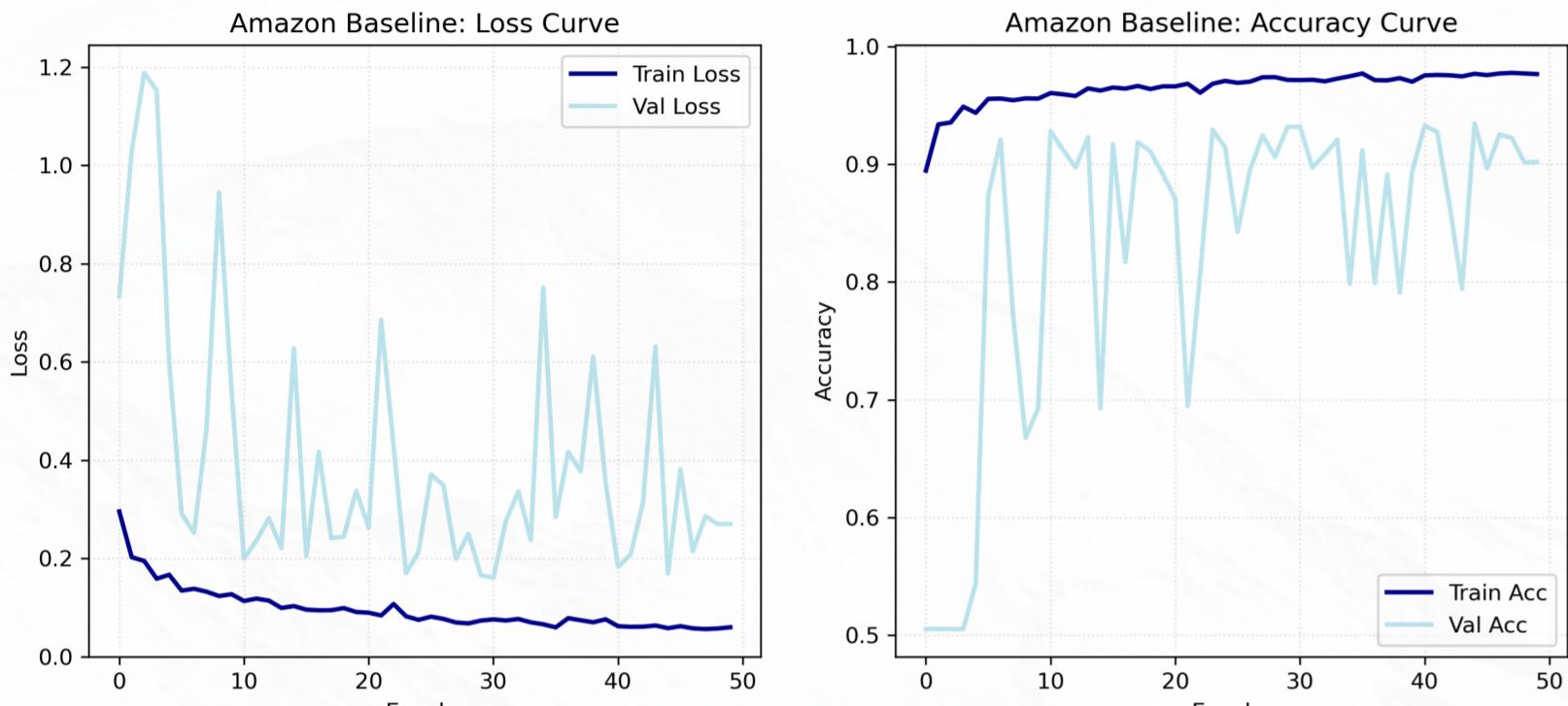


BLEEDING ICE - TSHO ROLPA

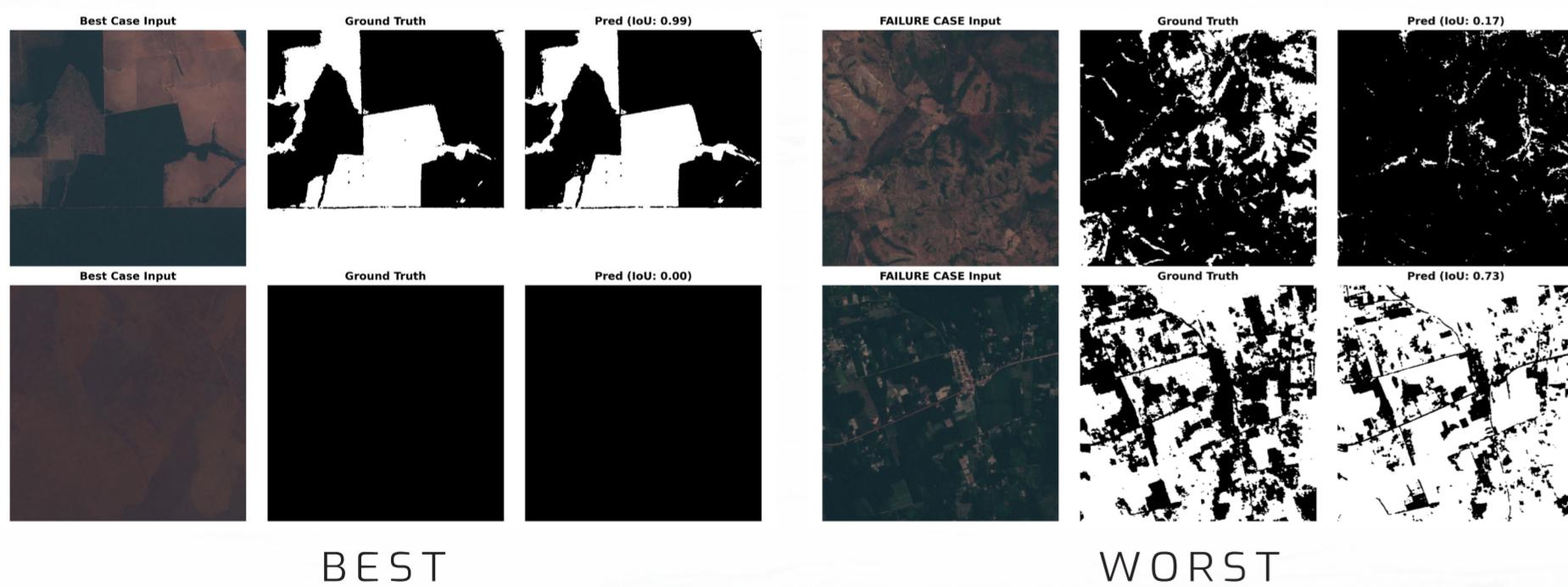
MSC AI-SD [2025] - MARCEL L. KEDZIORA



ATTENTION-BASED U-NET FOR DETECTING DEFORESTATION - SATELLITE SENSOR IMAGERY



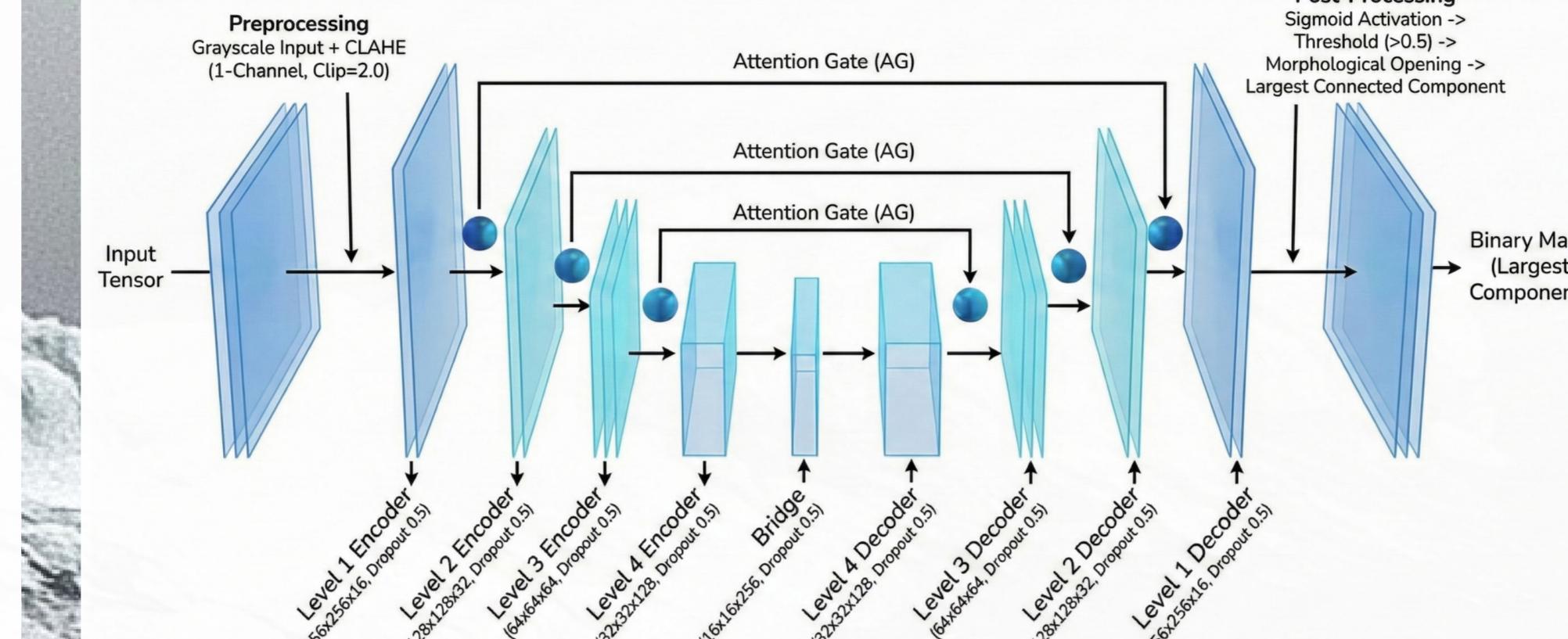
- ATTENTION GATES TARGET RELEVANT SPATIAL FEATURES.
- TRAINED ON SMALL RGB AMAZON DATASET (25 IMAGES).
- AUGMENTATION USED TO MITIGATE DATA SCARCITY.
- PERFORMANCE: F1: 0.9319 ACHIEVED (PAPER: 0.9550).
- CI (0.88–0.96) CONFIRMS MODEL VIABILITY.
- VOLATILE VALIDATION LOSS REFLECTS LIMITED DATA.
- GROUND TRUTH ERRORS LIMIT PREDICTION ACCURACY.
- COMPUTE RESOURCES SHIFTED TO NEPAL TASK.



