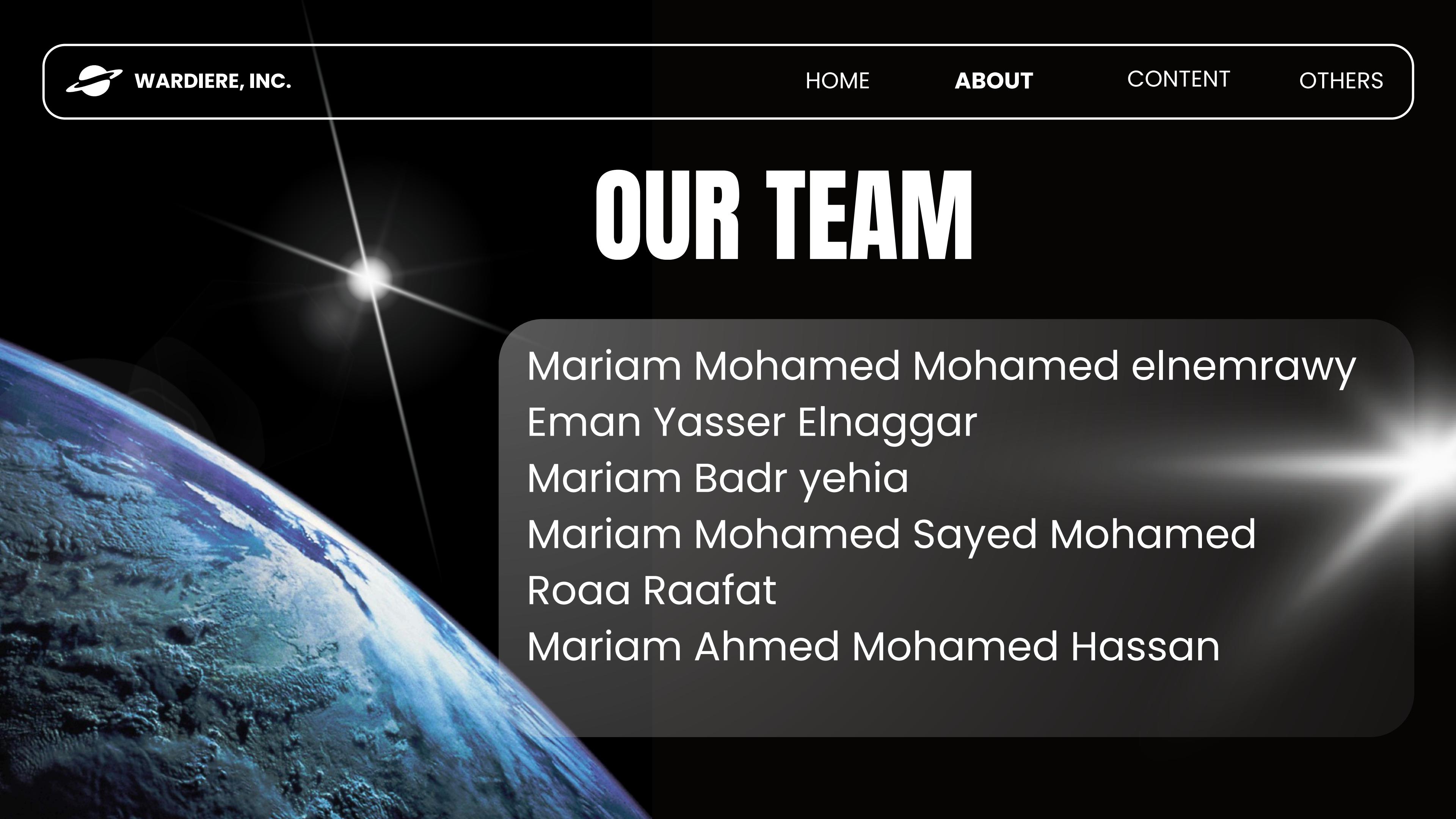
CONTENT

OTHERS

# GTC-LAND-TYPE-CLASSIFICATION TEAM - 34



# OUR TEAM



Mariam Mohamed Mohamed elnemrawy  
Eman Yasser Elnaggar  
Mariam Badr yehia  
Mariam Mohamed Sayed Mohamed  
Roaa Raafat  
Mariam Ahmed Mohamed Hassan

# THE CONTRIBUTION OF EACH TEAM MEMBER

- **Roaa Raafat** --> Data Pipeline, EDA & Feature Engineering
- **Mariam Mohamed Sayed Mohamed**--> Model Architecture & Evaluation
- **Mariam Badr**--> Deployment & Web App,
- **Eman Elnaggar & Mariam Elnemrawy**--> Video & GitHub README
- **Mariam Ahmed** --> presentation



# OUR VISION



## THE CHALLENGE WE'RE SOLVING

Critical Need: Accurate land type classification is essential for sustainable development in Egypt

