Damaged Road Extraction Based on Simulated Post-Disaster Remote Sensing Images

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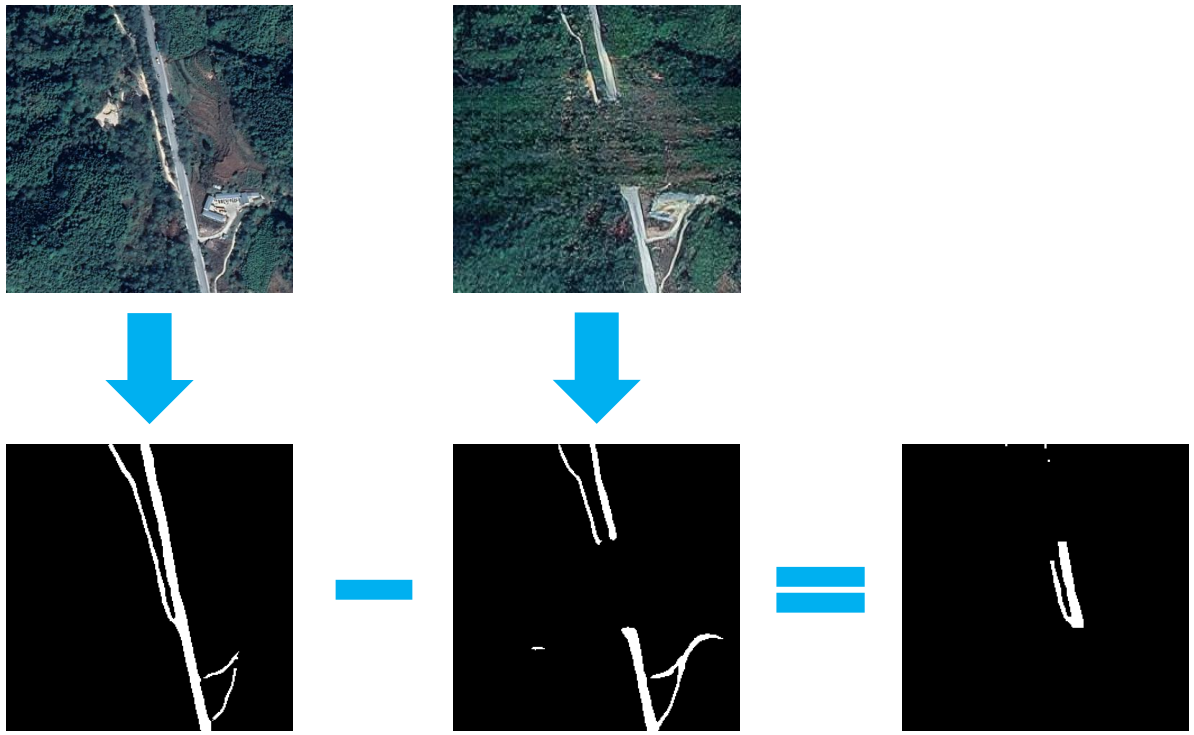
Problem Description

