Flood area segmentation using neural networks
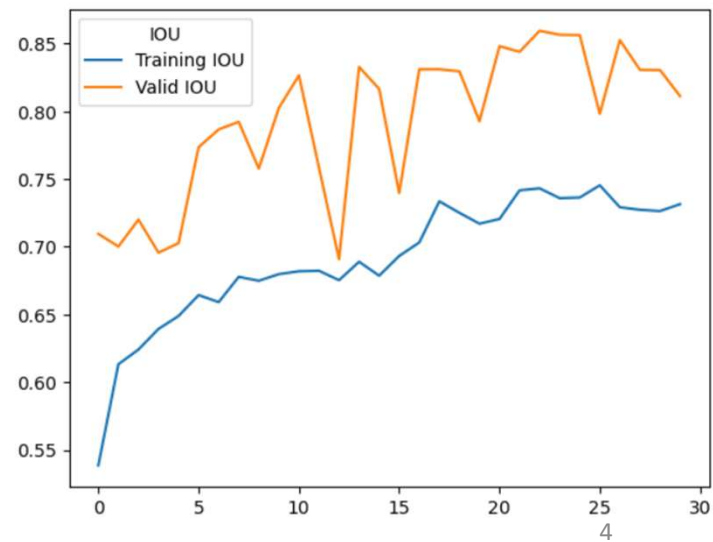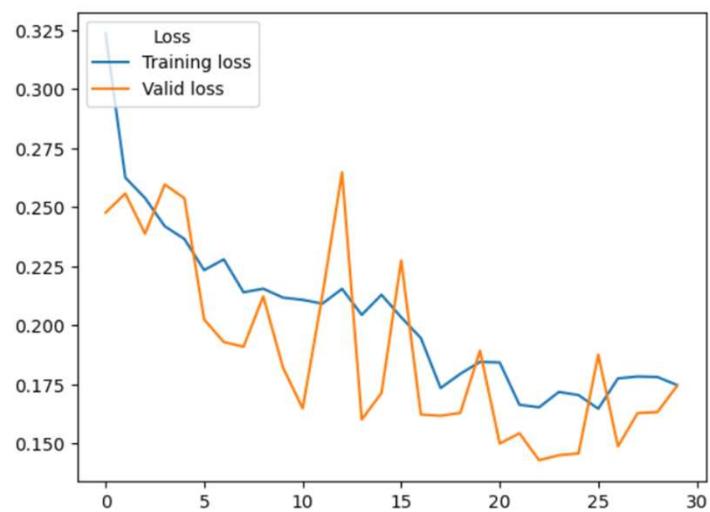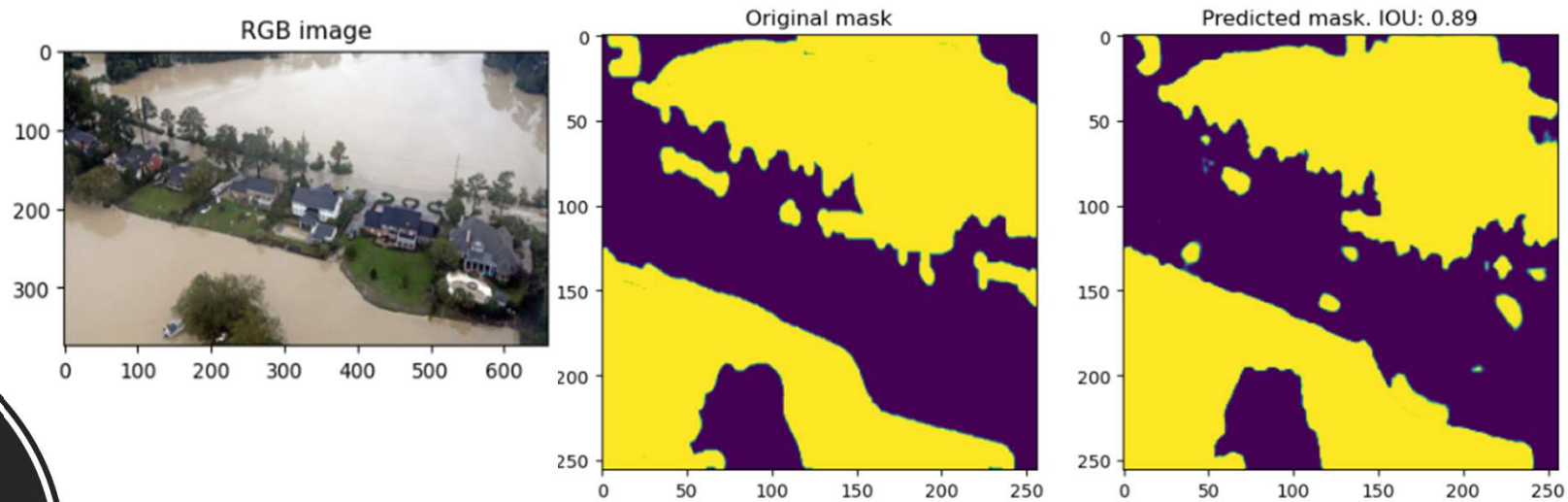
Haider Ali