### Key Applications:

- Agriculture Monitoring - Crop yield optimization
- Urban Planning - Smart city development
- Water Resource Management - Conservation strategies
- Environmental Studies - Climate change impact



# WORKFLOW

## 1- Data Pipeline

(GTC\_01\_data\_pipeline.ipynb +  
src/data\_pipeline.py)

- Downloads & organizes EuroSAT dataset
- Cleans CSVs, ensures consistent labels
- Generates dataset statistics & class maps
- Outputs train/validation/test splits

## 2-Exploratory Data Analysis

(GTC\_02\_eda\_visualization.ipynb)

- Class distribution plots
- Sample images per class (grid view)
- Checks for corrupted/missing/duplicate images
- RGB intensity histograms
- Data augmentation visualizations (rotation, flips, jitter, crop/zoom)
- Class-level mean RGB statistics
- Feature extraction (color histograms, texture descriptors)

## 3- Feature Engineering (src/features.py)

- Geospatial-safe augmentations (rotation, flip, jitter, crop/zoom)
- Normalization & preprocessing utilities



# WORKFLOW

## 4 MODELING & EVALUATION

**SCRIPT:** GTC\_03\_MODELING-6.ipynb

**TASKS:** LOAD AND PREPROCESS THE EUROSAT DATASET (RGB SATELLITE IMAGES FOR 10-CLASS LAND USE CLASSIFICATION) WITH CUSTOM TRANSFORMS INCLUDING RESIZING TO 224x224, DATA AUGMENTATION (RANDOM FLIPS, ROTATIONS, JITTER, AFFINE), AND NORMALIZATION (MEAN=[0.485, 0.456, 0.406], STD=[0.229, 0.224, 0.225]).

SPLIT DATASET INTO TRAIN/VALIDATION/TEST (60%/20%/20%) AND CREATE DATALOADERS WITH BATCH SIZE 64.

DEFINE AND TRAIN MULTIPLE MODELS: A CUSTOM CNN (VGG-INSPIRED) AND TRANSFER LEARNING MODELS (RESNET-50, EFFICIENTNET-B0, VISION TRANSFORMER B-16), ALL FINE-TUNED FOR 10 CLASSES.

TRAIN WITH CROSS-ENTROPY LOSS, ADAM OPTIMIZER (LR=0.001, WEIGHT DECAY=1E-4), MIXED PRECISION (AMP), LR SCHEDULER (REDUCELRONPLATEAU), AND EARLY STOPPING (PATIENCE=10).

EVALUATE MODELS ON TEST SET WITH ACCURACY, PRECISION/RECALL/F1, CONFUSION MATRIX, AND TRAINING HISTORY PLOTS. SAVE BEST MODEL CHECKPOINTS BASED ON VALIDATION ACCURACY.