Simplified steps to extract damaged road

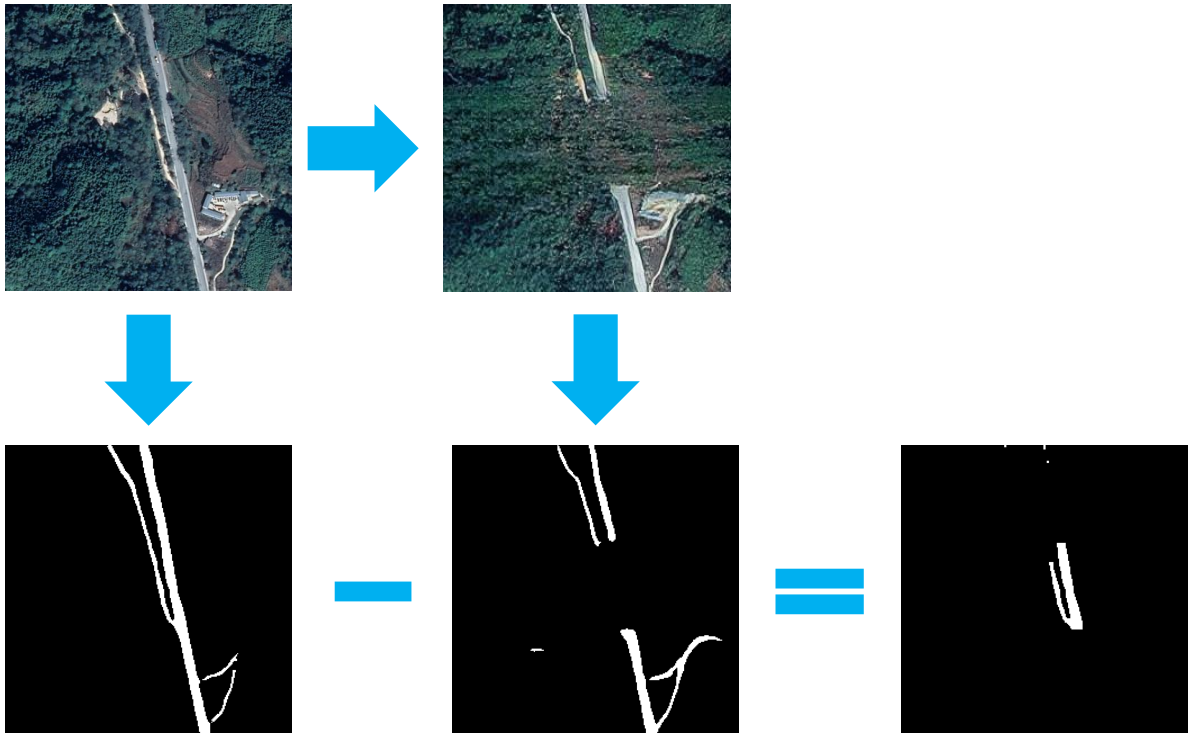


Missing post-disaster remote sensing images

OR

Missing post-disaster remote sensing images

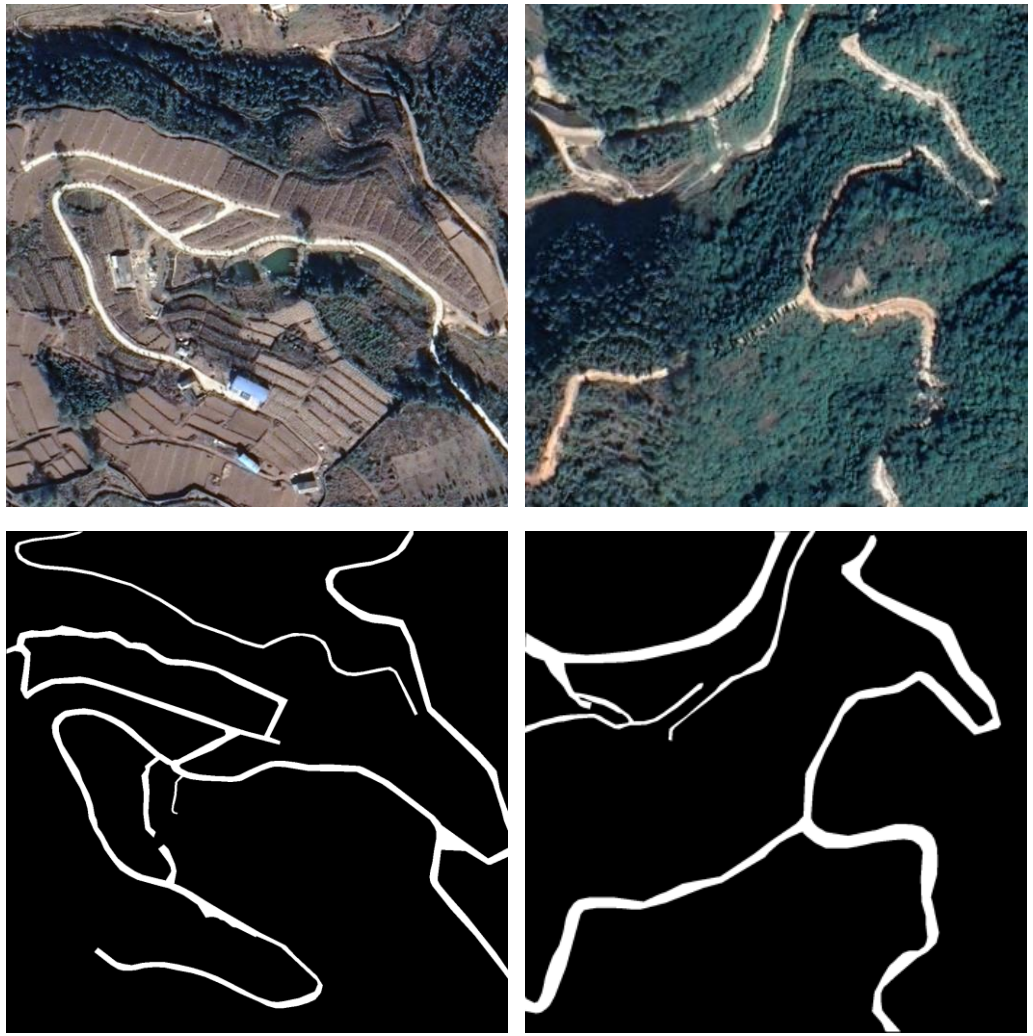
Solution



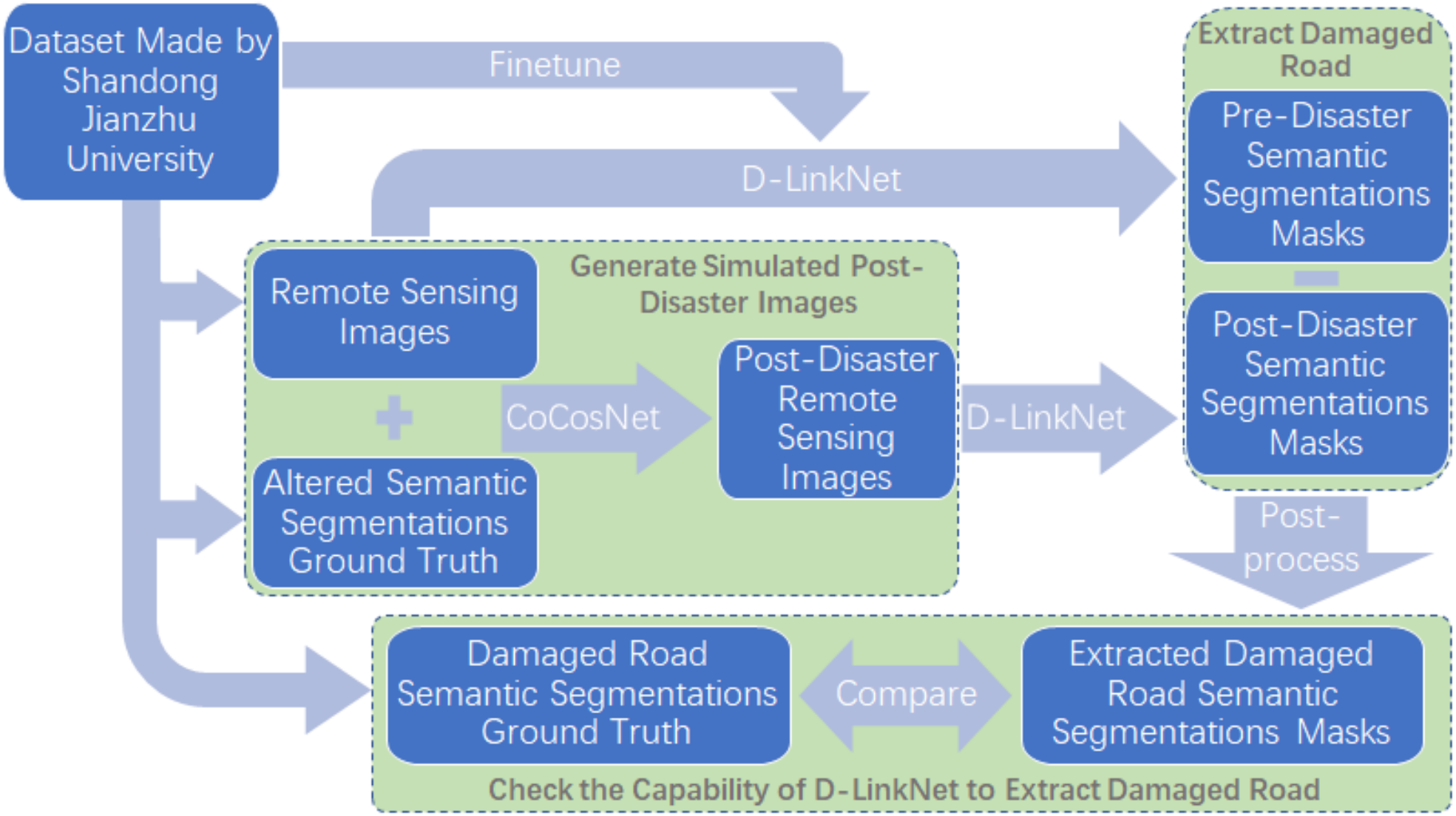
Dataset

Dataset Marked by Shandong Jianzhu University

- Pixel-level labelling
