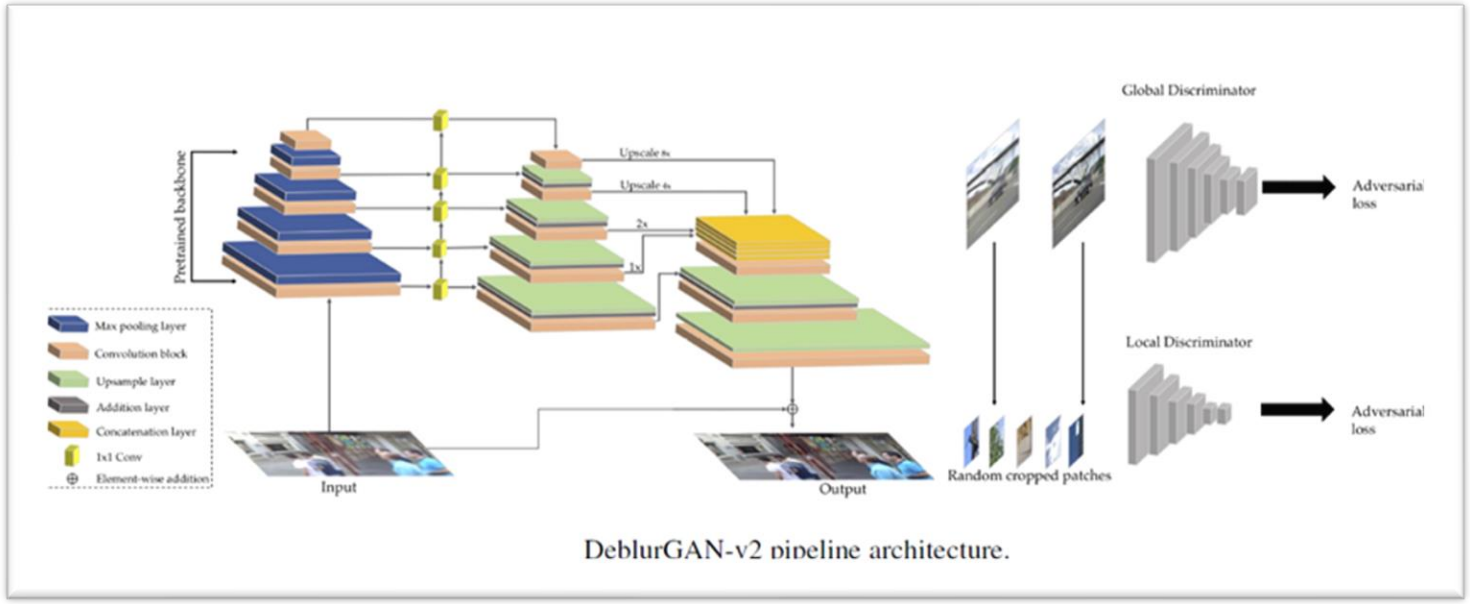
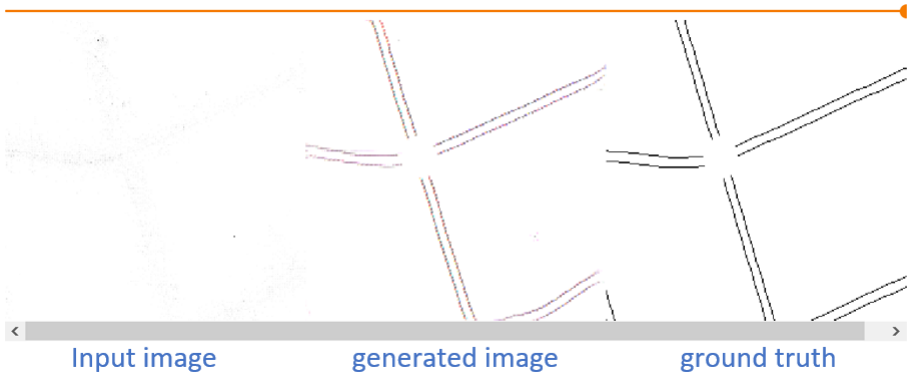
Image inpainting model for Lane Level Geometry Detection Models