# OUR STEPS



DATA COLLECTION → PREPROCESSING → EDA →  
FEATURE ENGINEERING → MODEL TRAINING →  
EVALUATION → DEPLOYMENT



# DATASET ANALYSIS



## Dataset Summary:

Total samples across all splits: 27000

Train: 18900 samples

Test: 2700 samples

Validation: 5400 samples

## Dataset Statistics:

Total classes: 10

Total images in raw dataset: 27000

## Training Set Class Distribution:

AnnualCrop: 2100 samples

Forest: 2100 samples

HerbaceousVegetation: 2100 samples

Highway: 1750 samples

Industrial: 1750 samples

Pasture: 1400 samples

PermanentCrop: 1750 samples

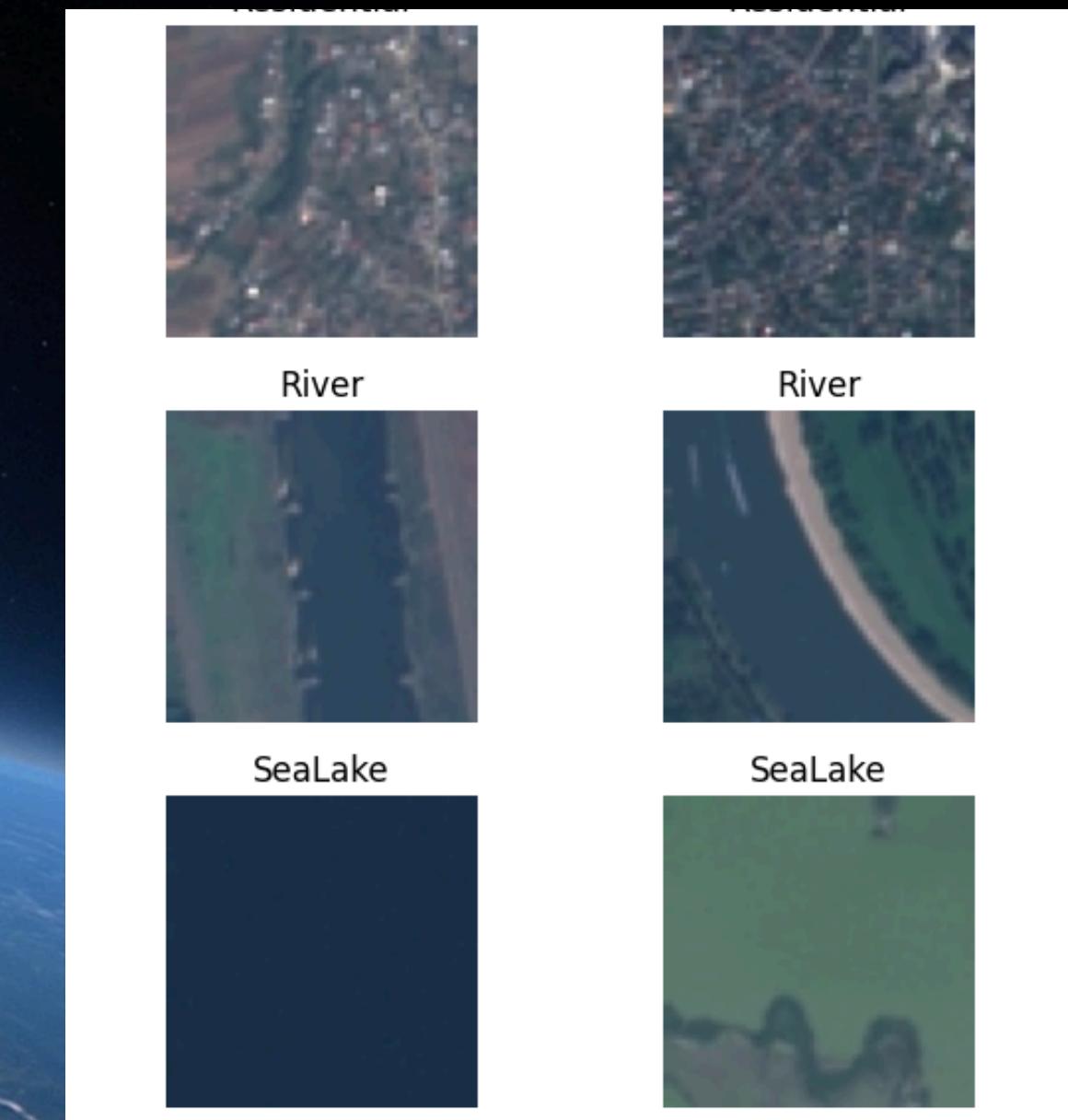
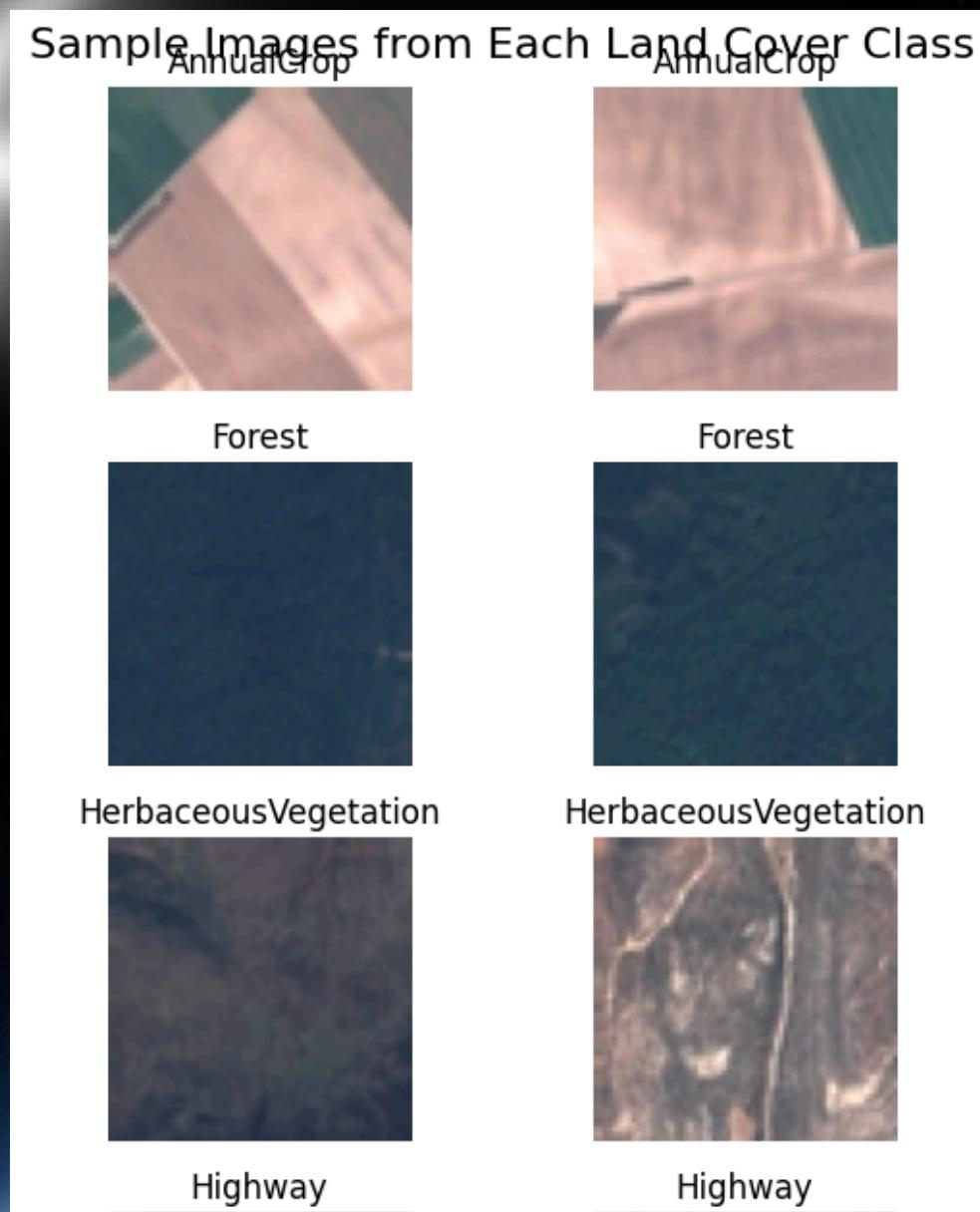
Residential: 2100 samples

