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A large, high-resolution image of the Earth as seen from space, showing the African continent and surrounding oceans. The image is framed by a thin white border.

Image Classification & Segmentation on VGG dataset

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(COMP4106)



Topics

- Image Classification
- Semantic Segmentation



Image Classification: Dataset

- 17 flower categories
- 80 images in each category



Image Classification: Data folder structure

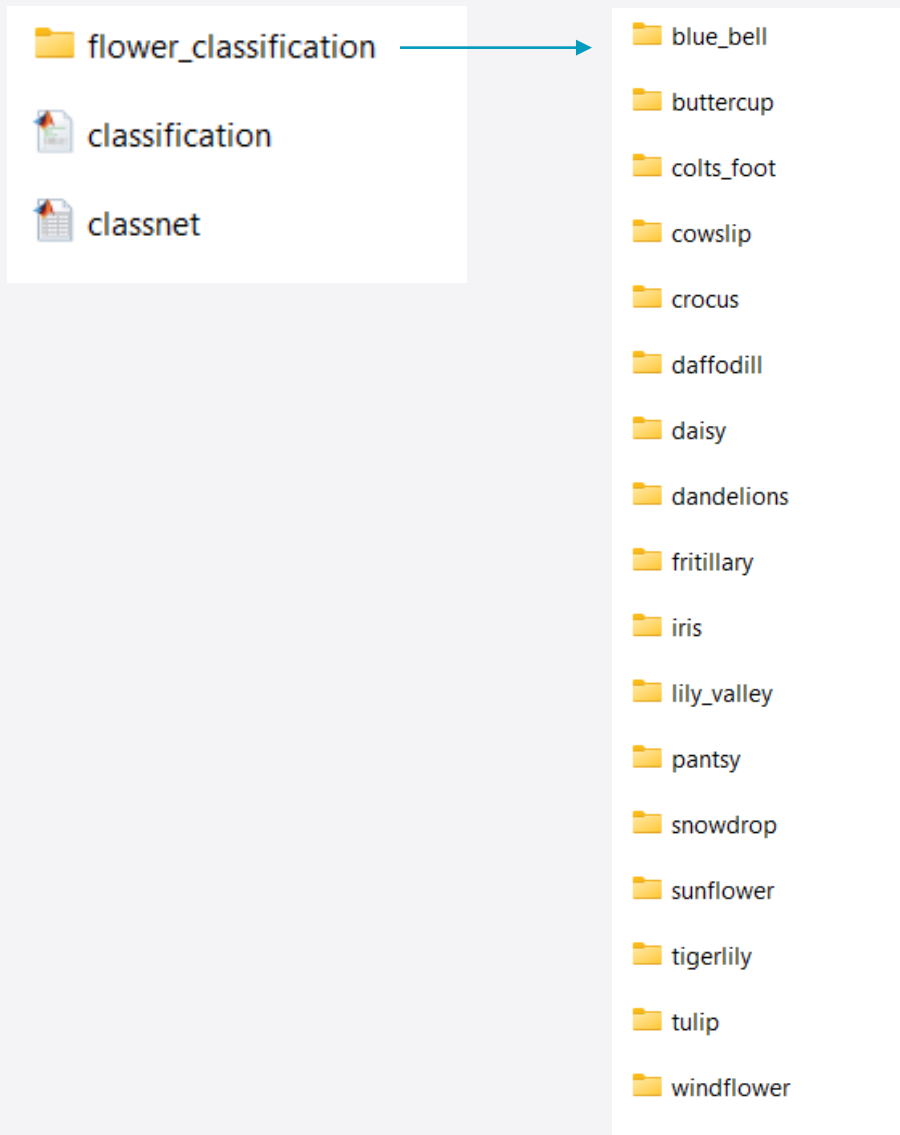




Image Classification: Data Pipeline

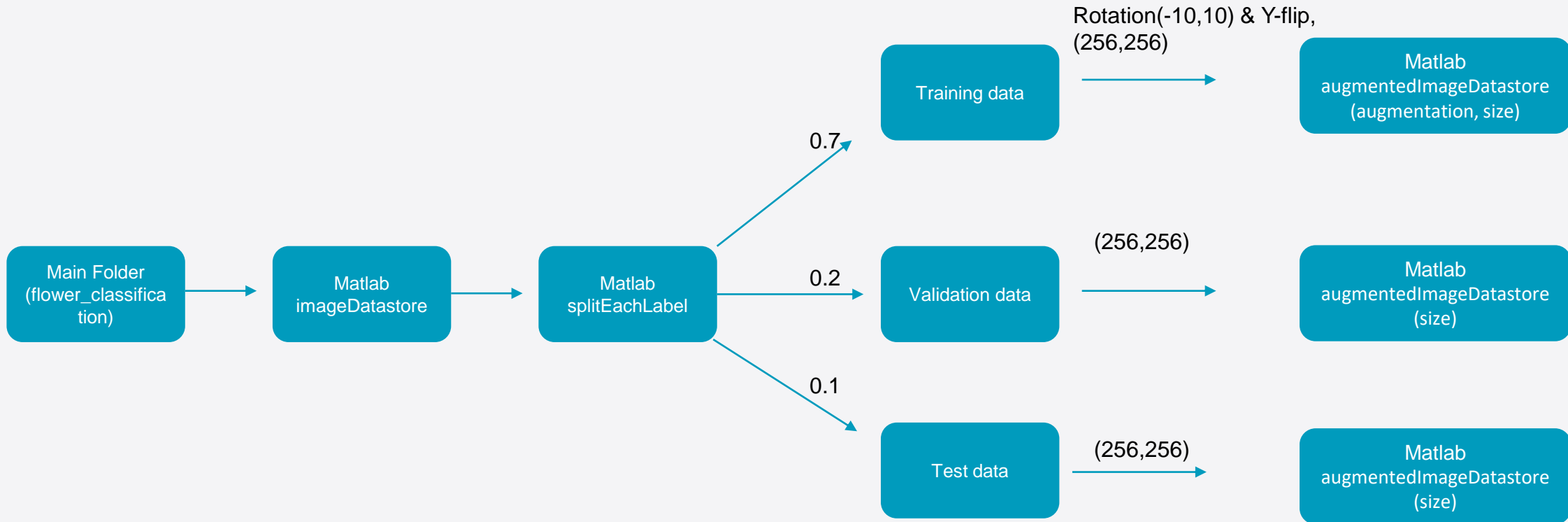




Image Classification: Data Augmentation



Different orientations of blue bell flower



Image Classification: Skip Connections

34-layer residual

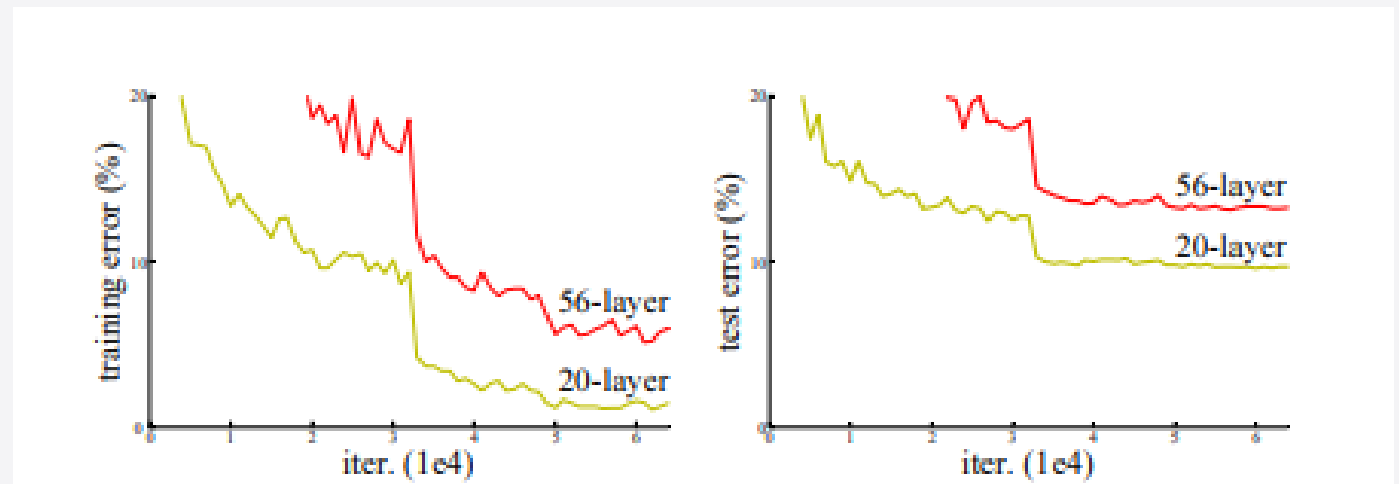
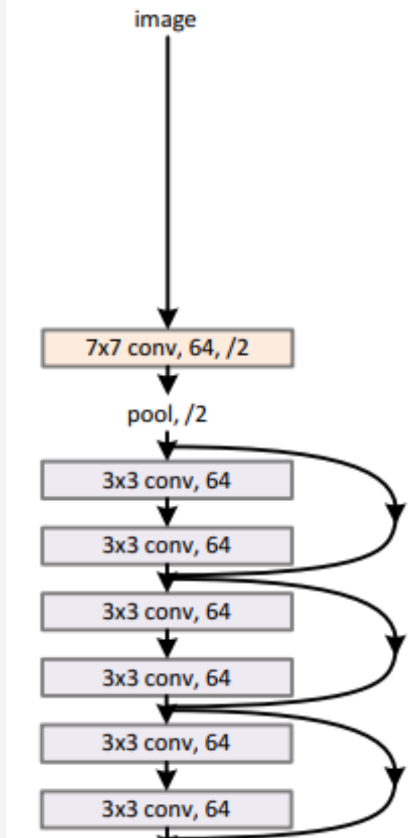




