Drone Image Segmentation

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Problem Statement

- ‘Last Mile Delivery’ is costly portion of package delivery
- Start-up focused on deliveries using drones
- Create model that can identify safe landing/delivery zones for drone
- Focus on these targets:
  - Paved-Area
  - Grass
  - Dirt
  - Gravel

Semantic Segmentation

Input Image

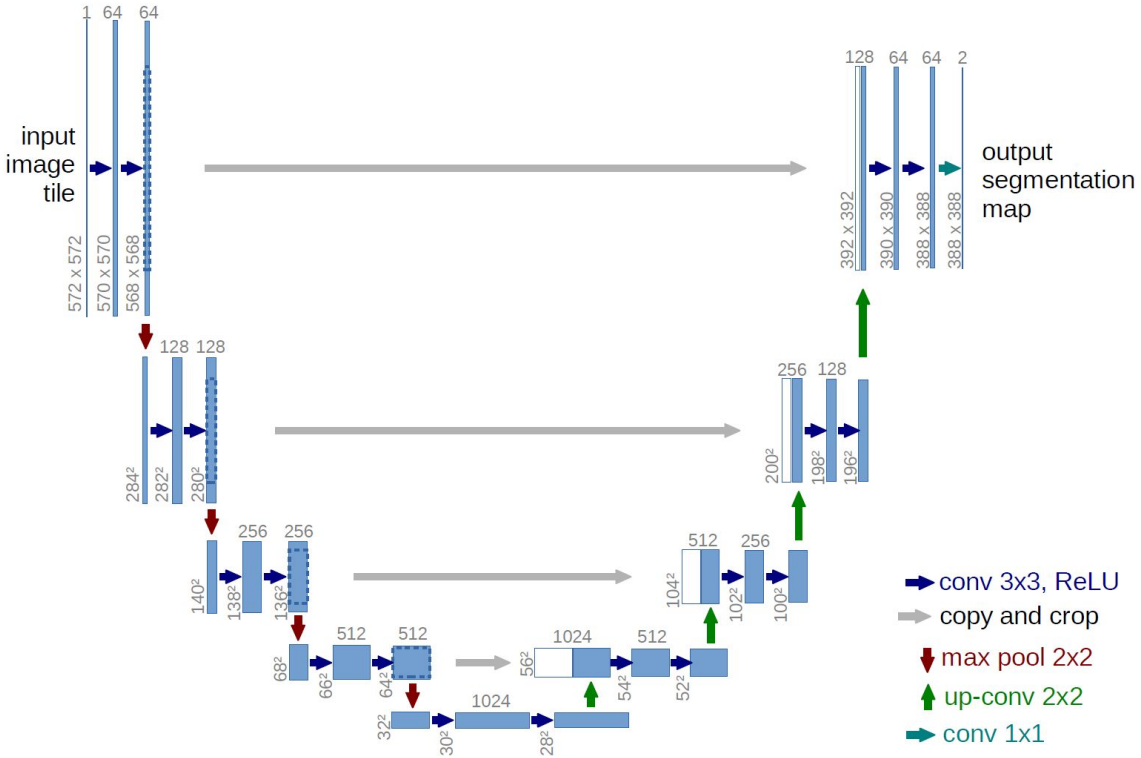
True Mask

- Pixel Classification
- Each pixel has class value in mask

U-Net Model

Model Features:

- Fully Convolutional
- Decoder and Encoder
- Skip Layers



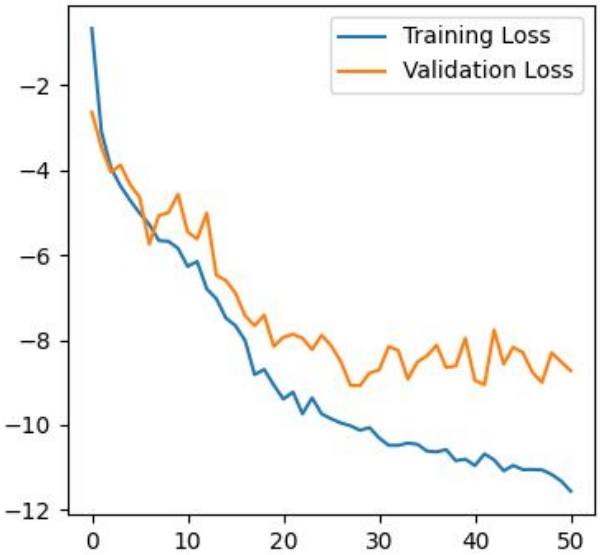
Modeling Metrics

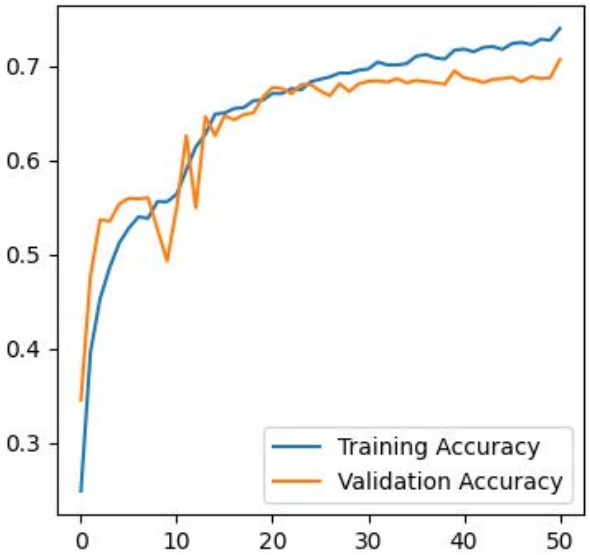
- Accuracy can be affected by class imbalance
- Intercept over Union (IoU) allows for a per class metric
- Dice Coefficient used for loss function of one model