Problem overview

- There are lot of Flood events happening and it becomes very critical to identify amount of area affected my it.

- By identification the rescue team can make informed decisions for ex. Number of rescue members needed for a particular area.

- It can be used for urban planners and policymakers to make informed decisions regarding land use, infrastructure development, and flood mitigation measures

- Climate change: Identifying climate change by measuring the flood impact according to time constraint to measure climate change.

- Humanitarian Aid: It can help government and NGO's to prioritize resources based on severity of flood.

- Urban planning: It assists in prioritizing repair and maintenance work, ensuring timely interventions and reducing infrastructure downtime
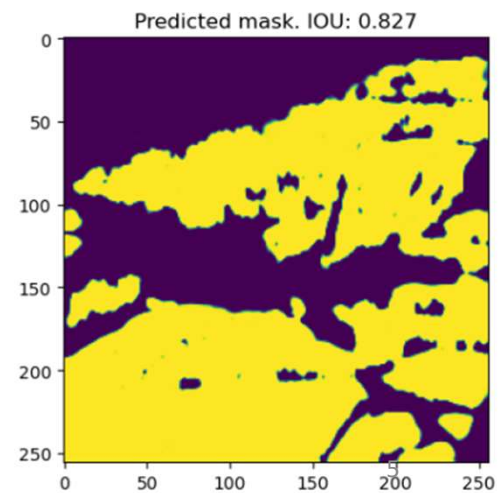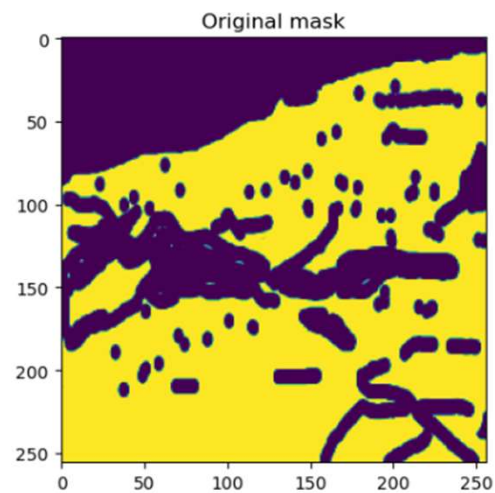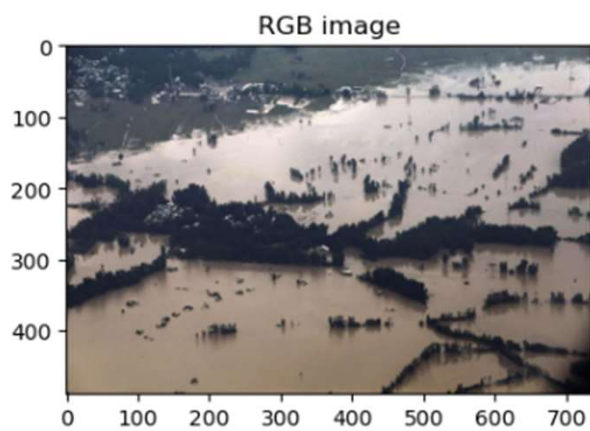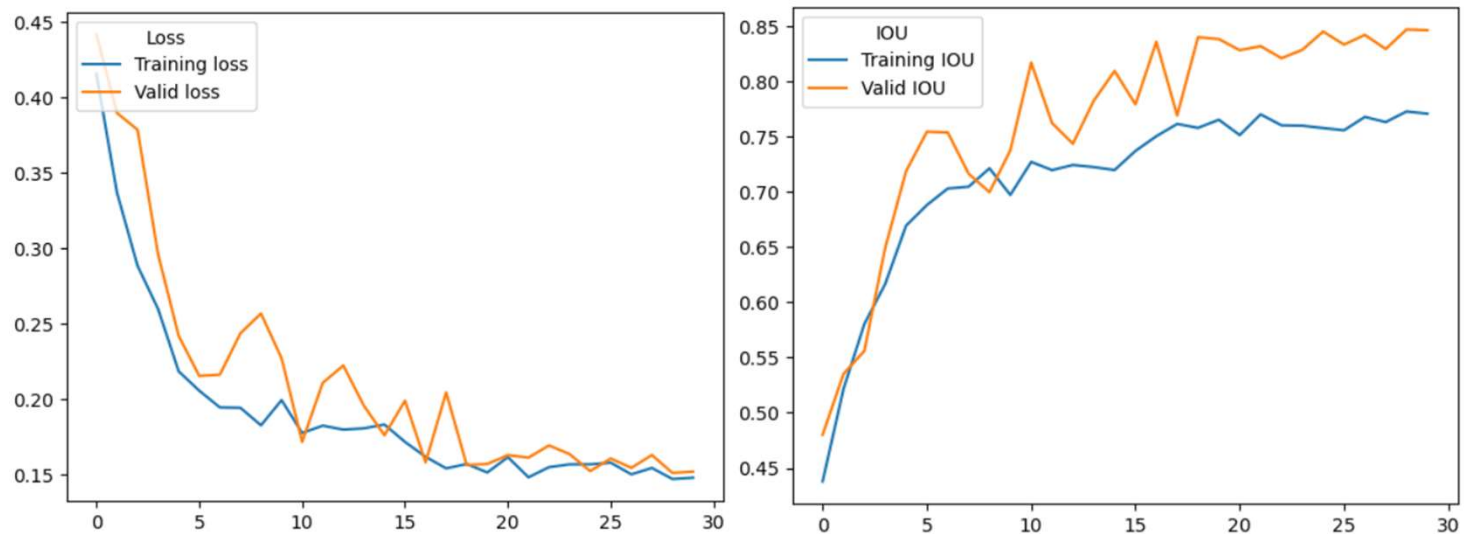
Dataset

- This dataset taken from Kaggle uploaded by Faizal Karim and 2 more collaborators.

- The dataset contains images of flood hit areas and corresponding mask images showing the water region.