Image Classification: Model Architecture

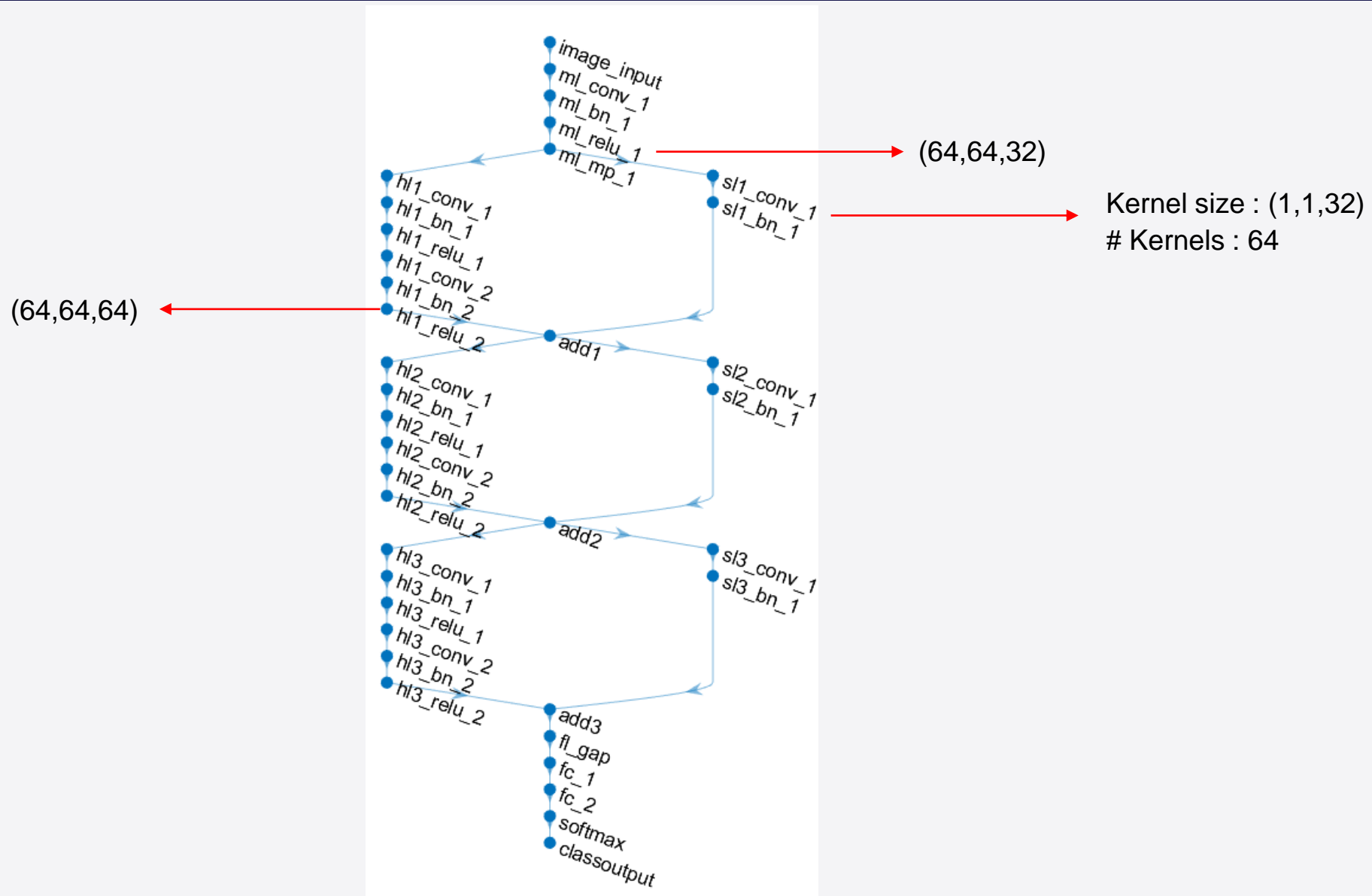




Image Classification: Results

Skip Connection Model Accuracy

Final Validation Accuracy :
77.94%

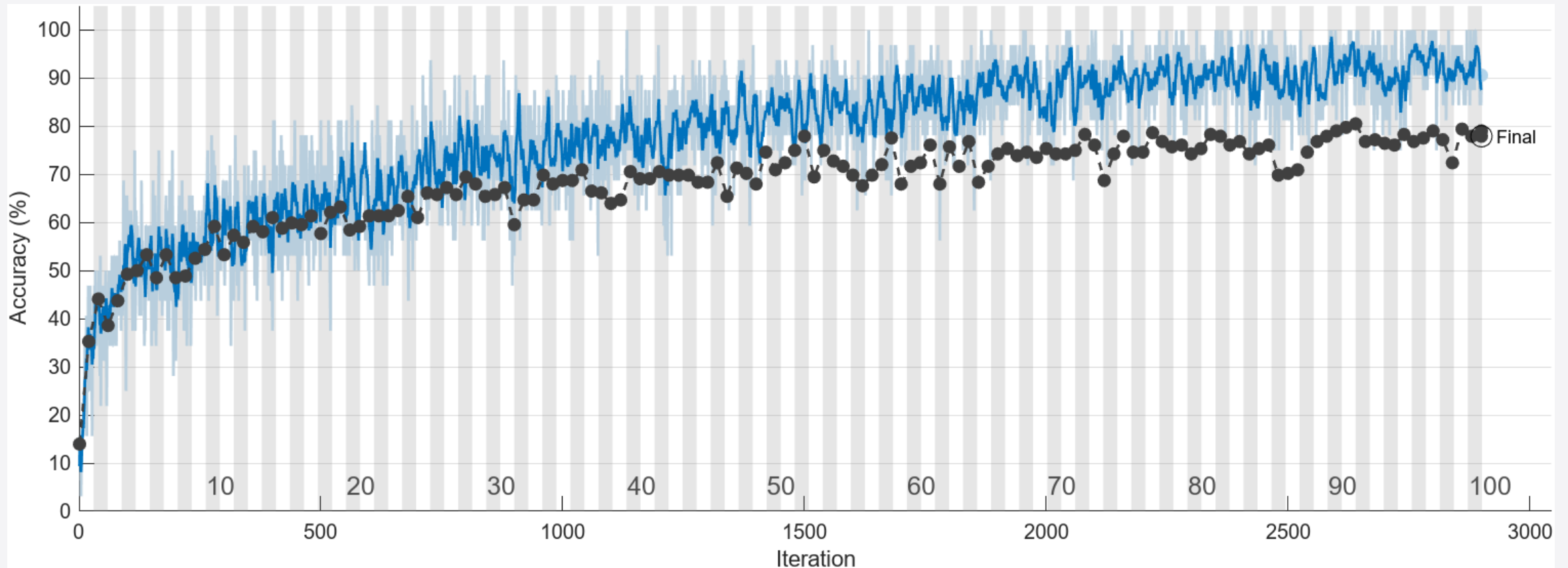




Image Classification: Results

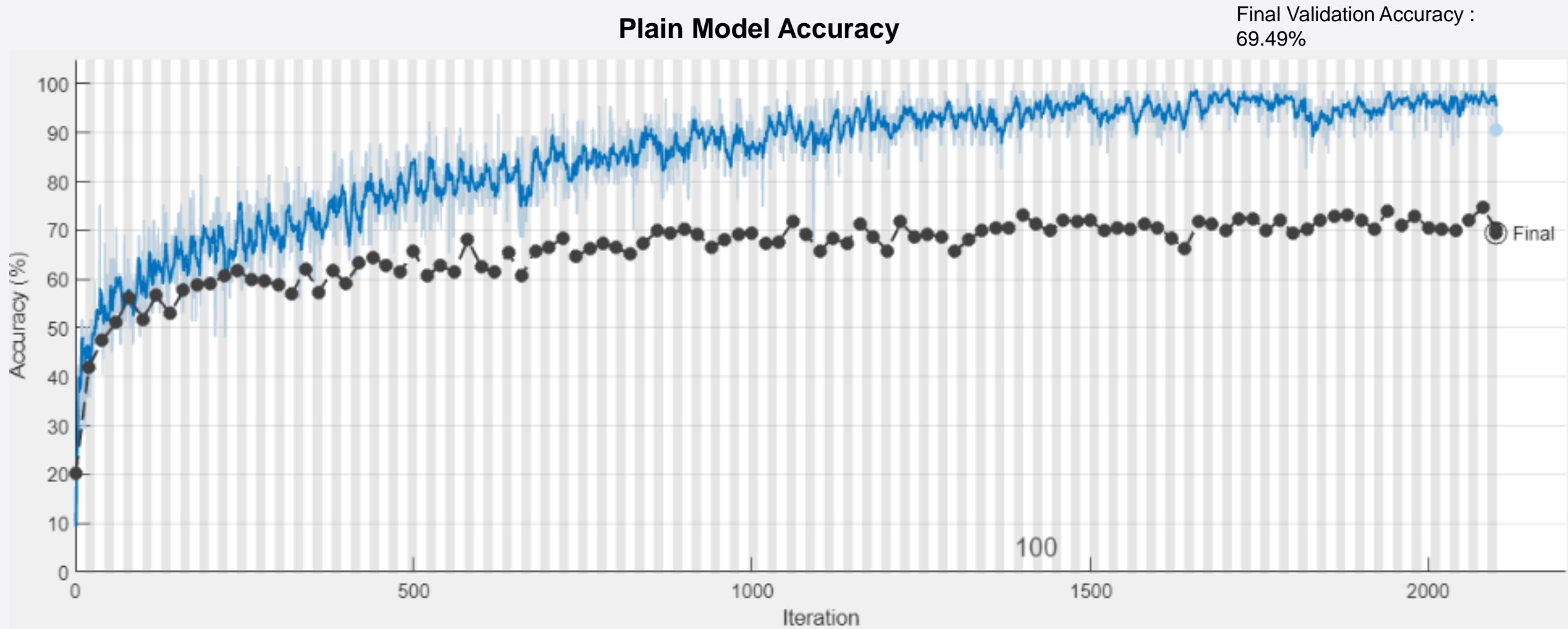


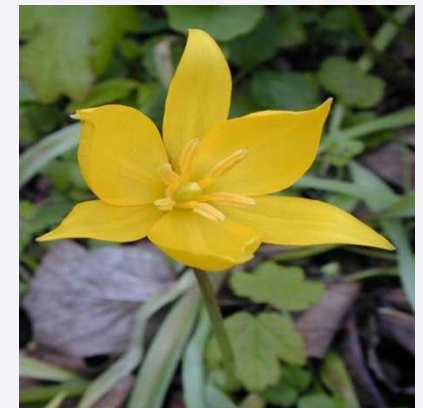


Image Classification: Evaluation (Test Data)

True Class	Predicted Class																
	blue_bell	buttercup	colts_foot	cowslip	crocus	daffodill	daisy	dandelions	fritillary	iris	lily_valley	pansy	snowdrop	sunflower	tigertily	tulip	windflower
blue_bell	8																
buttercup		8															
colts_foot			8														
cowslip				8													
crocus					8												
daffodill						5		1								2	
daisy							8										
dandelions								8									
fritillary									8								
iris										7			1				
lily_valley											7		1				
pansy												7					1
snowdrop													8				
sunflower		1												7			
tigertily															8		
tulip						1										7	
windflower											1						7