River: 1750 samples

SeaLake: 2100 samples

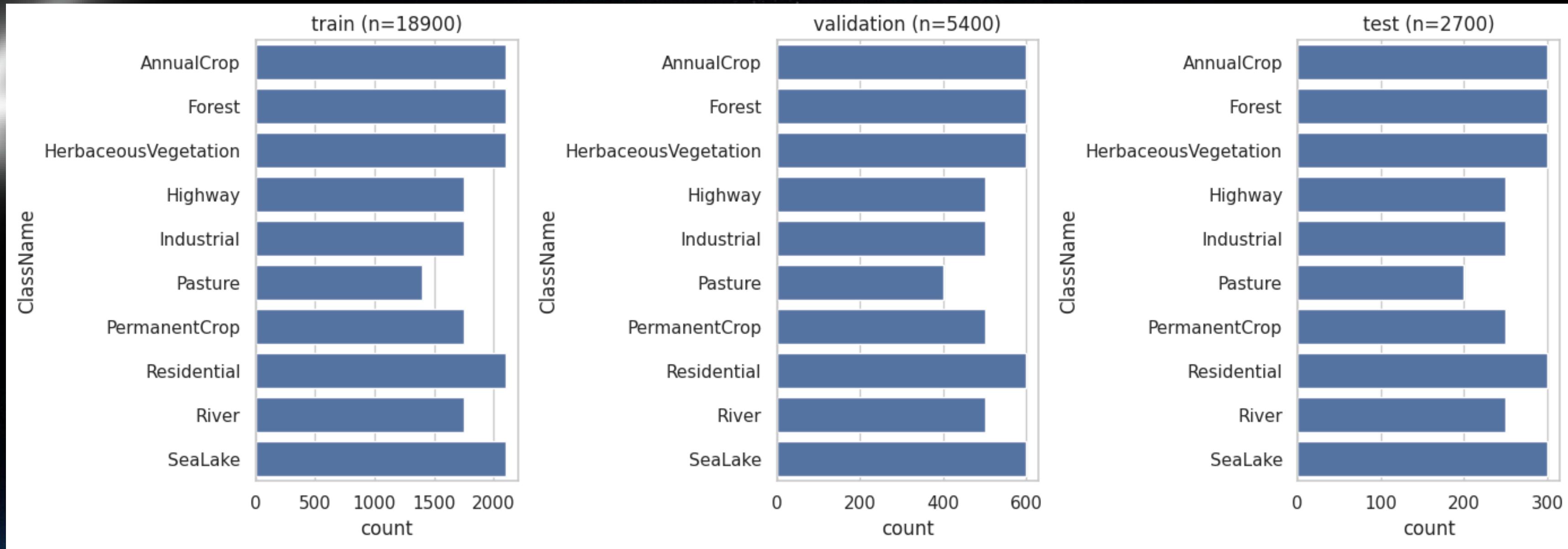


# SMAPLES FROM EACH LAND CLASS



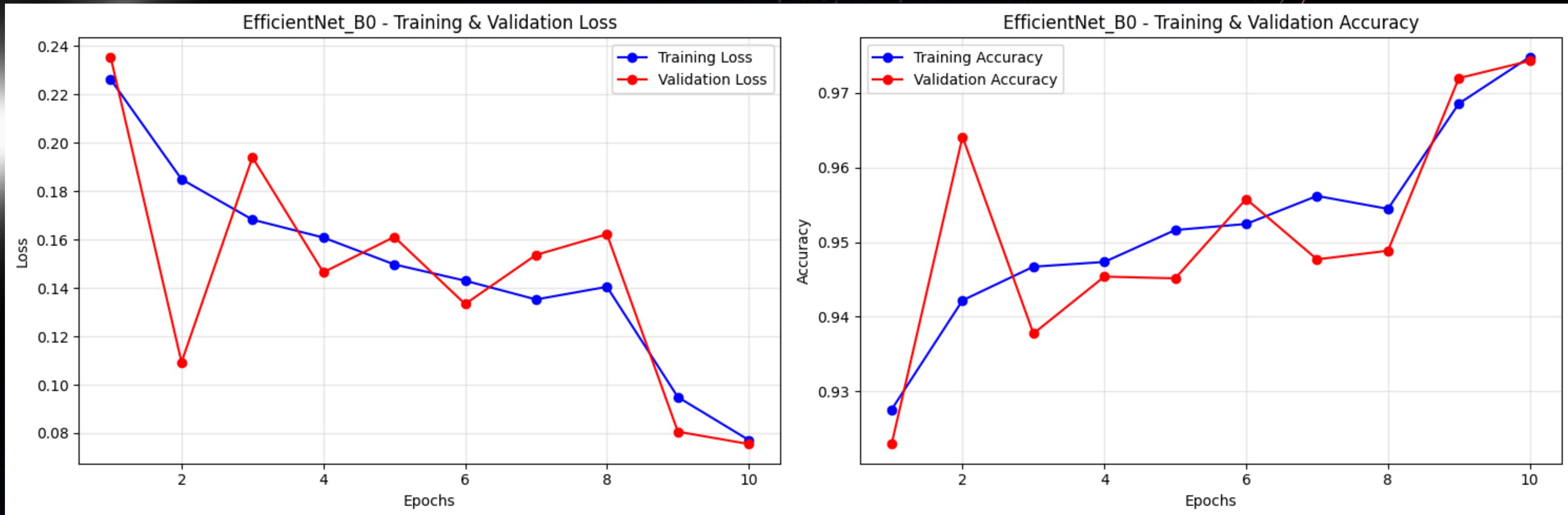


# CLASS DISTRIBUTIONS





# MODELING





# ACCURACY AND SOME