NEPAL CONTEXT - TSHO ROLPA WARNING

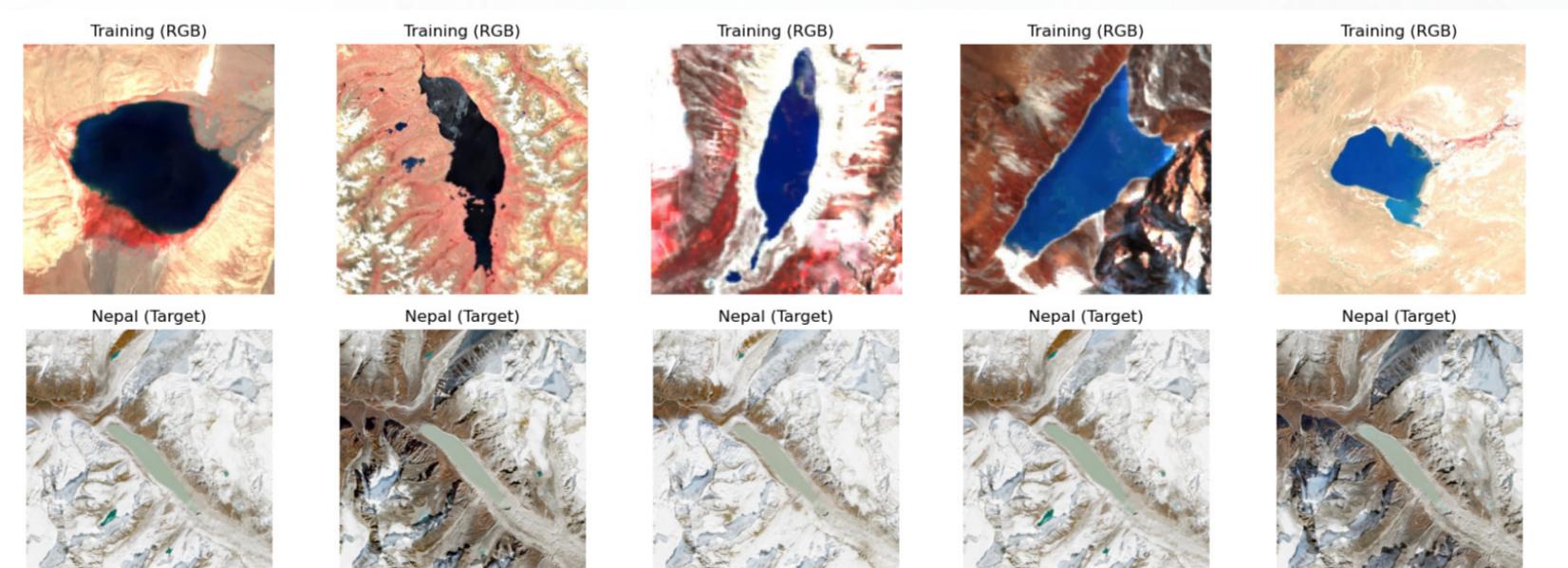
TSHO ROLPA PRESENTS A CRITICAL GLACIAL LAKE OUTBURST FLOOD (GLOF) THREAT TO THE ROLWALING VALLEY DUE TO ACCELERATED GLACIAL MELT. ALIGNING WITH SDG 13, THIS AI ADAPTATION ENABLES CONTINUOUS REMOTE MONITORING, PROVIDING ESSENTIAL EARLY WARNINGS TO SAFEGUARD VULNERABLE DOWNSTREAM COMMUNITIES.