Tulip



Daffodil



Image Classification: Evaluation (Grad-Cam)

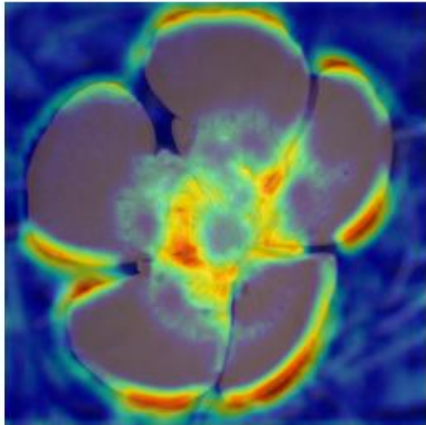




Image Segmentation: Folder Structure

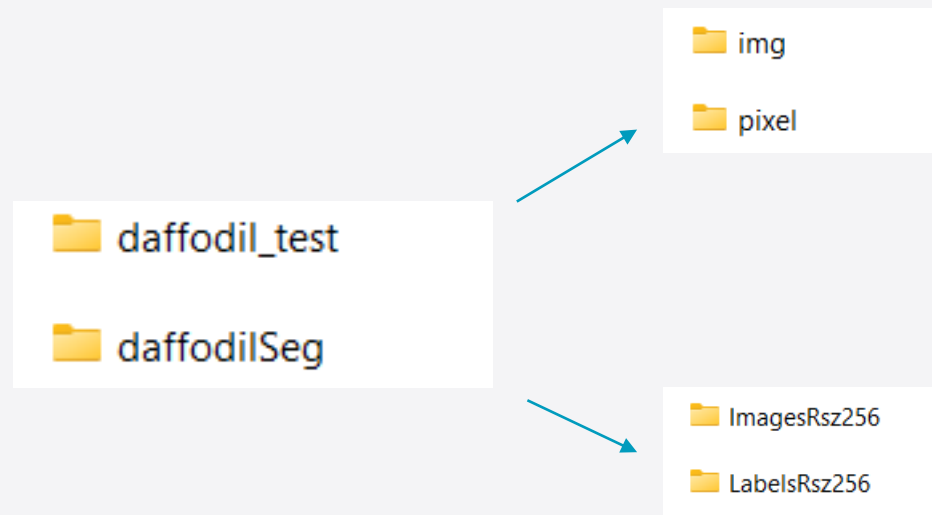