PARAMETERS



EfficientNet\_B0 Results:

Overall Accuracy: 0.9719

Macro Average - Precision: 0.9722, Recall: 0.9703, F1: 0.9711

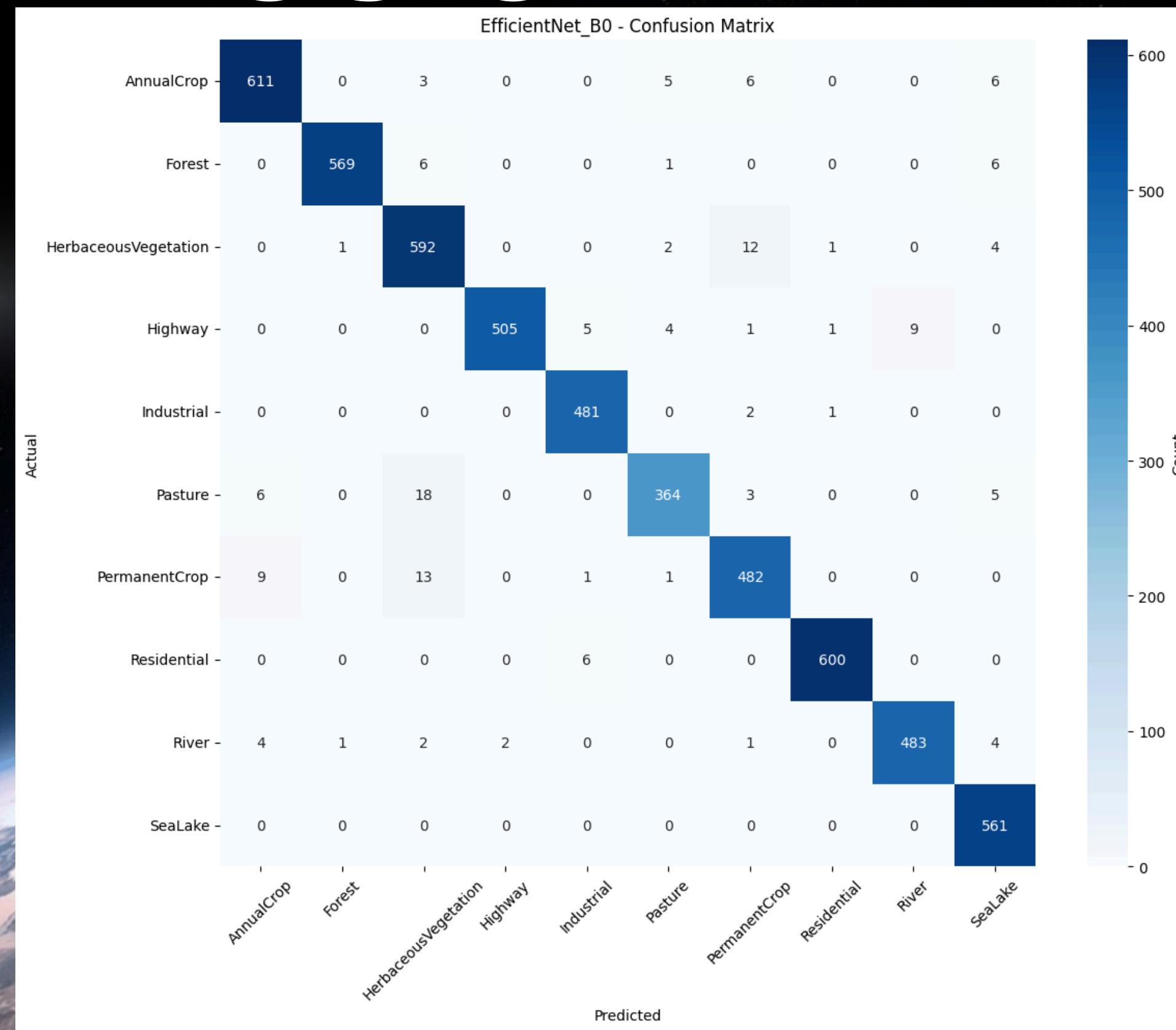
Weighted Average - Precision: 0.9722, Recall: 0.9719, F1: 0.9719