ADAPTATION OF MODEL ARCHITECTURE

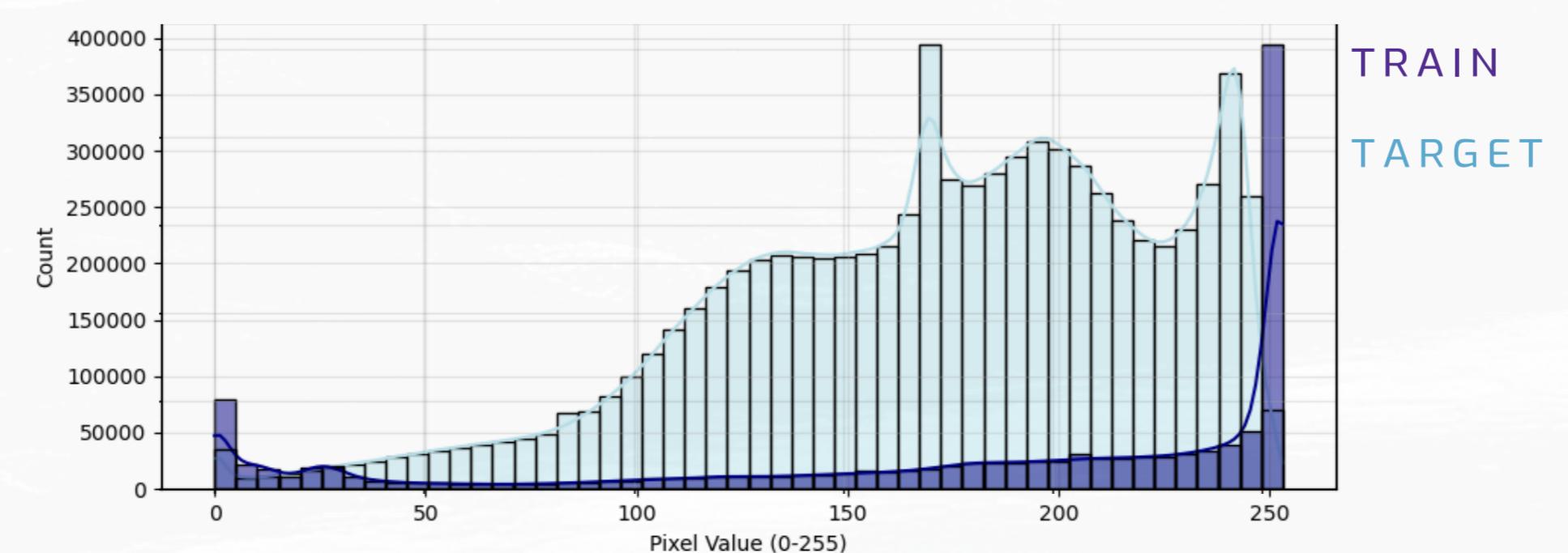


- INPUT RESIZED TO 256X256 FOR LOCAL ROI FOCUS.
- GRAYSCALE INPUT (1-CHANNEL) BYPASSES SHADOW NOISE.
- CLAHE PREPROCESSING BOOSTS TERRAIN CONTRAST.
- DROPOUT (0.5) FORCES SHAPE-BASED LEARNING.
- MIXED PRECISION REDUCES GPU ENERGY COST (SDG 12).
- LARGEST COMPONENT FILTER REMOVES SMALL NOISE.