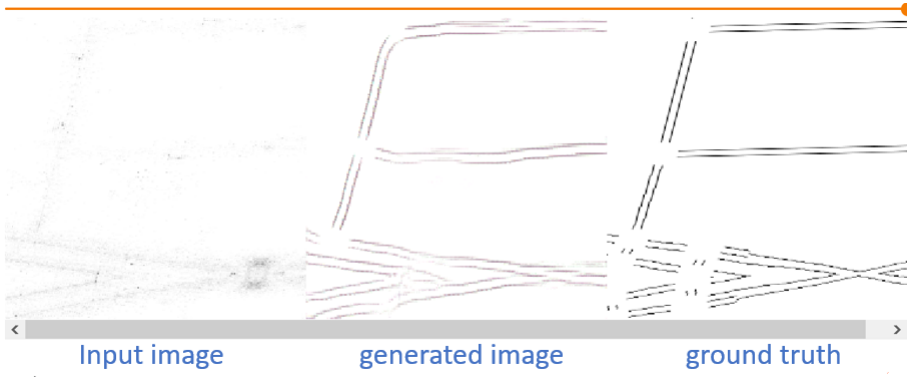
May 4. 2021

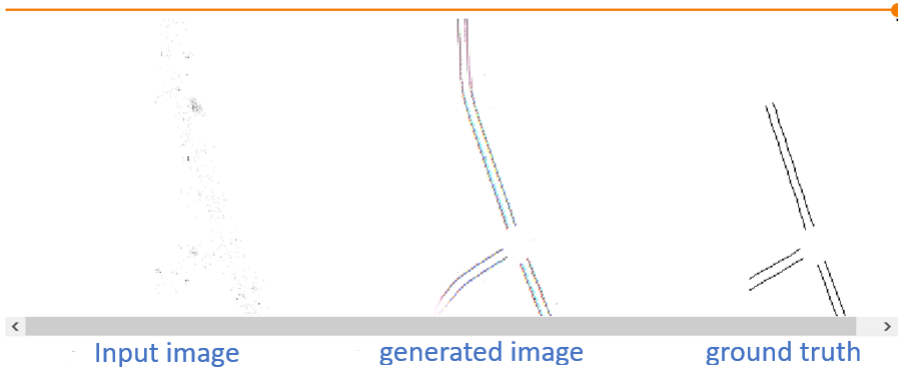
Soojung Hong

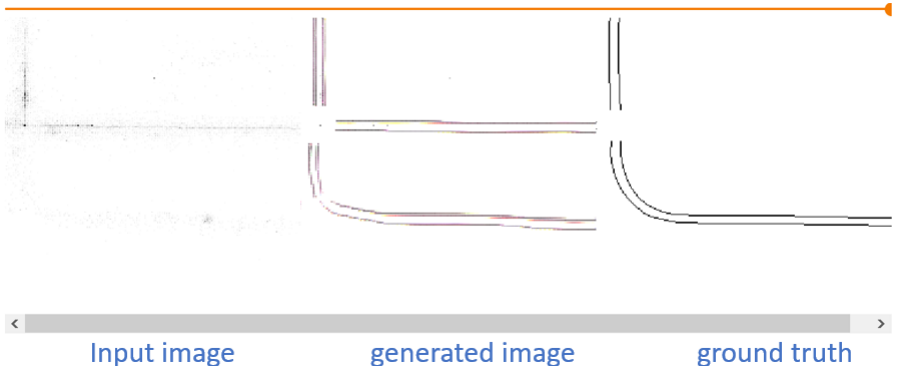


DeblurGAN-v2 pipeline architecture.





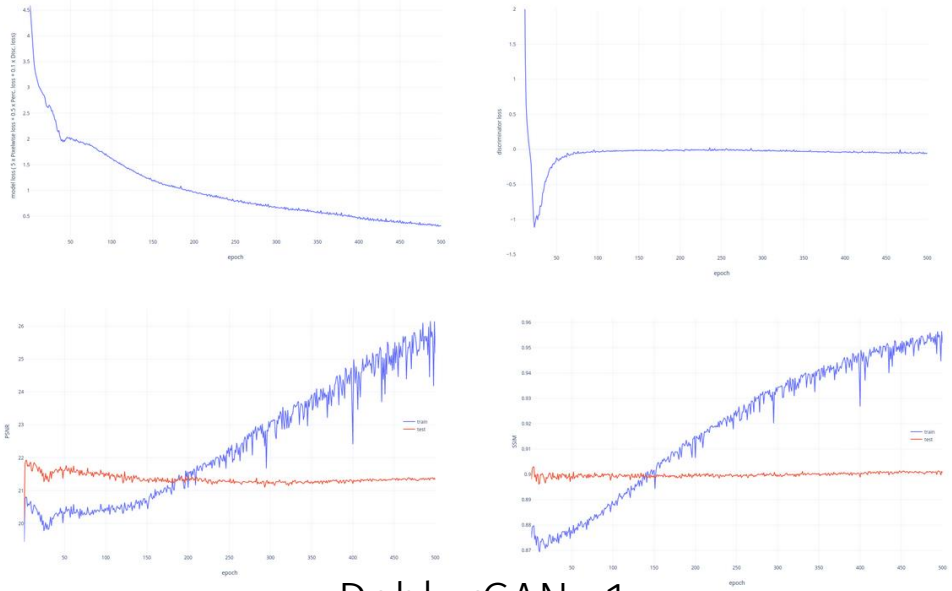




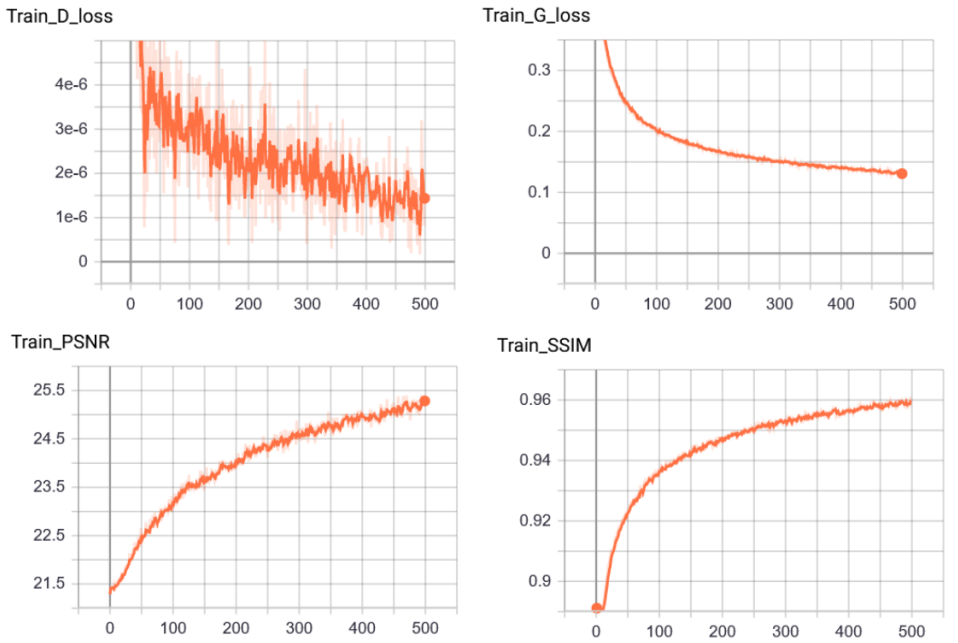
- SFO probe data
- zoom level 26
- pixel : 50x50cm
- # of images : 9550