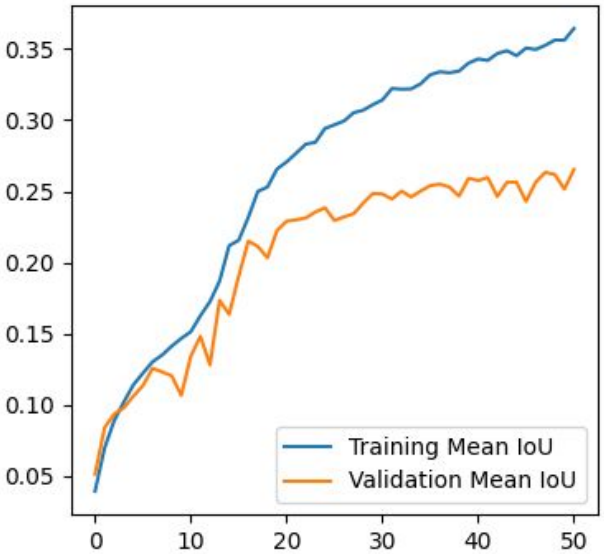
$$IoU = TP / (TP + FP + FN)$$

$$Dice = (2*TP) / (2*TP + FP + FN)$$

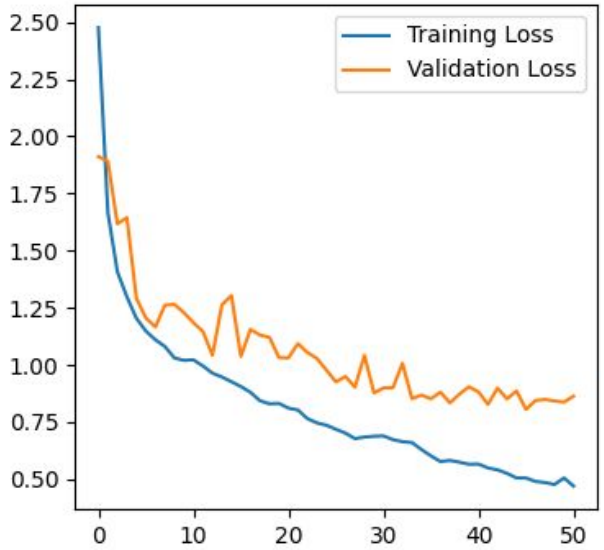
Dice Coef Loss Model

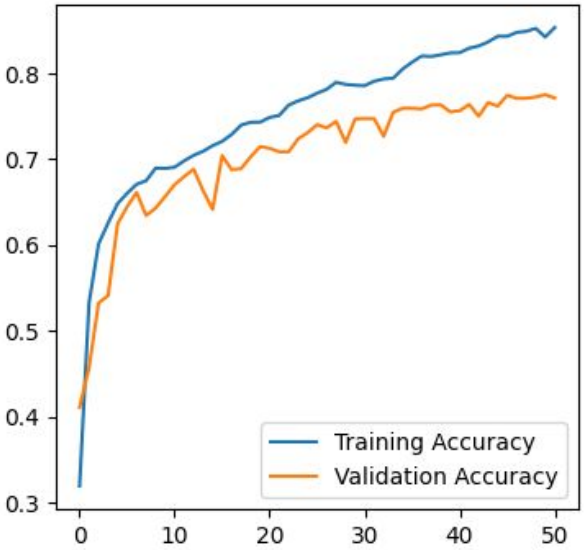


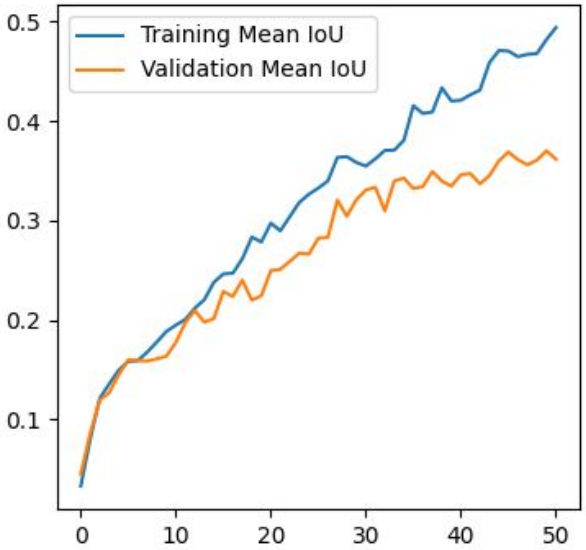




Categorical Loss Model

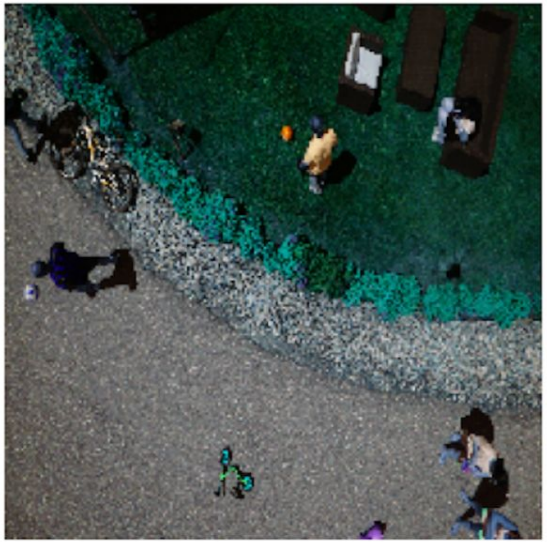




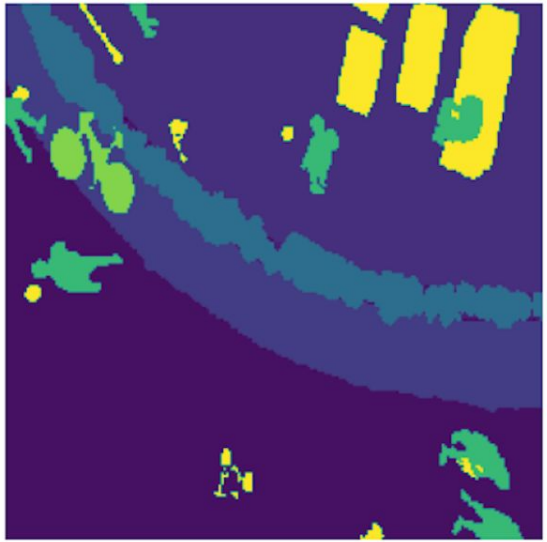


Mask Predictions

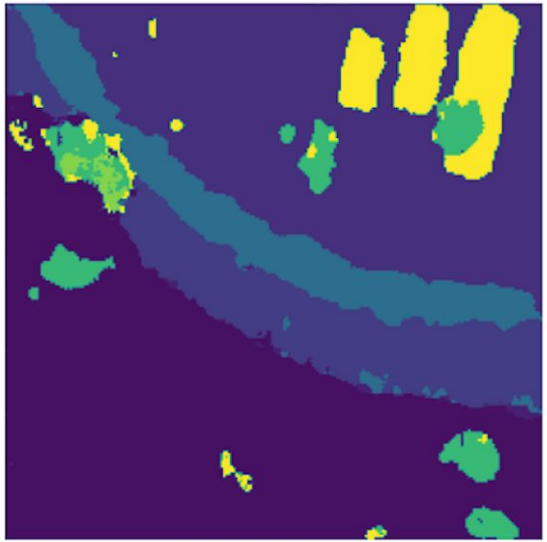