GLACIAL LAKES DATASET & TSHO ROLPA AIM



- DOMAIN SHIFT FROM FORESTS TO GLACIAL LAKES.
- FALSE-COLOUR TRAIN TO TRUE-COLOUR TARGET.

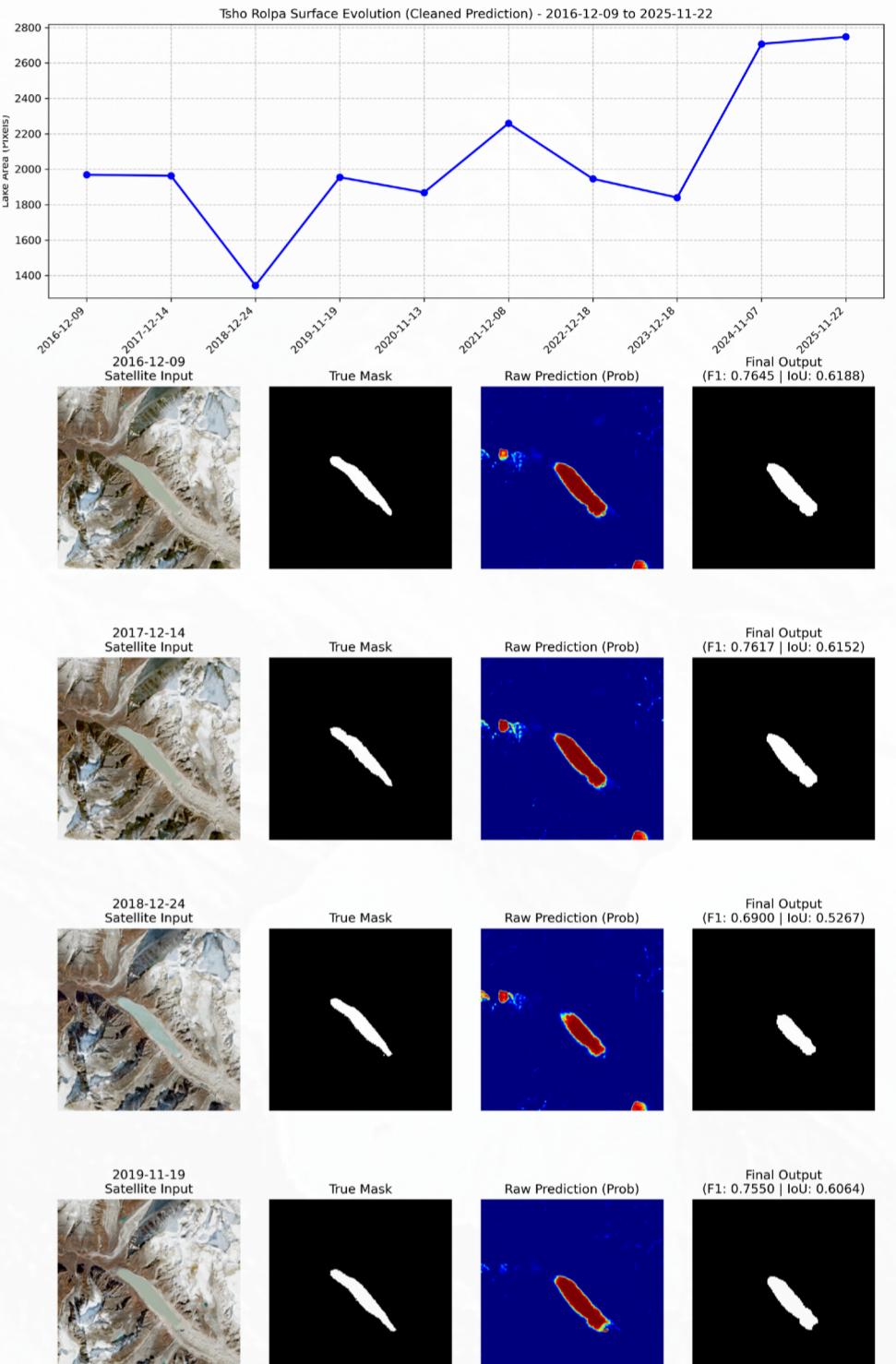


PERFORMANCE & CRITICAL REFLECTION

ROBUST PERFORMANCE DESPITE DOMAIN SHIFTS CONFIRMS THE THREAT. SATELITE 2D PIXELS MISS DAM STABILITY. TO SECURE THE VALLEY (SDG 11), URGENCY TO FUSE THIS MODEL WITH ON-GROUND LIDAR/GPR, UPGRADING SURFACE MONITORING TO 3D VOLUMETRIC RISK ASSESSMENT.