Per-class metrics:

	Class	Precision	Recall	F1-Score	Support
0	AnnualCrop	0.9698	0.9683	0.9691	631
1	Forest	0.9965	0.9777	0.9870	582
2	HerbaceousVegetation	0.9338	0.9673	0.9502	612
3	Highway	0.9961	0.9619	0.9787	525
4	Industrial	0.9757	0.9938	0.9846	484
5	Pasture	0.9655	0.9192	0.9418	396
6	PermanentCrop	0.9507	0.9526	0.9516	506
7	Residential	0.9950	0.9901	0.9926	606
8	River	0.9817	0.9718	0.9767	497
9	SeaLake	0.9573	1.0000	0.9782	561



# CONFUSION MATRIX

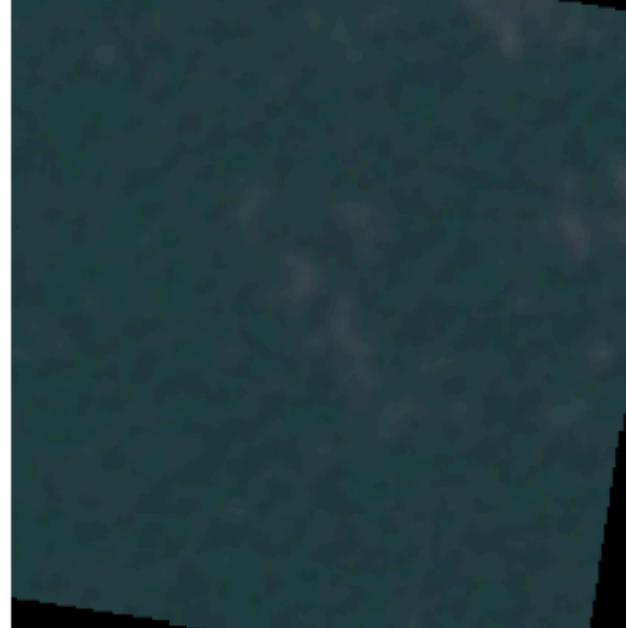




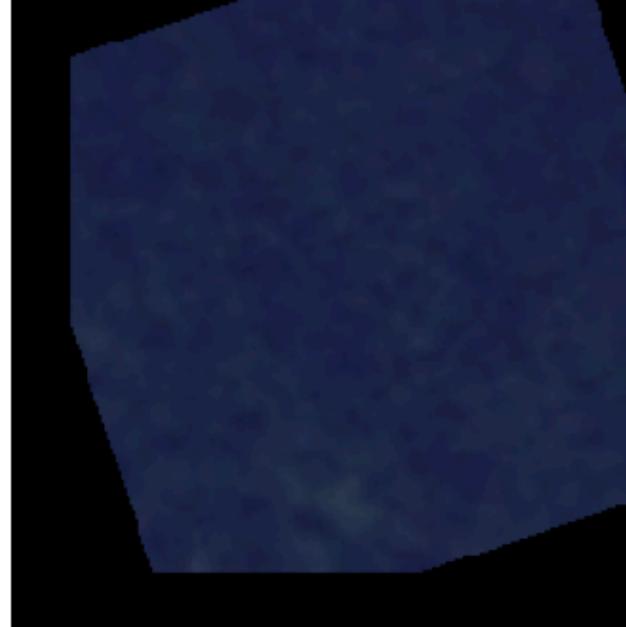
# VISUALIZE SAMPLE PREDICTIONS

EfficientNet\_B0 - Sample Predictions

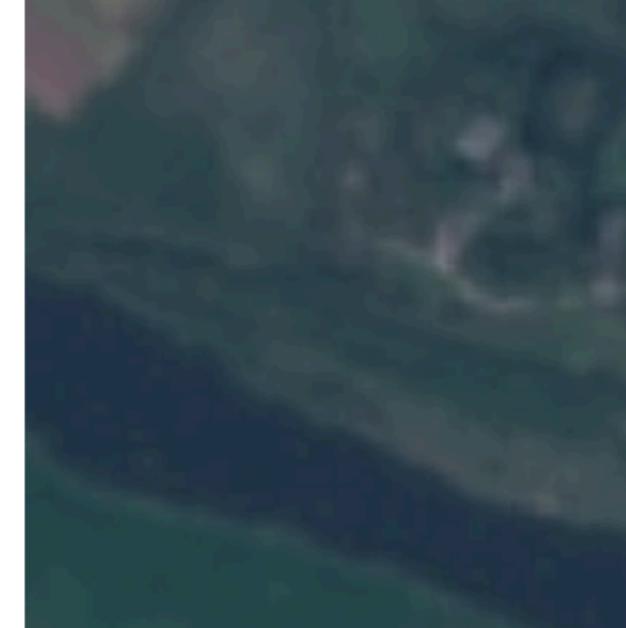
True: Forest  
Pred: Forest (100.0%)



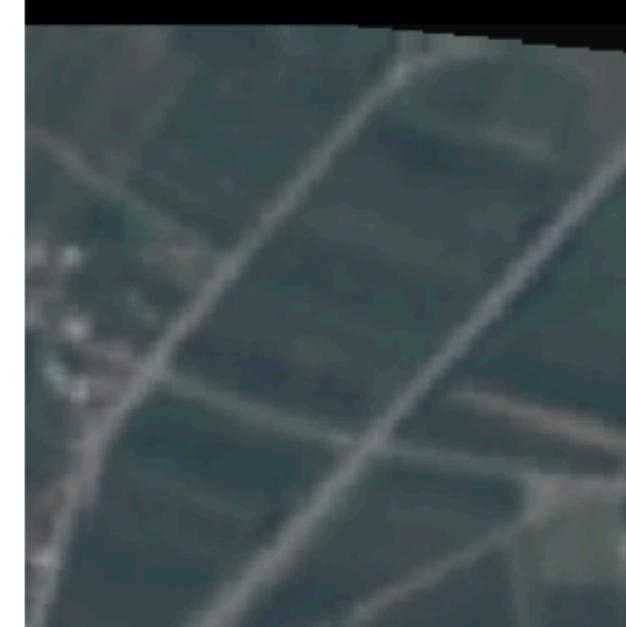
True: Forest  
Pred: Forest (100.0%)



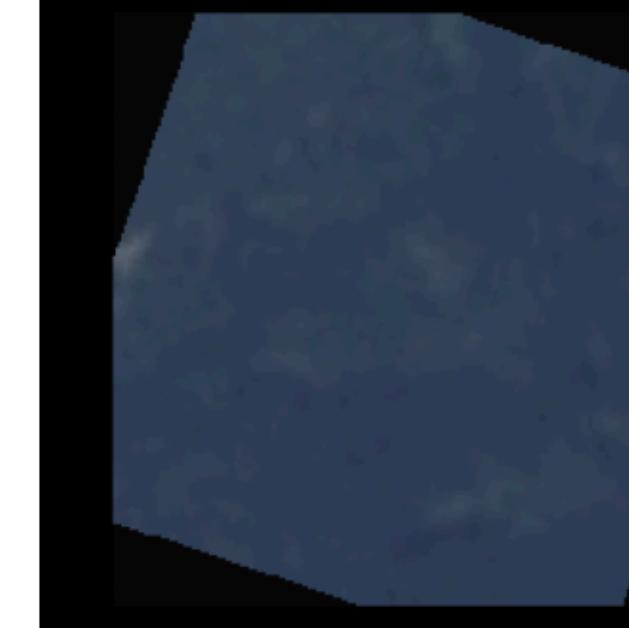
True: River  
Pred: River (100.0%)



True: Highway  
Pred: PermanentCrop (98.6%)



True: Forest  
Pred: Forest (99.6%)