Input Image



True Mask

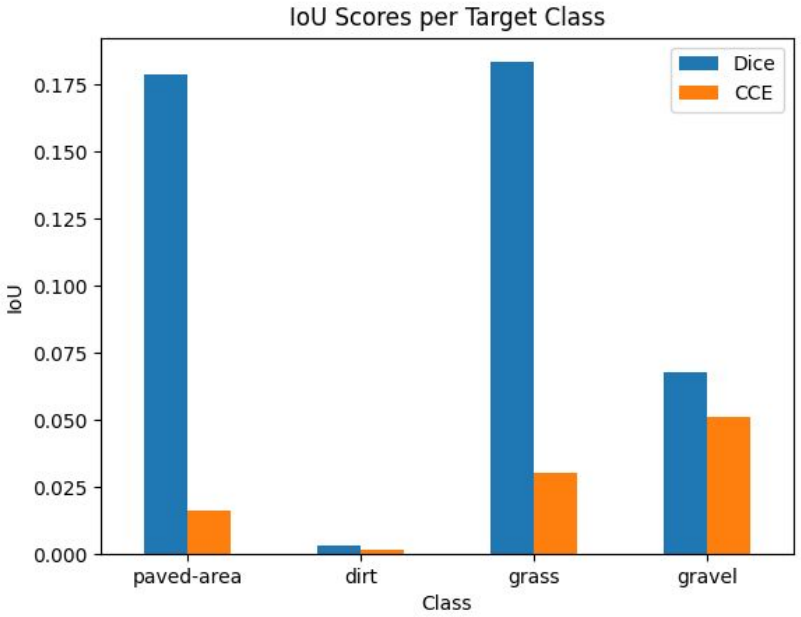


Predicted Mask



Target Class IoU

- Dice Loss Model performs better
- Potential Errors:
  - Much lower than MeanIoU
  - Dice and IoU perform differently for averaging



Conclusions and Recommendations

- Model should be improved before implementation
- Suggestions for improvement:
  - Custom model architecture
  - Higher resolution input
  - Further augmentation