DeblurGAN model benchmark

Dataset	Model	Config (hyperparameter) Setting	PSNR		SSIM		Comments / Details
			Train	Test	Train	Test	
Benchmarking Results#SF-L26-M5-LC	DeblurGAN v1	BS=1 CU=1 RL=1e-5 Epoch=500 Model loss=5 x Pixel-wise + 0.5 x Perc. loss + 0.1 x Disc. loss	29.91	21.75	0.9690	0.9037	DeblurGANv1-exp#1
		BS=1 CU=1 RL=5e-6 Epoch=500 Model loss=5 x Pixel-wise + 0.5 x Perc. loss + 0.1 x Disc. loss	26.16	21.39	0.9565	0.9014	At epoch 53, an intermediate high value of 21.77 is achieved for test PSNR. From that point, the test PSNR gradually begins to decline. DeblurGANv1-exp#2
	DeblurGAN v2	› configuration	25.37	23.56	0.968	0.9217	



DeblurGAN v1



DeblurGAN v2

Dataset	Model	Config (hyperparameter) Setting	PSNR		SSIM		Comments / Details
			Train	Test	Train	Test	
Benchmarking Results#SF-L26-M5-LC	DeblurGAN v1	BS=1 CU=1 RL=1e-5 Epoch=500 Model loss=5 x Pixel-wise + 0.5 x Perc. loss + 0.1 x Disc. loss	29.91	21.75	0.9690	0.9037	DeblurGANv1-exp#1
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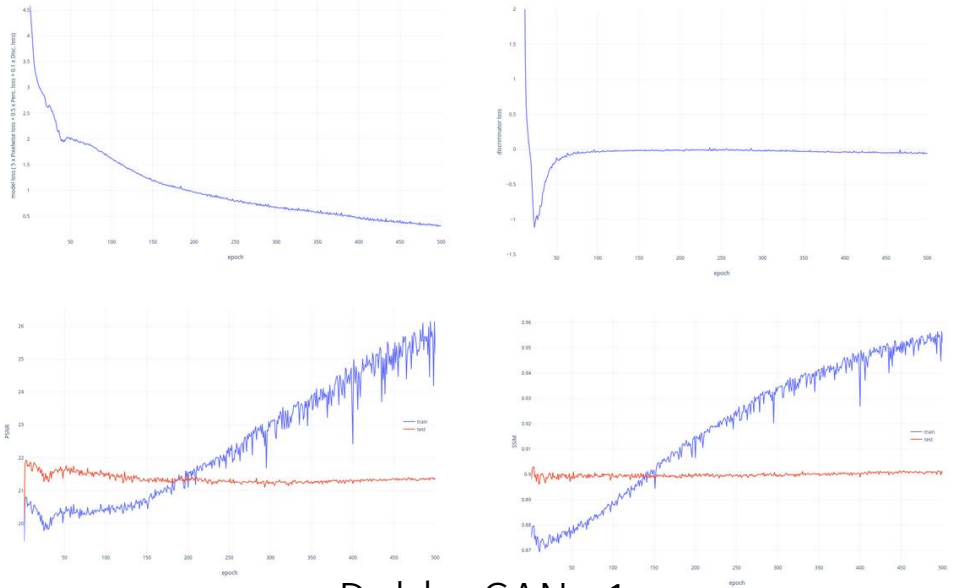
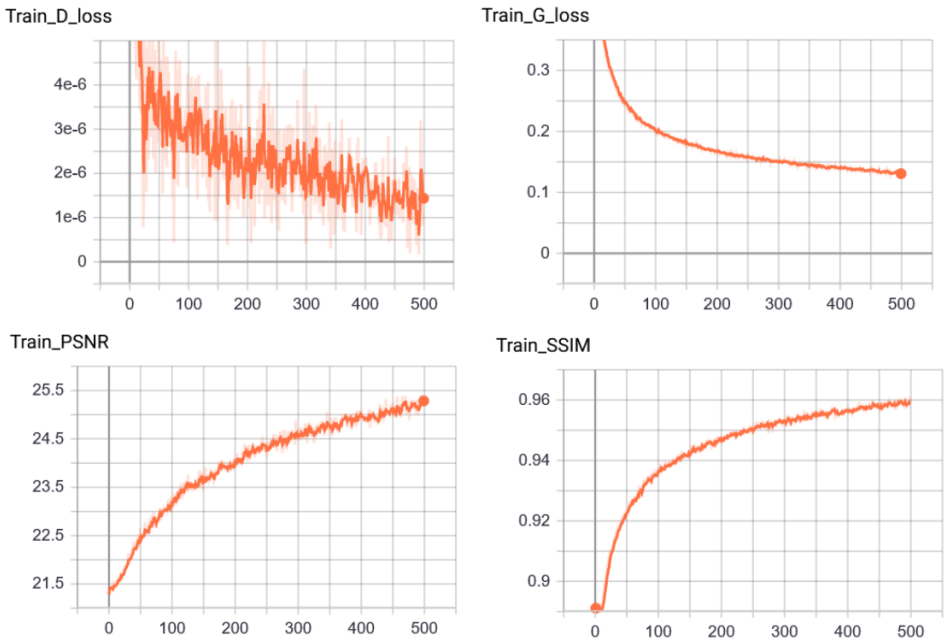