- Spatial resolution: 0.27m
- Location: Tengchong, Yunnan, China
  - Tengyue
  - Beihai
  - Gudong
  - Hehua
  - Zhonghe
- Image size: 1280*1280 pixels
- Number of images: 825

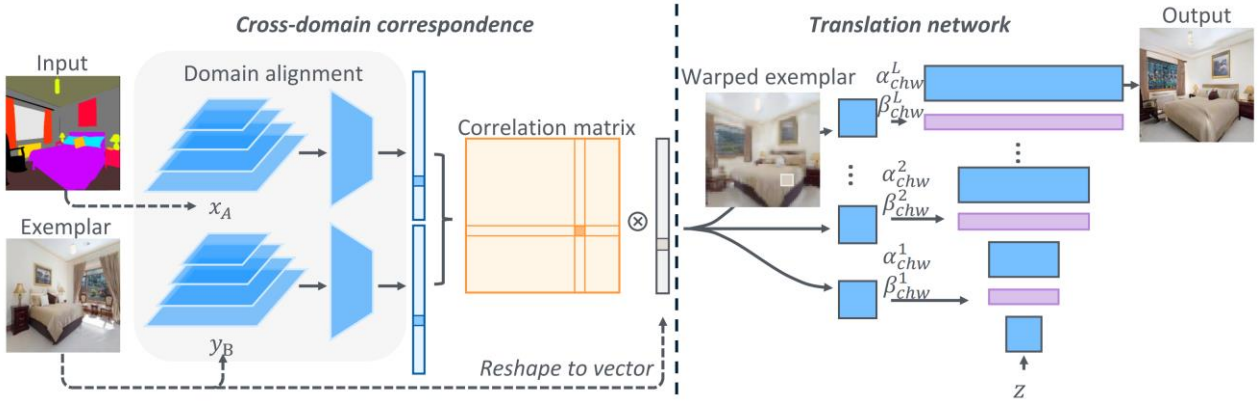


Flow Chart


Dataset Made by Shandong Jianzhu University
Finetune
D-LinkNet
Extract Damaged Road
Pre-Disaster Semantic Segmentations Masks
Post-Disaster Semantic Segmentations Masks
Generate Simulated Post-Disaster Images
Remote Sensing Images
CoCosNet
Post-Disaster Remote Sensing Images
D-LinkNet
Altered Semantic Segmentations Ground Truth
Post-process
Damaged Road Semantic Segmentations Ground Truth
Compare
Extracted Damaged Road Semantic Segmentations Masks
Check the Capability of D-LinkNet to Extract Damaged Road