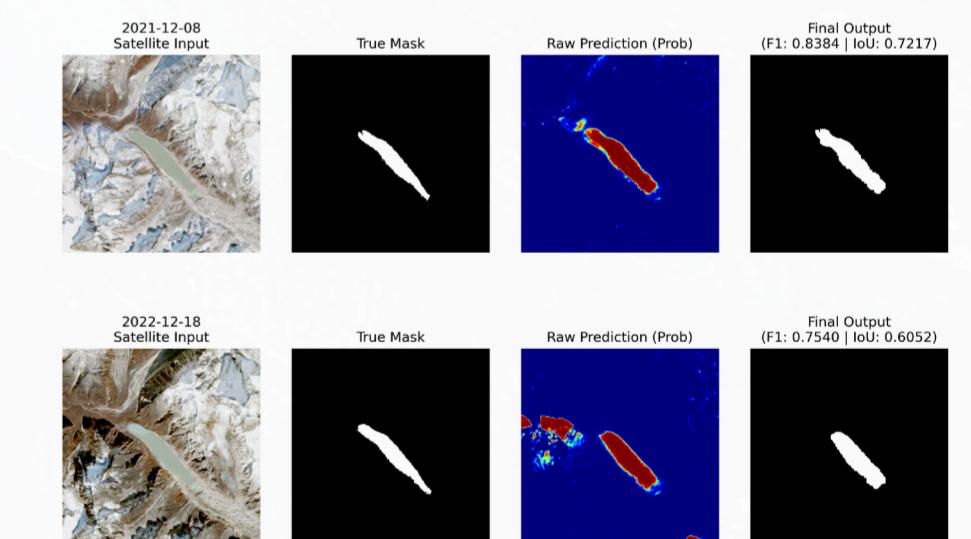
EVALUATING TRAIN

BINARY F1: 0.9314
WEIGHTED F1: 0.9813
IoU: 0.8716
95% CI: 0.9154 - 0.9212



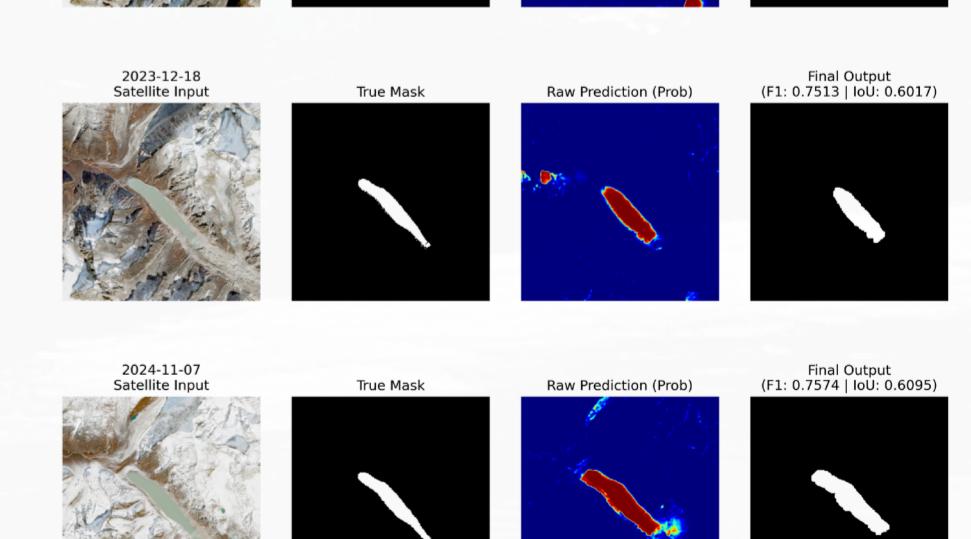
EVALUATING INTERNAL VAL

BINARY F1: 0.9390
WEIGHTED F1: 0.9828
IoU: 0.8850
95% CI: 0.9171 - 0.9400



UNSEEN DATA

TSHO ROLPA (RAW)
BINARY F1: 0.7030
WEIGHTED F1: 0.9822
IoU: 0.5421
95% CI: 0.6525 - 0.7587



TSHO ROLPA (CLEANED)

BINARY F1: 0.7566
WEIGHTED F1: 0.9860
IoU: 0.6084
95% CI: 0.7370 - 0.7746