DeblurGAN v1



DeblurGAN v2

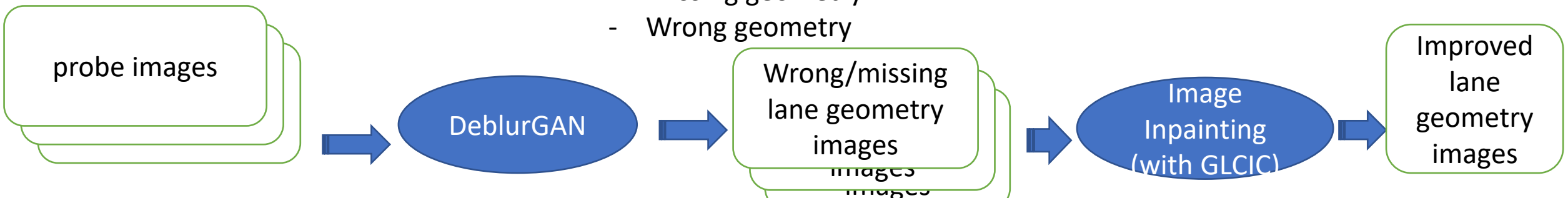
Why Image Inpainting model? Deblurring is not enough

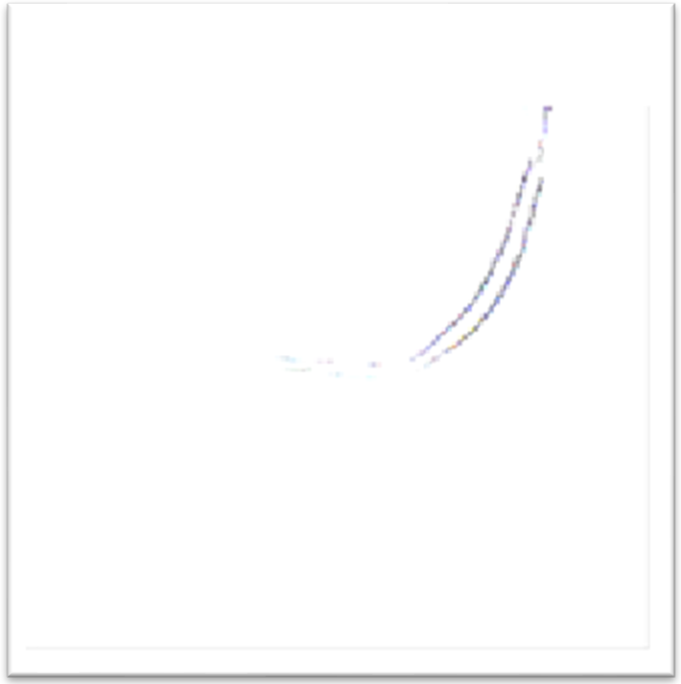
Deblurred lane center geometry

Deblurred lane center geometry on map

- Missing geometry
- Wrong geometry

correction with image inpainting





deblurred road centerlines
By DeblurGAN

deblurred road centerlines on map

correction with image inpainting

WANTED
- No missing lines
- No wrong construction