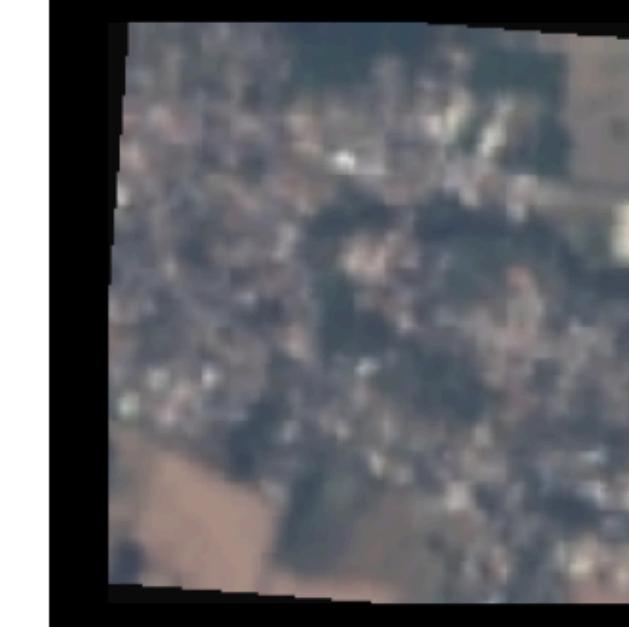
True: Highway  
Pred: Highway (100.0%)



True: Pasture  
Pred: Pasture (100.0%)



True: Residential  
Pred: Residential (97.1%)





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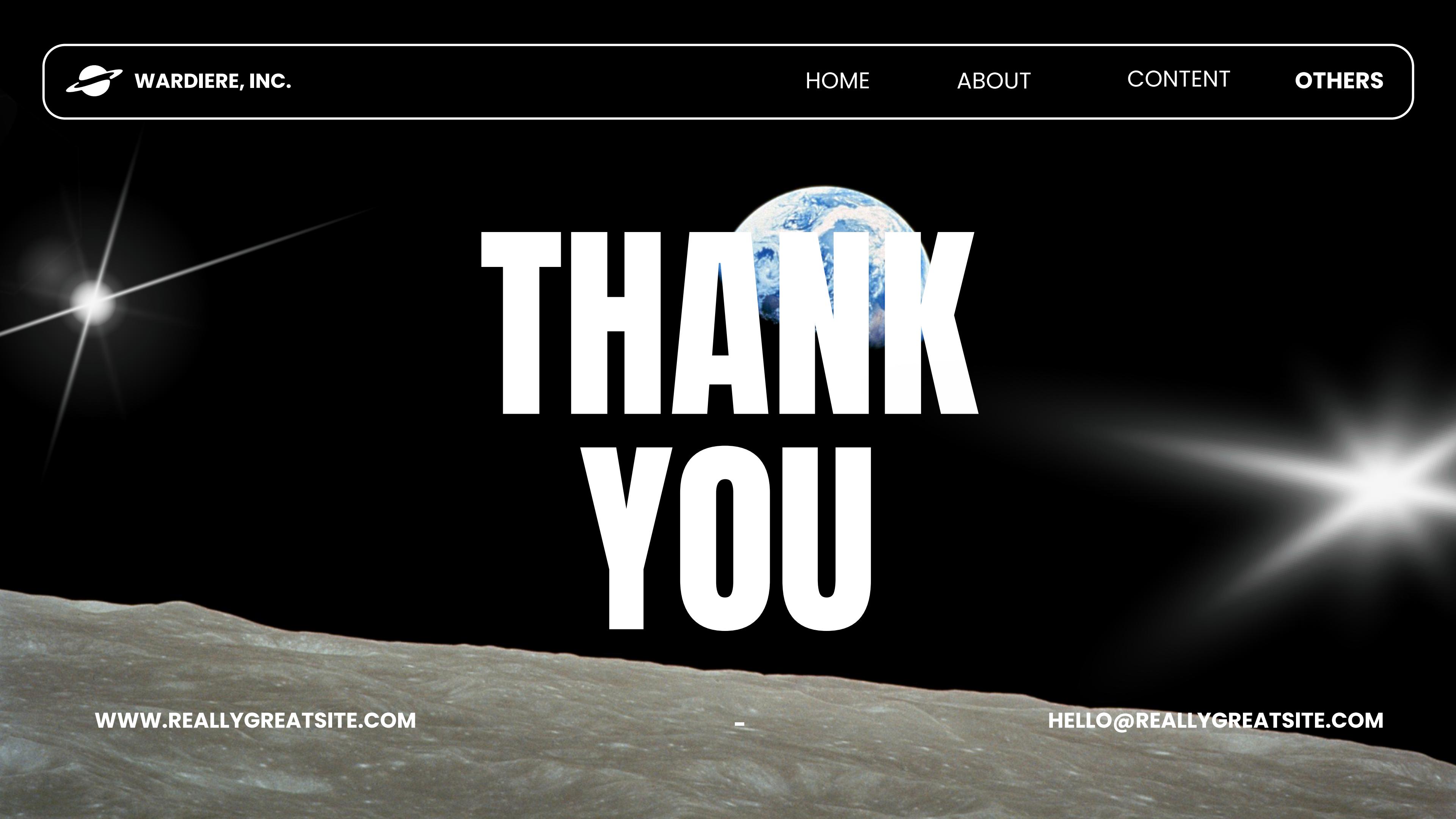
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# THANK YOU



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