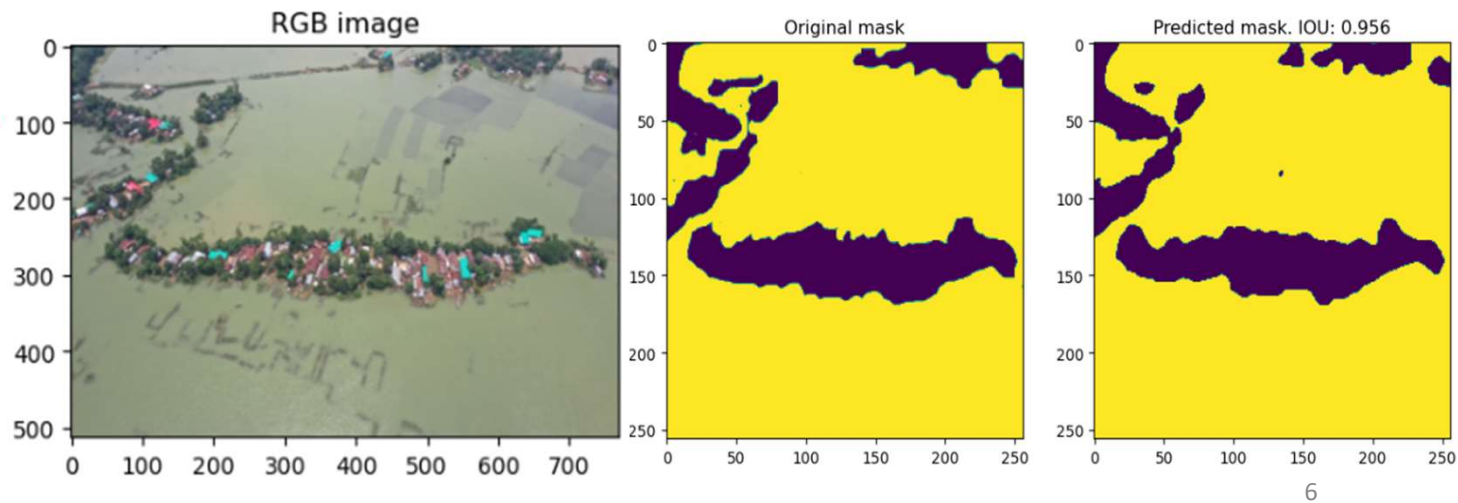- The dataset contains 290 images with their masks which are further split into test size 58 and train size 231 images