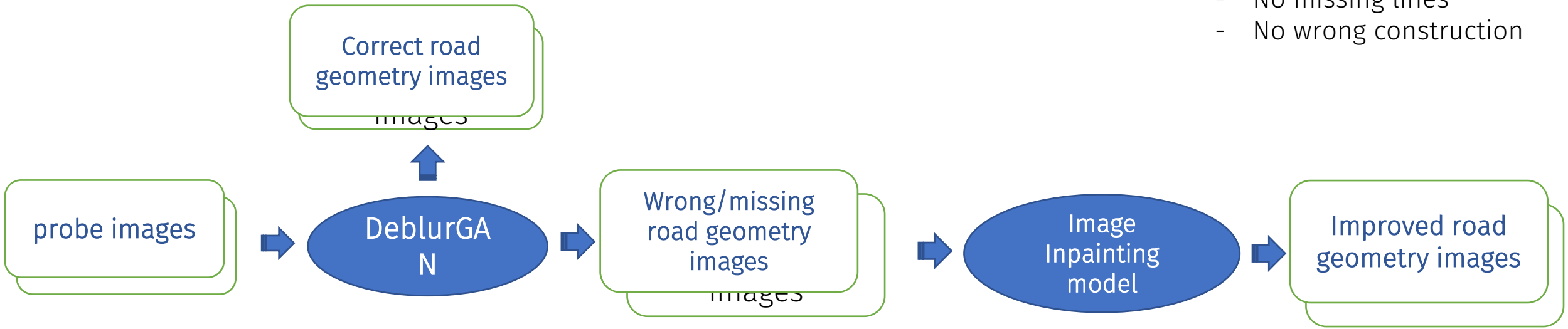


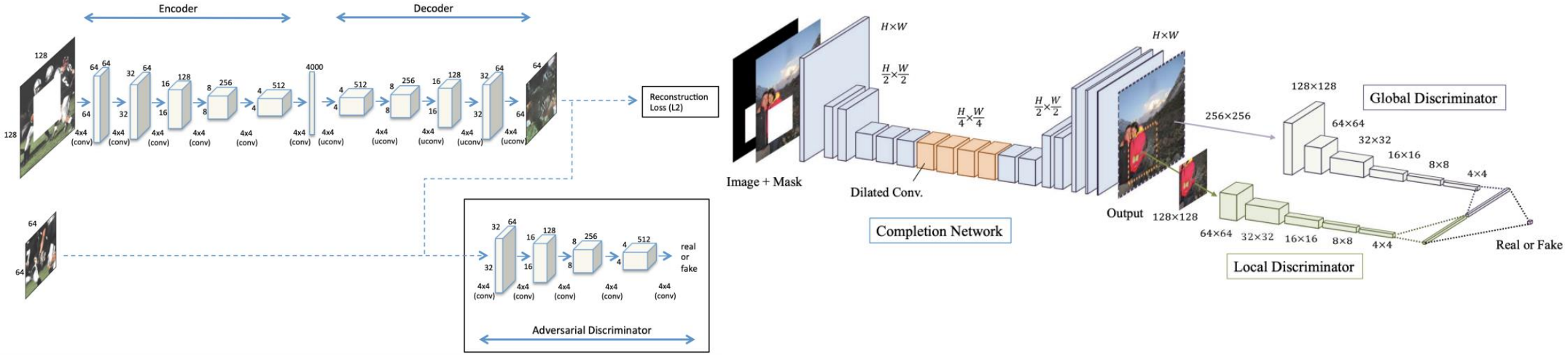
Image Inpainting Model

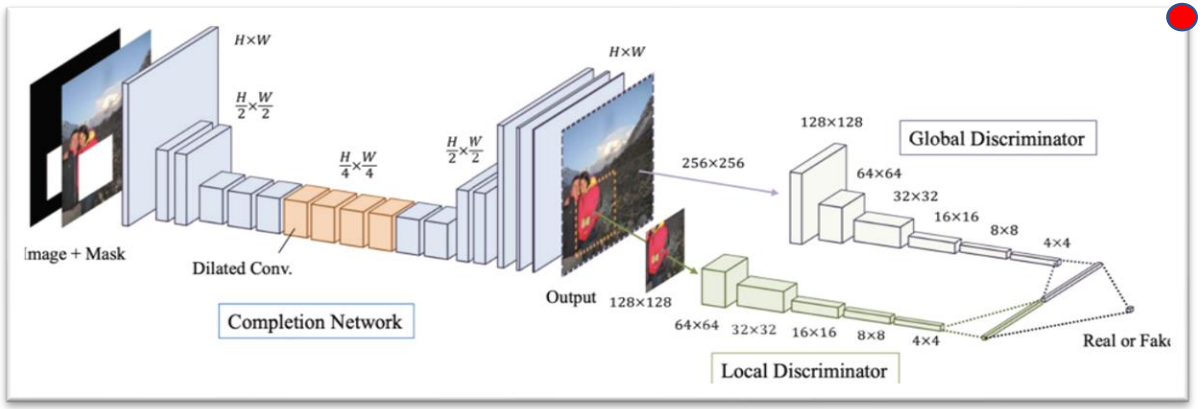
DeepFill v1 (Generative Image Inpainting with contextual attention) 2018

Context Encoder (1st GAN-based inpainting, 2016)

GLCIC (Globally and Locally Consistent Image Completion) 2017

DeepFill v2 (Free form image inpainting with Gated Convolution)





Context Encoder (1st GAN-based inpainting, 2016)