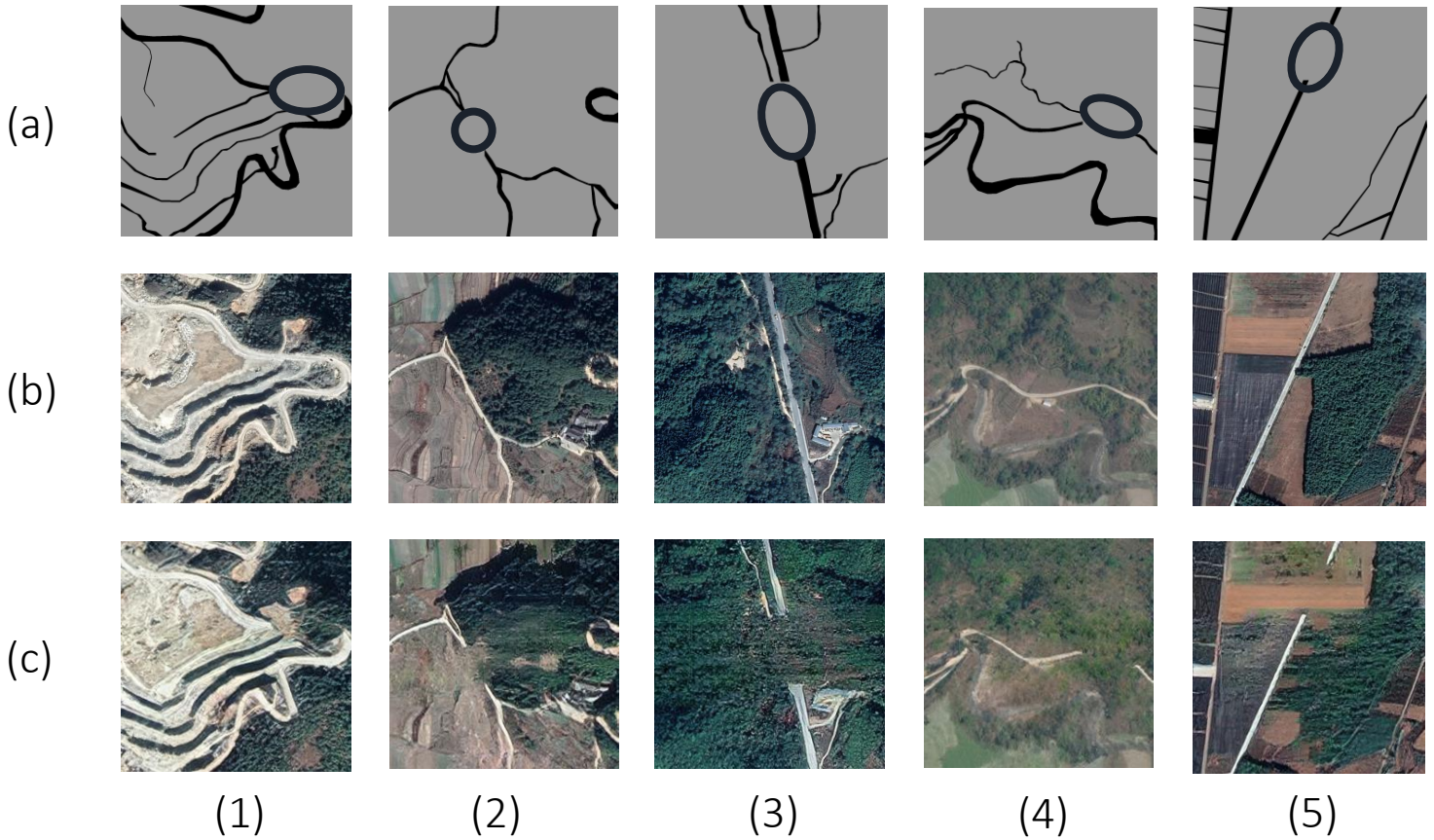
CoCosNet

- CoCosNet is the paper accepted by CVPR 2020 as oral presentation.[1]
- CoCosNet is a general framework for exemplar-based image translation, which synthesizes a photo-realistic image from the input in a distinct domain (e.g., semantic segmentation mask, or edge map, or pose keypoints), given an exemplar image.
- In our work, CoCosNet can use pre-disaster images and altered semantic segmentation masks to synthesize the simulated post-disaster images whose styles (e.g., color, texture) are in consistent with pre-disaster images and whose structures are in consistent with altered masks.



[1] "Cross-domain Correspondence Learning for Exemplar-based Image Translation", Pan Zhang, Bo Zhang, Dong Chen, Lu Yuan and Fang Wen Conference on Computer Vision and Pattern Recognition (CVPR), 2020, Oral Presentation