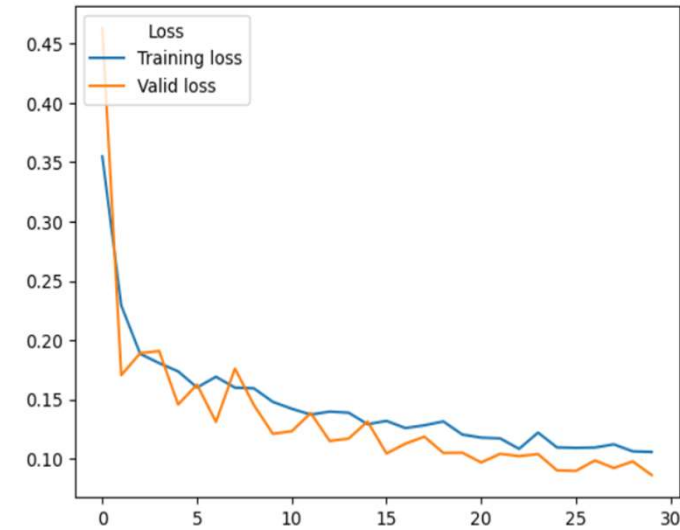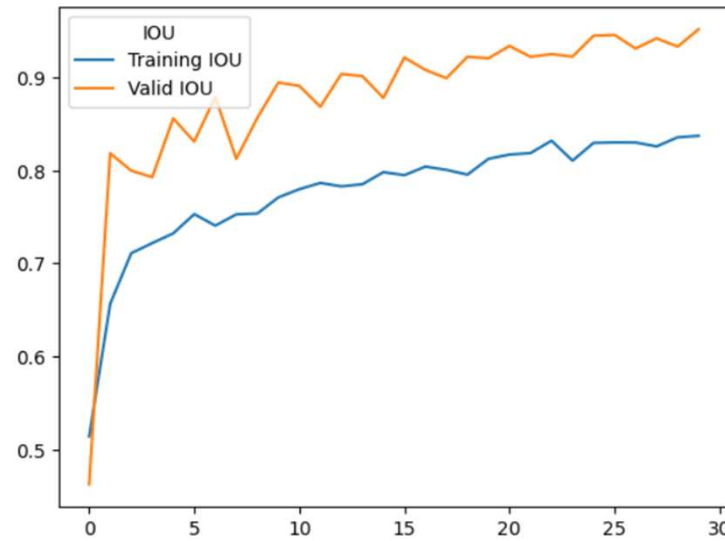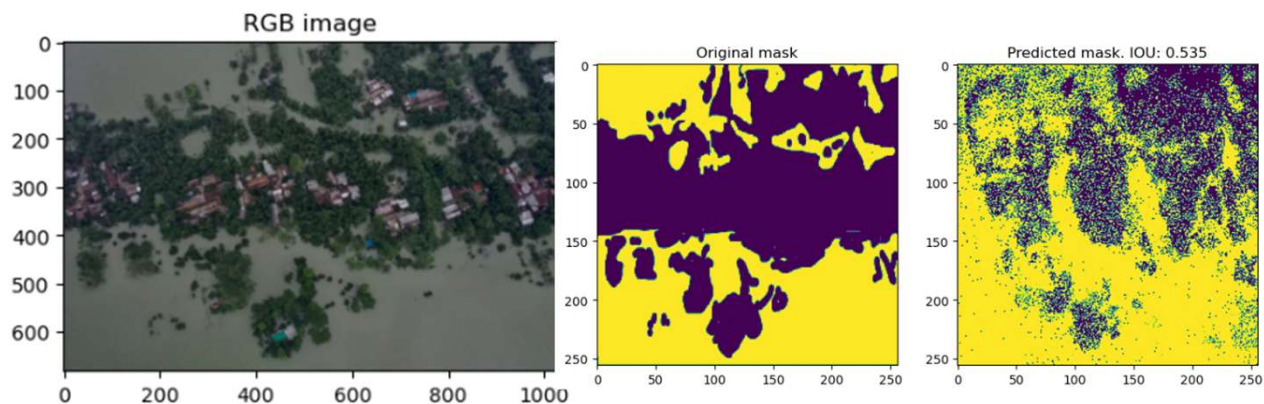
RGB image