Image Segmentation: Data Pipeline

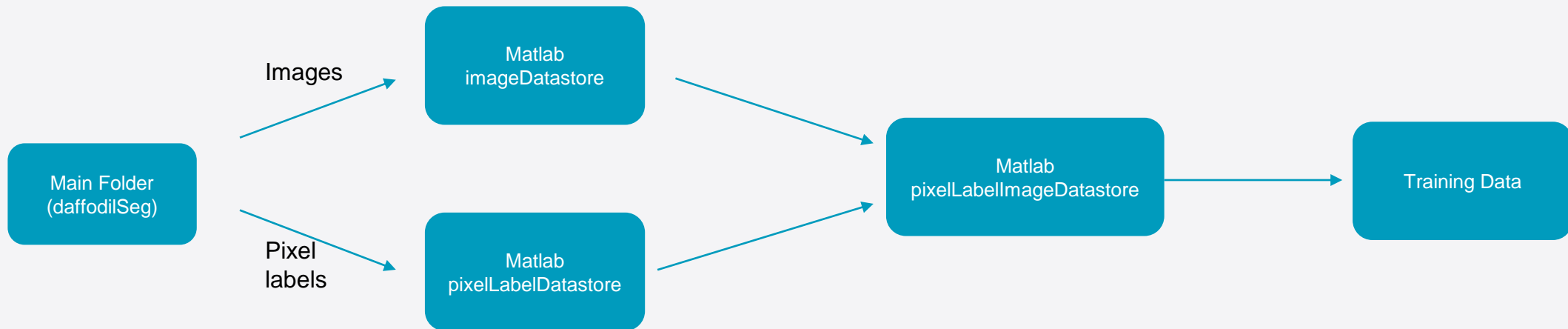




Image Segmentation: Unet

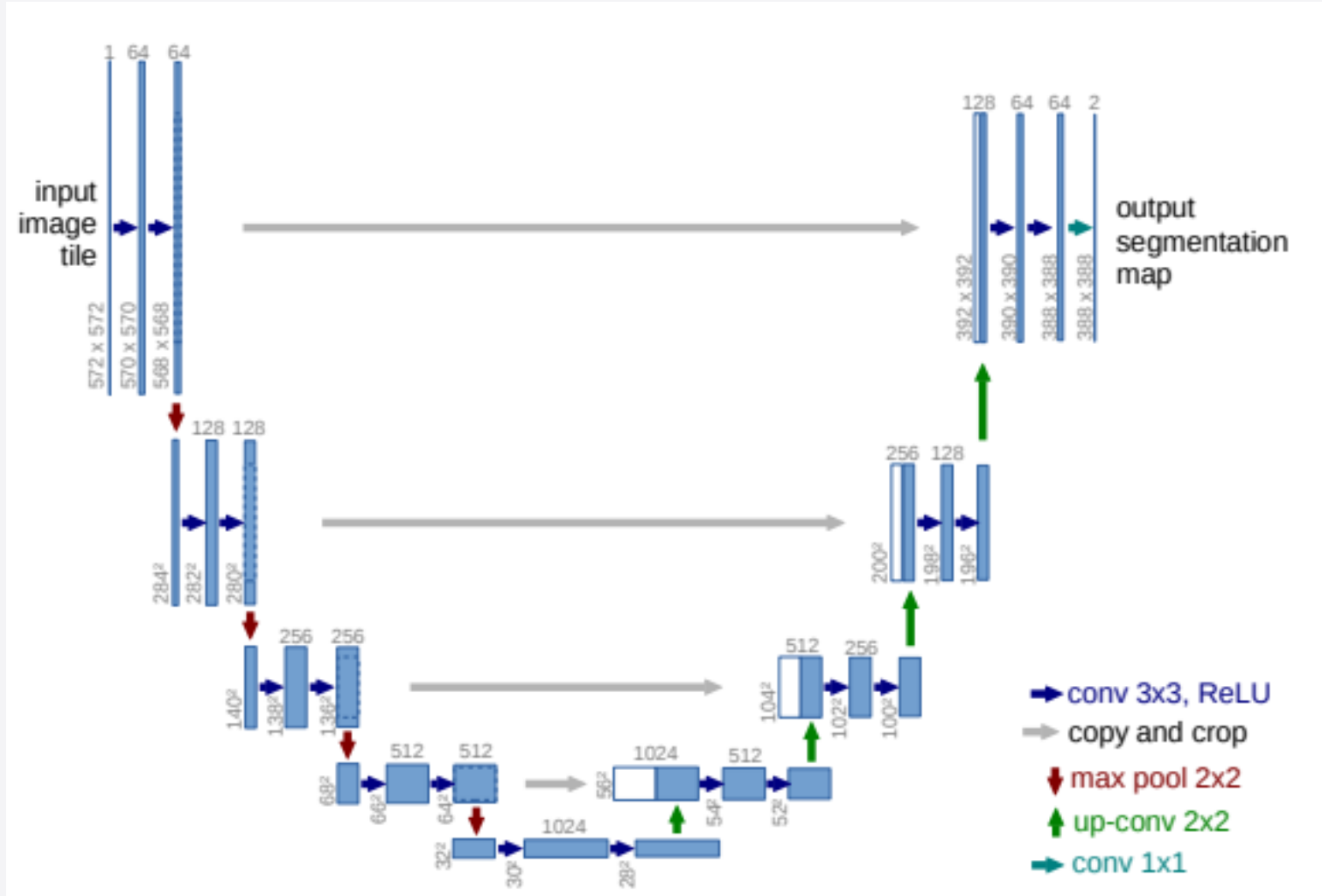
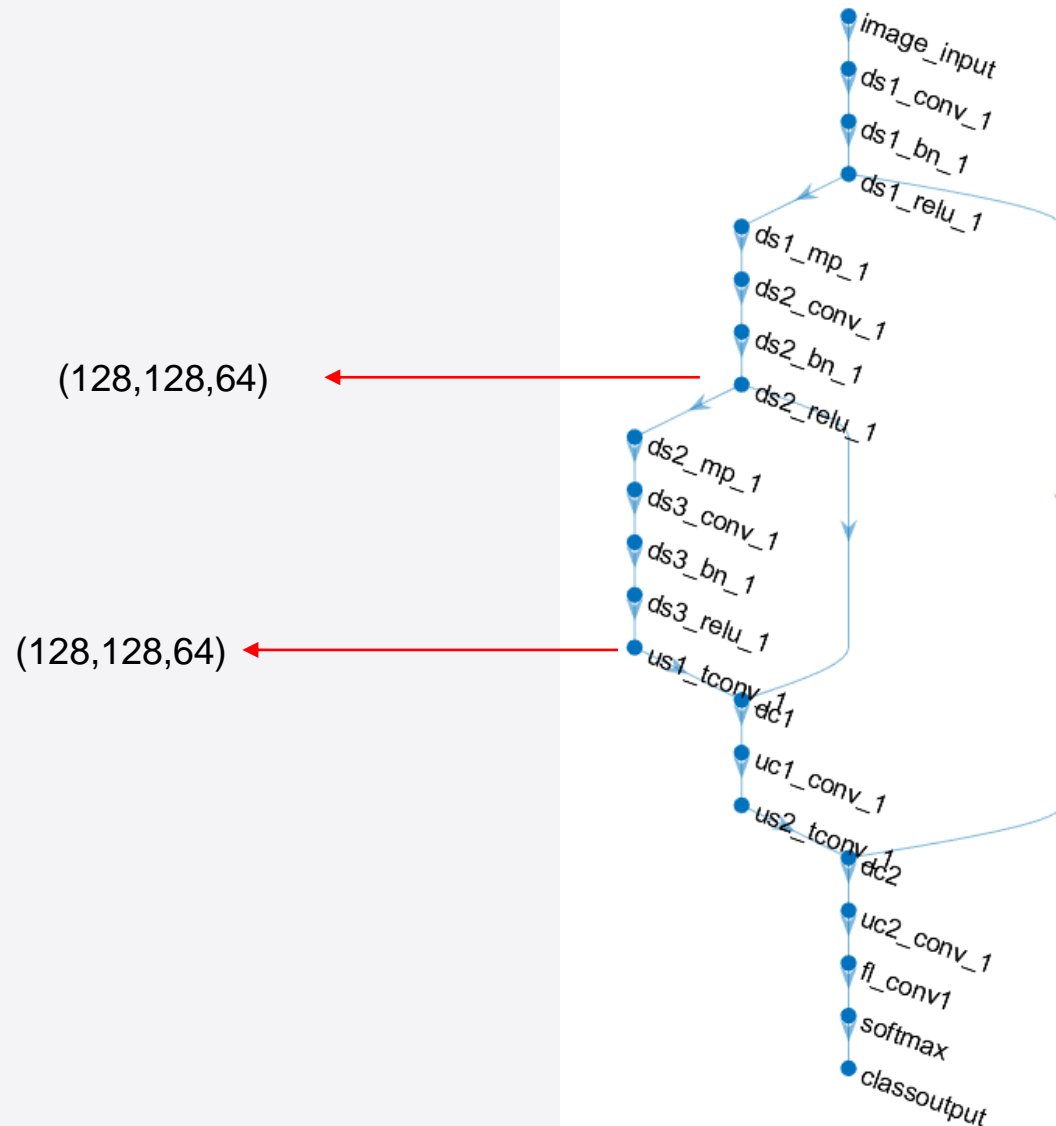