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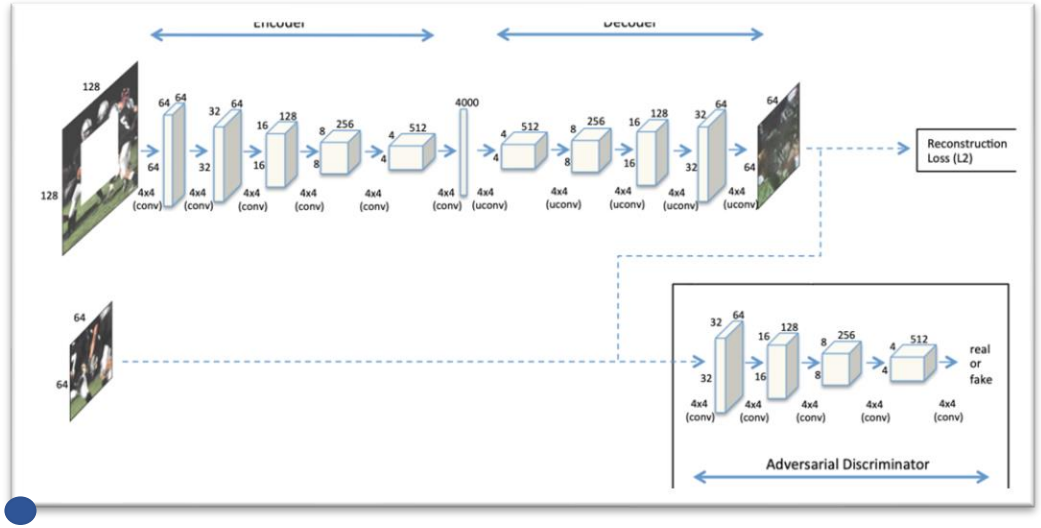
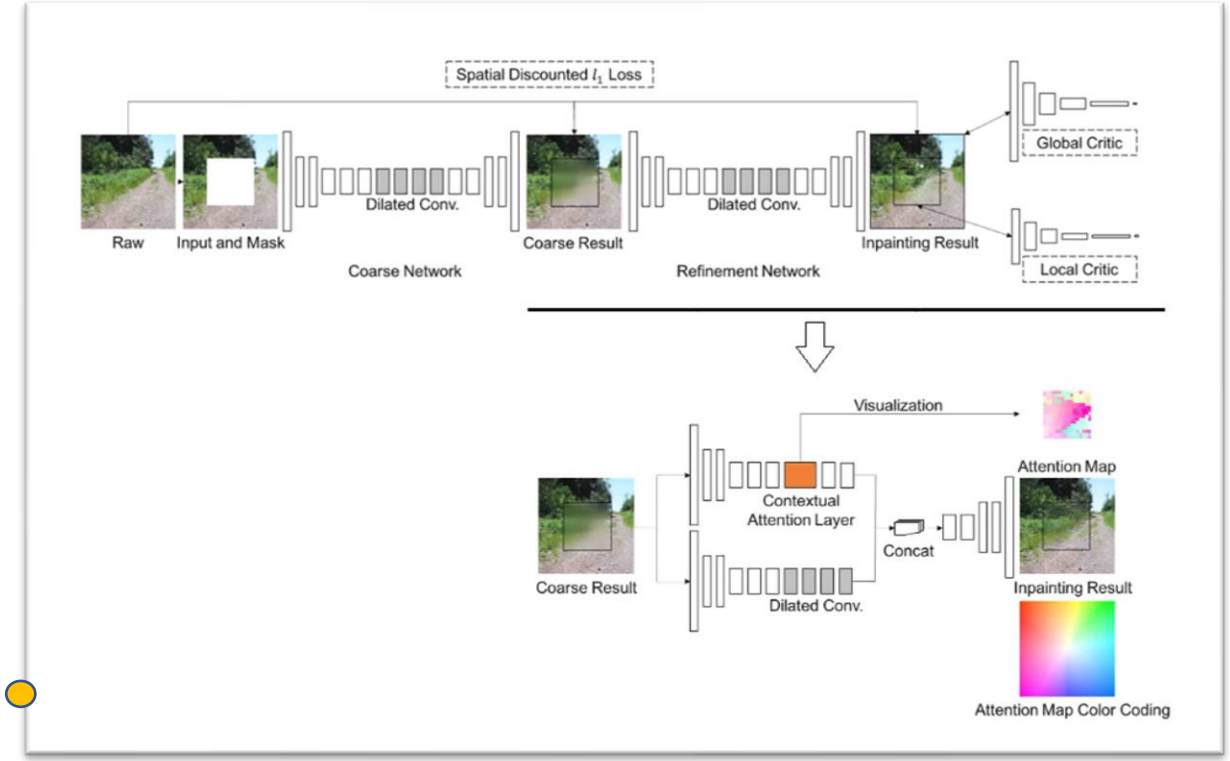
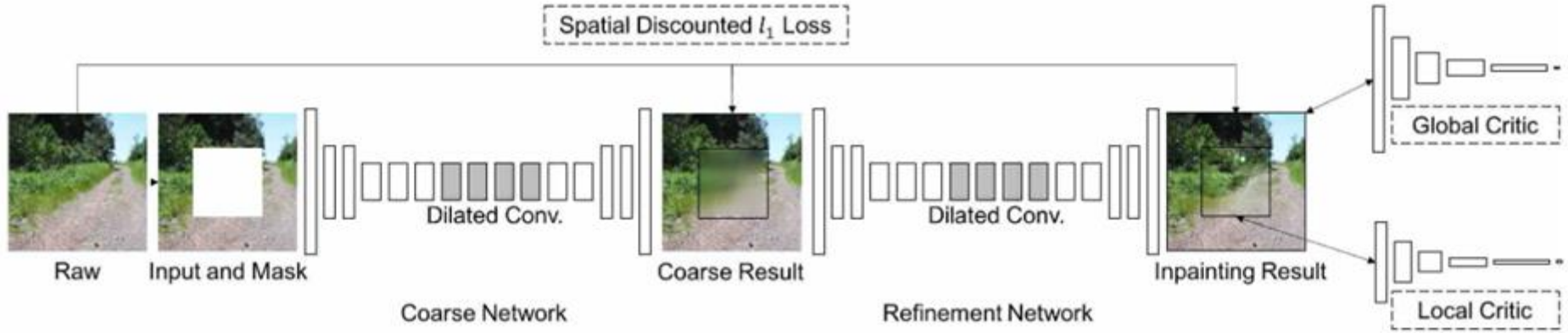
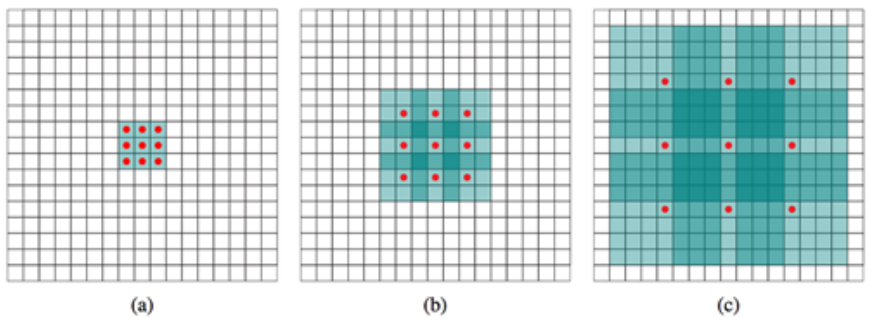





Spatial Discounted l_1 Loss
Raw
Input and Mask
Dilated Conv.
Coarse Result
Dilated Conv.
Inpainting Result
Global Critic
Local Critic
Coarse Network
Refinement Network


(a)
(b)
(c)