Original mask

Predicted mask. IOU: 0.89

UNet

Loss
- Training loss
- Valid loss

IOU
- Training IOU
- Valid IOU

U2Net

ResNext50 UNet

RGB image | Original mask | Predicted mask. IOU: 0.956

VIT

Original mask

Predicted mask. IOU: 0.886

RGB image

DeepLabV3+

Loss
Training loss
Valid loss

IOU
Training IOU
Valid IOU
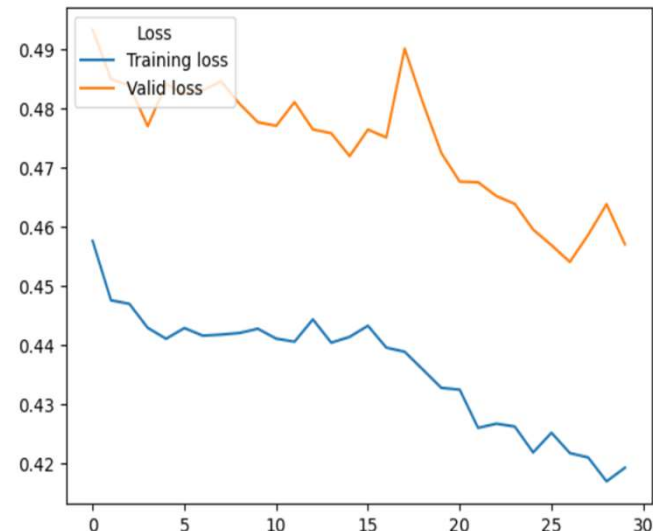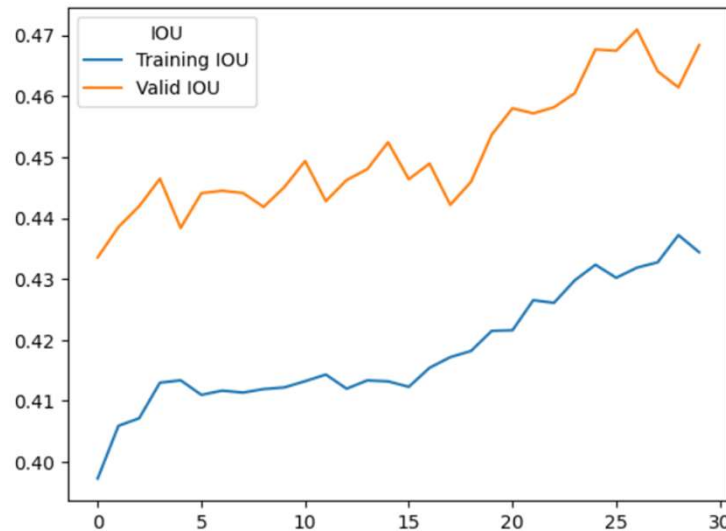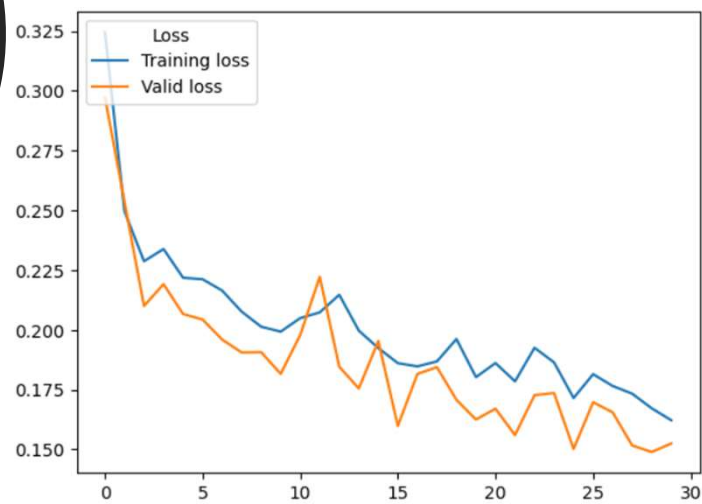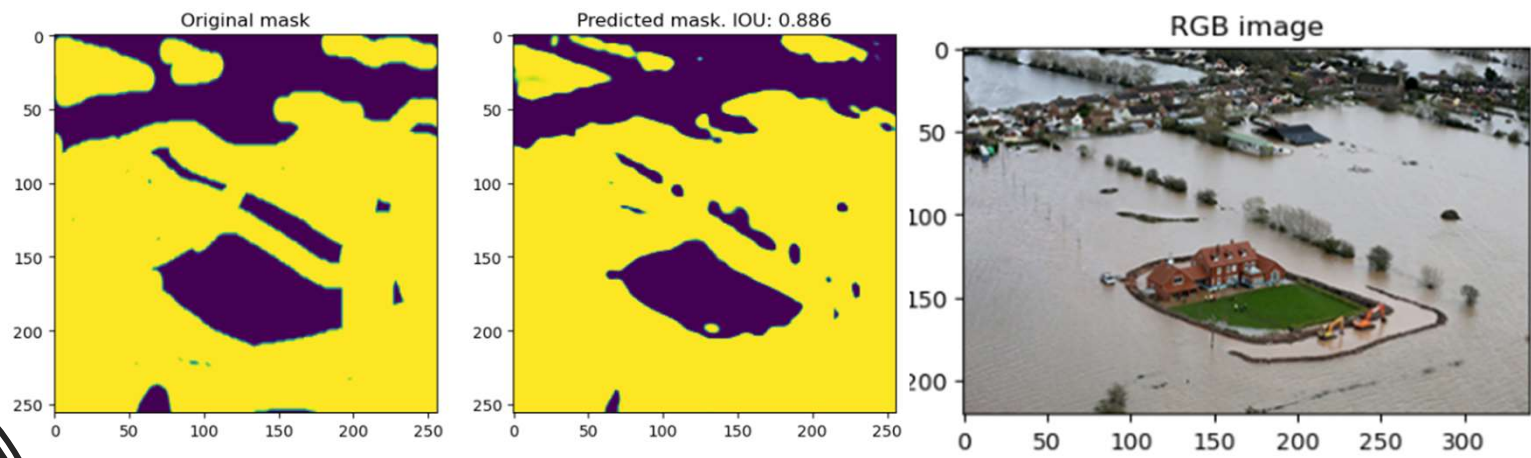
Comparison of models

Model	Mean IOU
ResNext50 + UNet	95.1%
UNet	85.9%
DeepLabV3+	85%
U2Net	84.6%
VIT	47

Conclusion and future work

- The UNet results are very close to the ResNext50UNet and DeepLabV3+.

- During my experimentations I observed that using Otsu's thresholding increased the accuracy of the models.

- Even using color transforms such as ColorJitter and Normalization methods

- More transformations and thresholding techniques can be explored and applied to get more accurate results.

- The results of these models can be compared with Segment Anything Model (SAM).

Thanks for your attention

Questions?