Image Segmentation: Model Architecture



ds: downsampling

us: upsampling

dc: depthwise concatenation

uc: upsampling convolution



Image Segmentation: Evaluation

Normalized Confusion Matrix

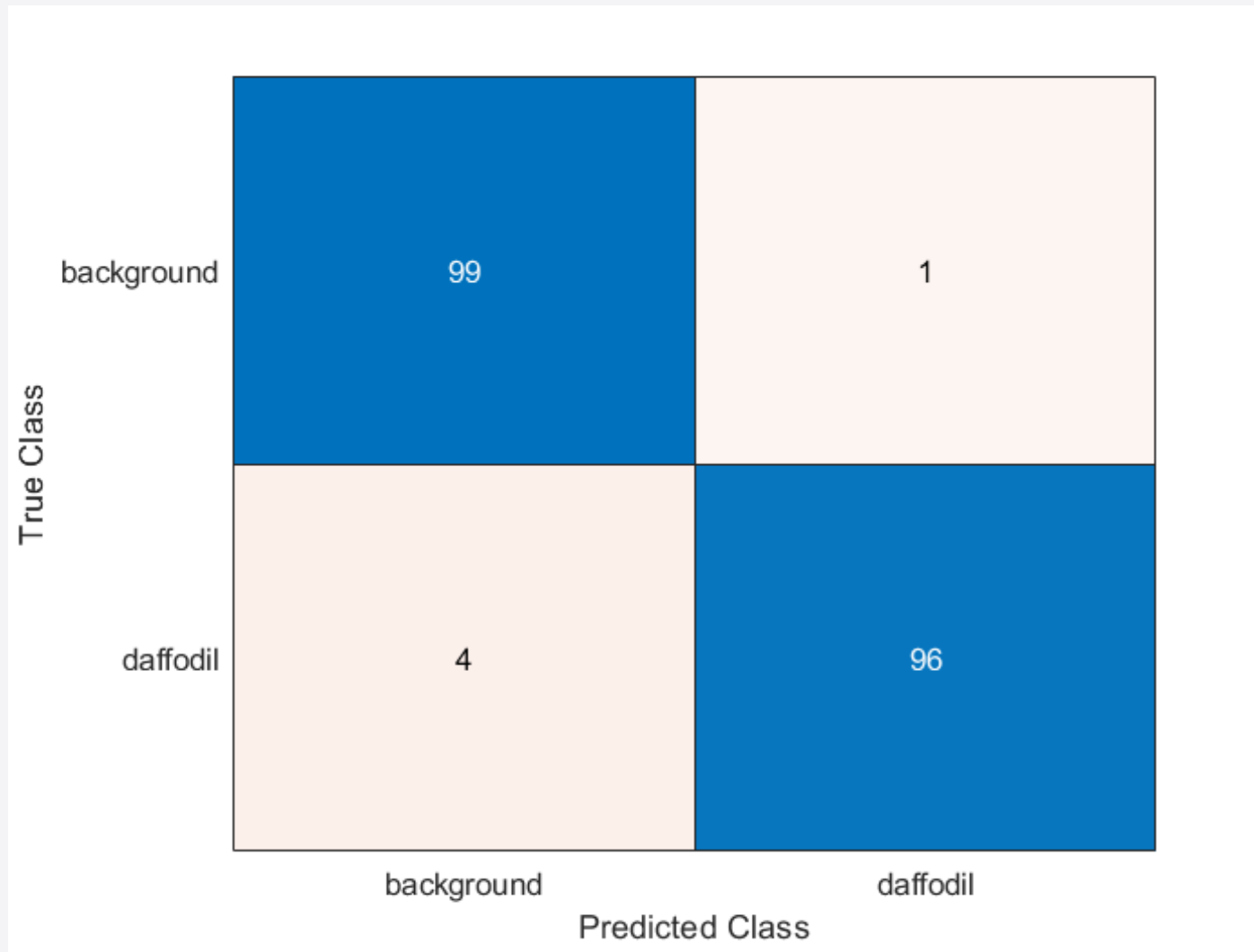
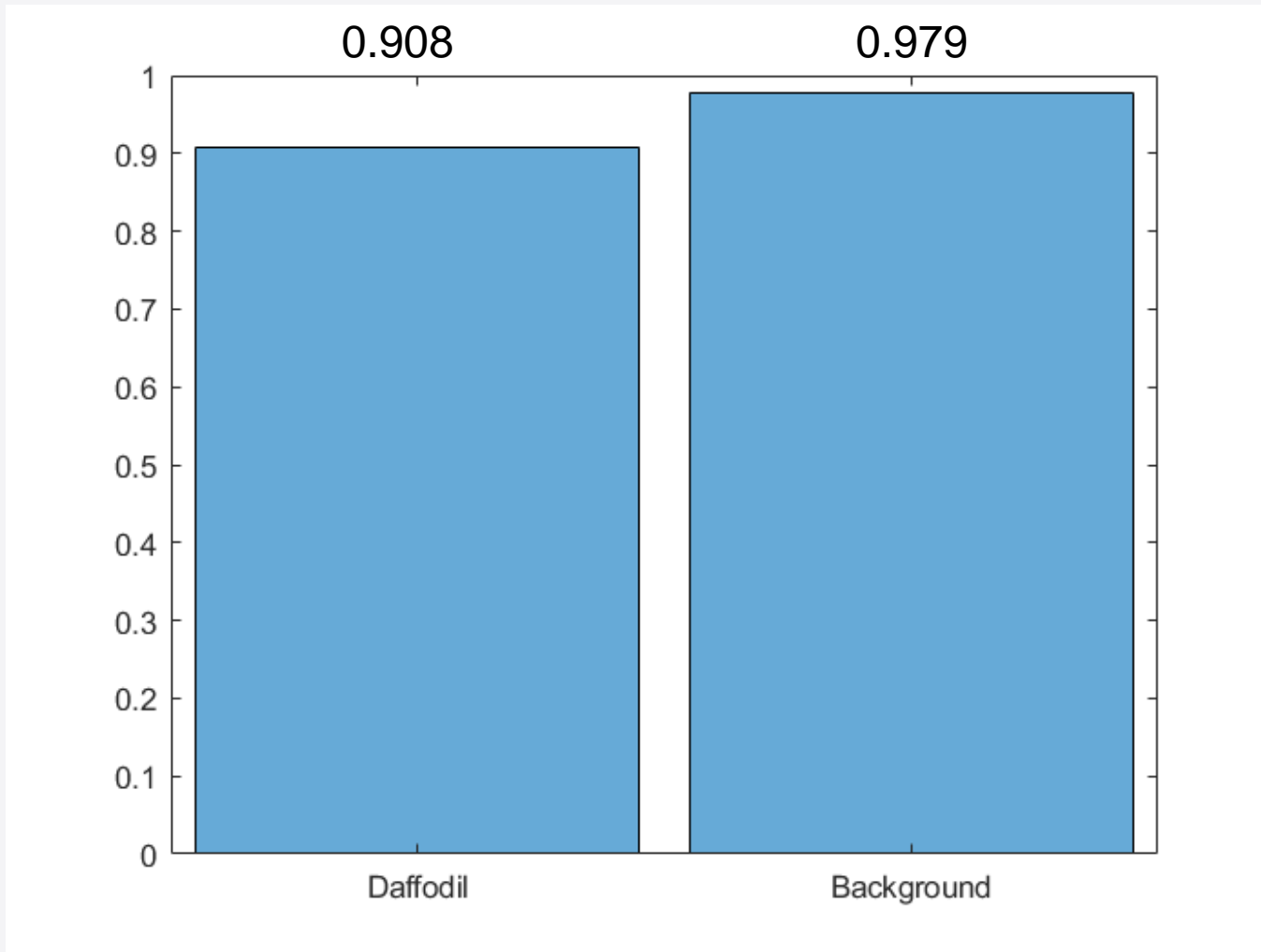
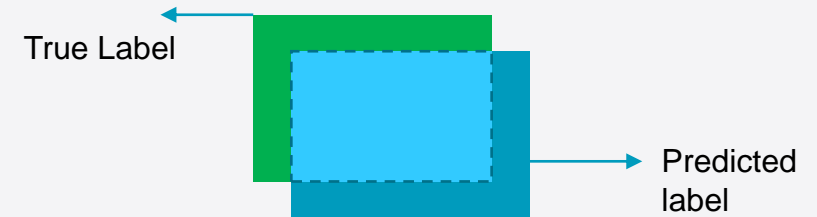




Image Segmentation: Evaluation



$$\text{IOU} = \frac{\text{Area of Intersection}}{\text{Area of Union}}$$



A diagram showing three overlapping rectangles. The top rectangle is light blue. The bottom-left rectangle is light blue. The bottom-right rectangle is green. A horizontal line is drawn across the middle of the three rectangles, representing the union area.

$$\text{IOU} = \frac{\text{Area of Intersection}}{\text{Area of Union}}$$



Conclusion & Future Work

- Skip connections were effective for both classification and segmentation task.
- Grad-Cam , Rotation augmentation > 10 degrees, pixel weights for training