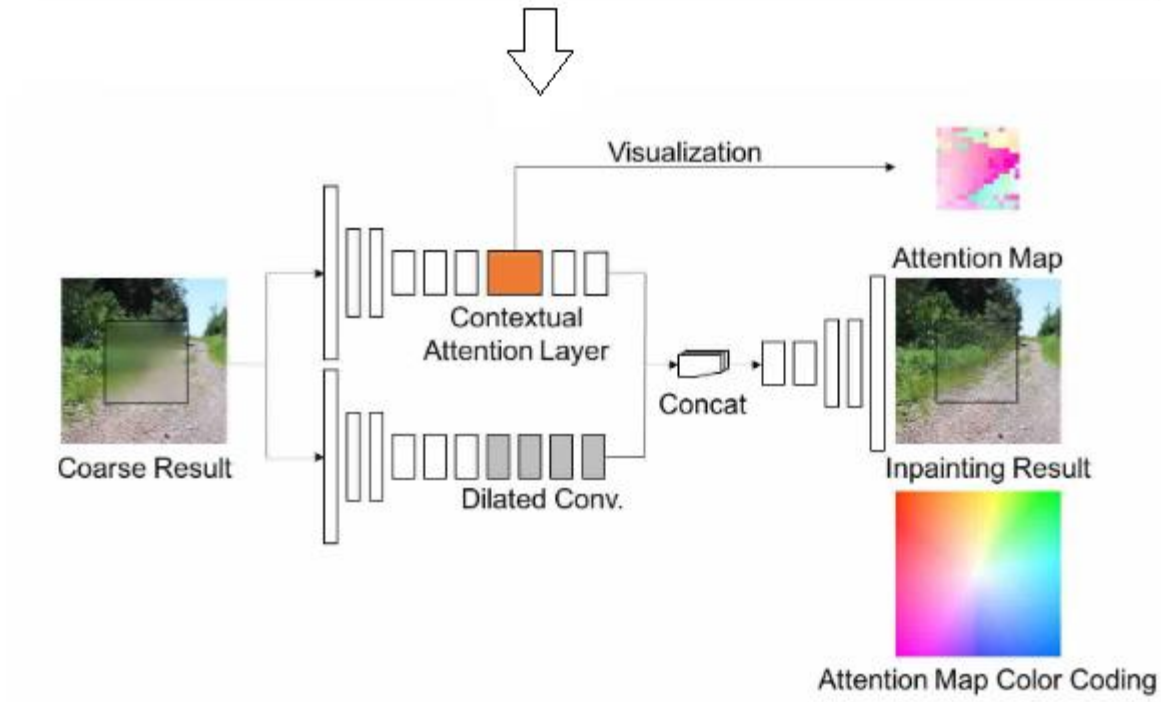
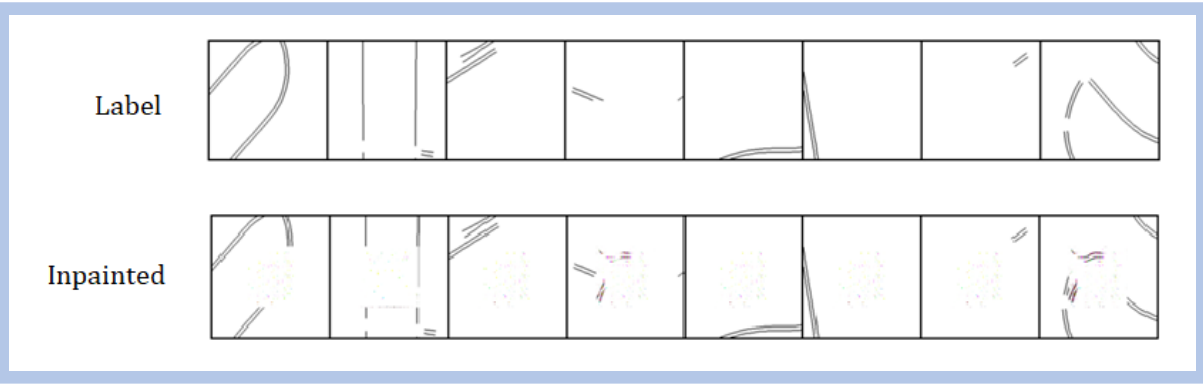
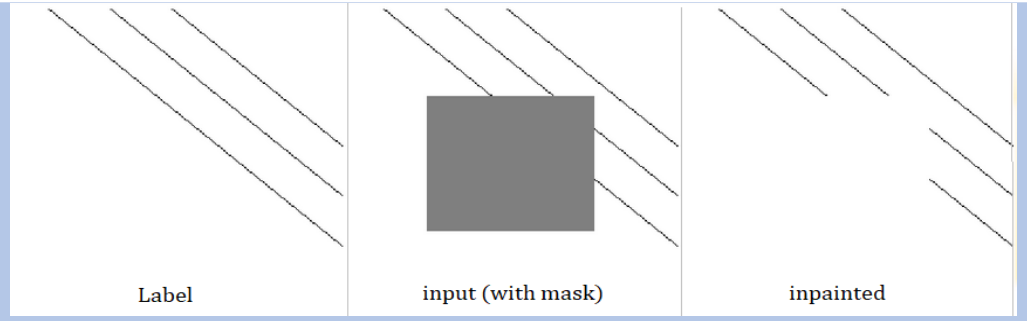
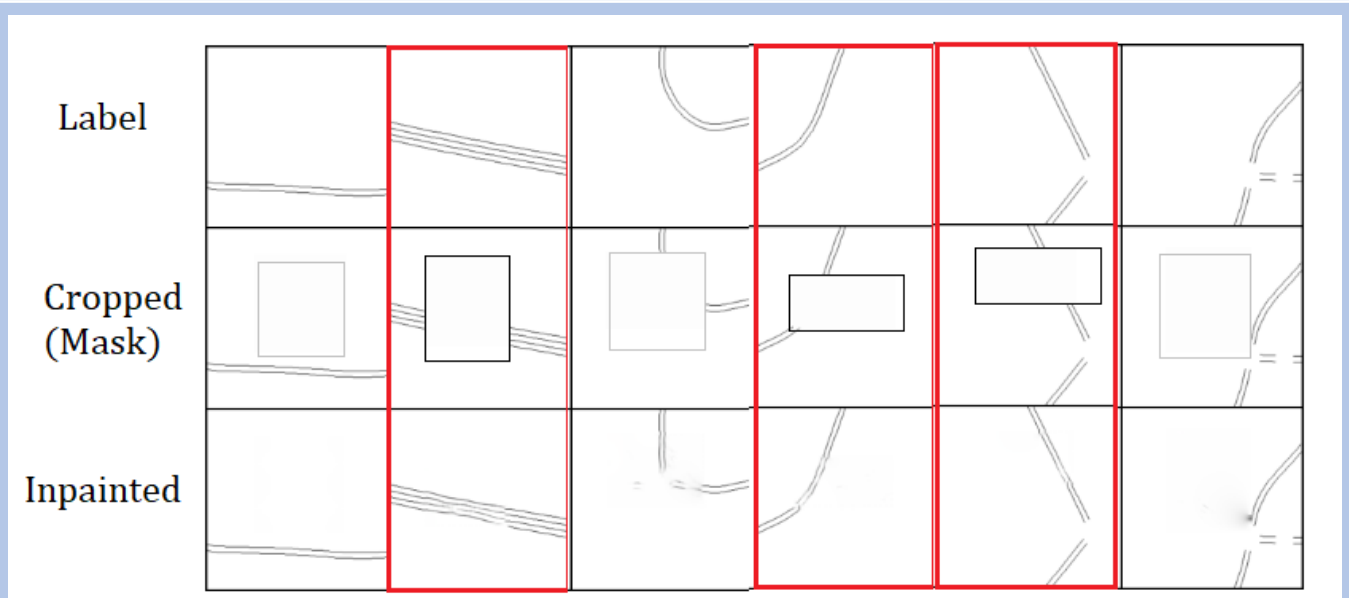
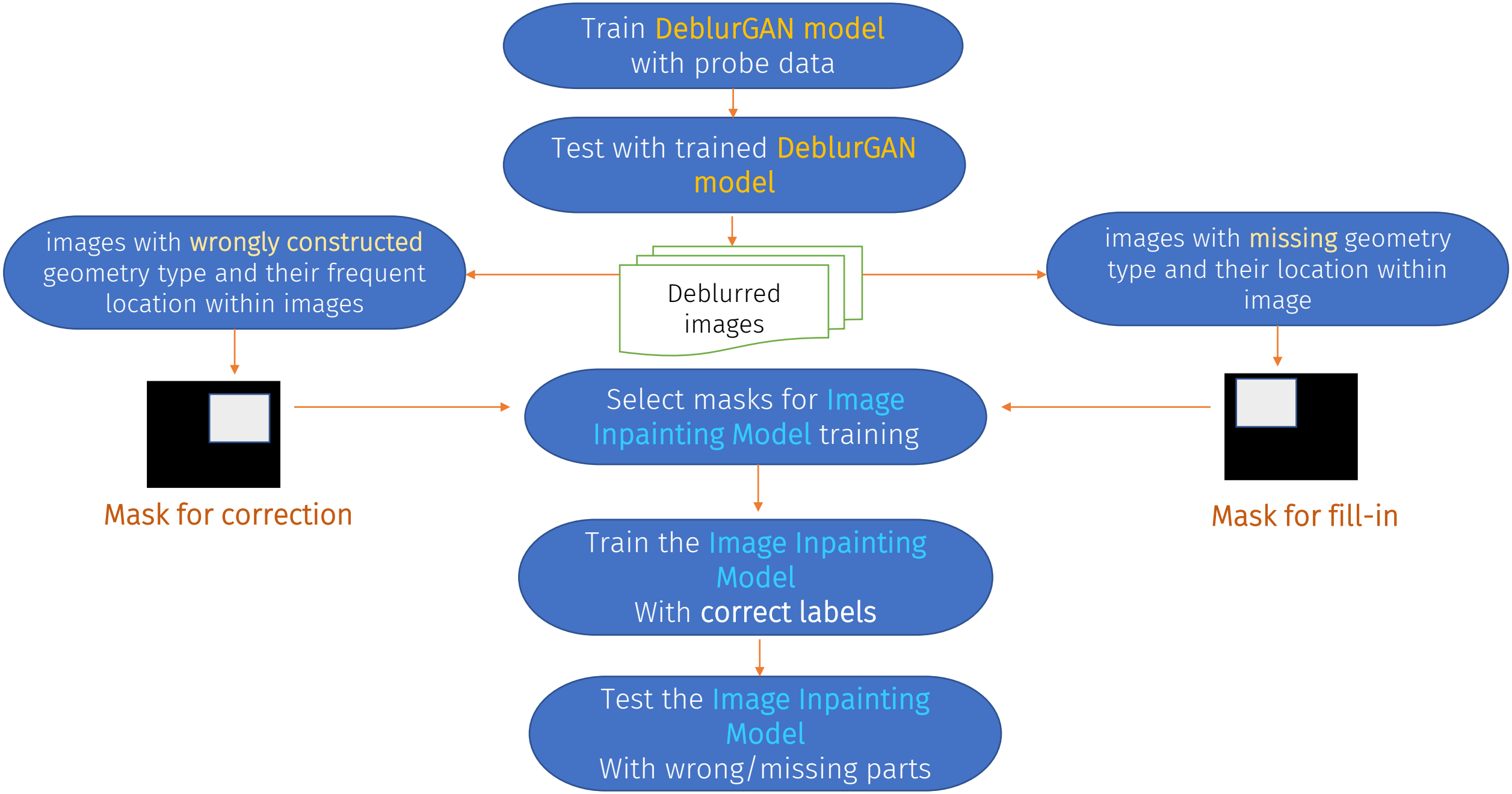

Visualization
Attention Map
Contextual
Attention Layer
Concat
Coarse Result
Dilated Conv.
Inpainting Result
Attention Map Color Coding

Image Inpainting Model	Image Inpainting Result
Context Encoder • Data : San Francisco road centerline labels • 6544 label images • Epoch 700	
DeepFill ver2 • Data : San Francisco road centerline labels • 6544 label images • Epoch : 100000	
GLCIC (Globally and Locally Consistent Image Completion) • Data : San Francisco road centerline labels • 6544 label images • Epoch : 90000	


Train DeblurGAN model with probe data
Test with trained DeblurGAN model
Deblurred images
images with wrongly constructed geometry type and their frequent location within images
images with missing geometry type and their location within image
Mask for correction
Mask for fill-in
Select masks for Image Inpainting Model training
Train the Image Inpainting Model With correct labels
Test the Image Inpainting Model With wrong/missing parts