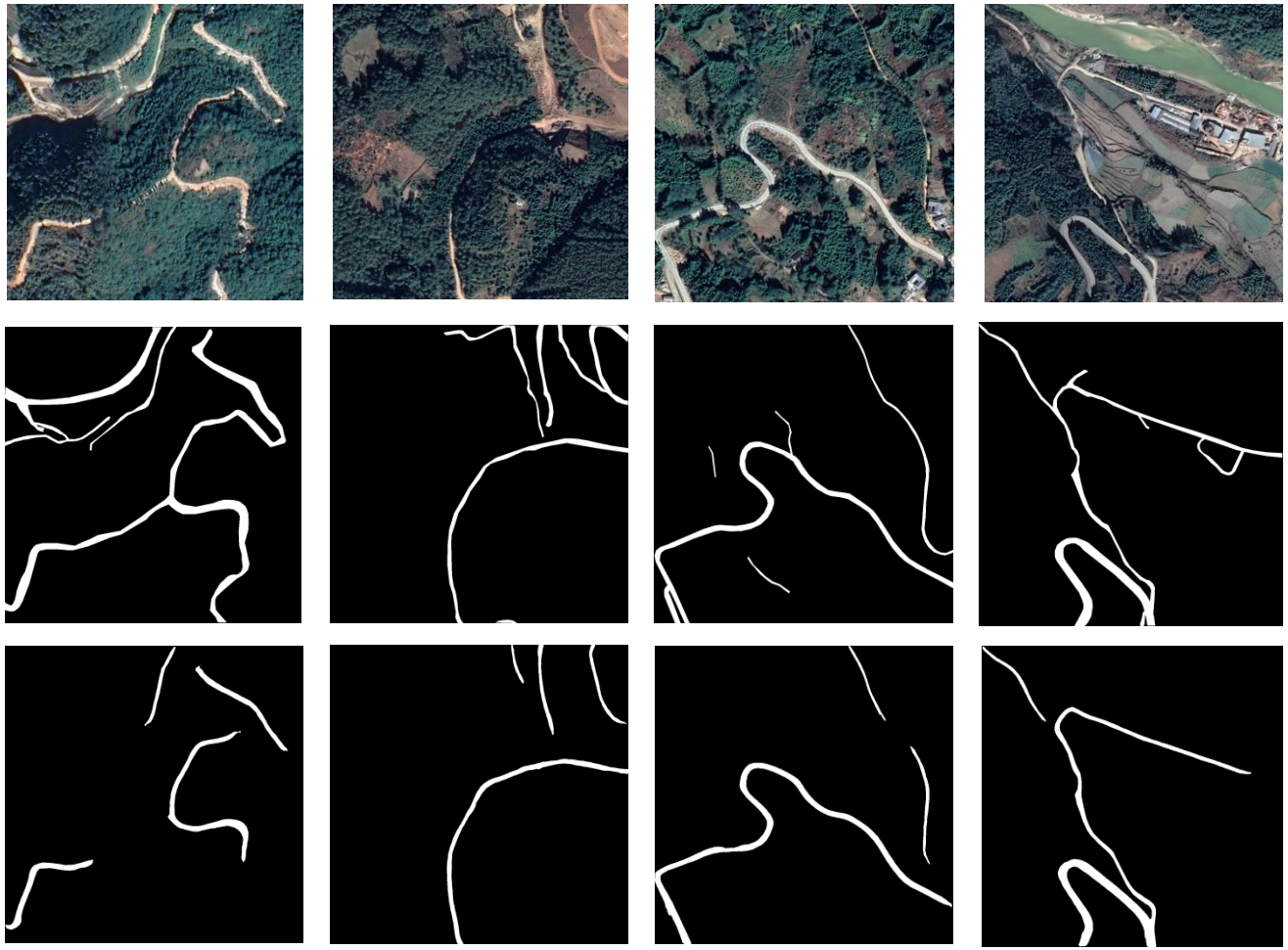
Simulated Post-Disaster Images



- Altered semantic segmentation masks
- Pre-disaster images
- Simulated post-disaster images

D-LinkNet and Road Extraction

- We pretrain it on the DeepGlobe Road Extraction dataset and then finetune it on the dataset marked by Shandong Jianzhu University.
- The mIOU of the finetuned model on test dataset is 0.392



- Pre-disaster images
- Ground Truth
- Extraction results

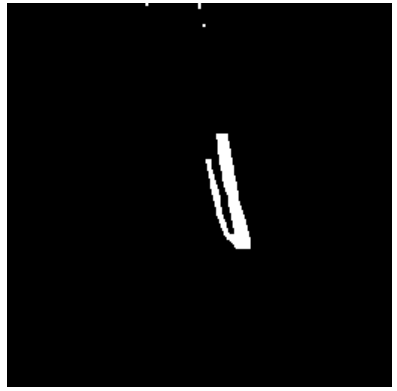
Example of Damaged Road Extraction

pre-disaster image

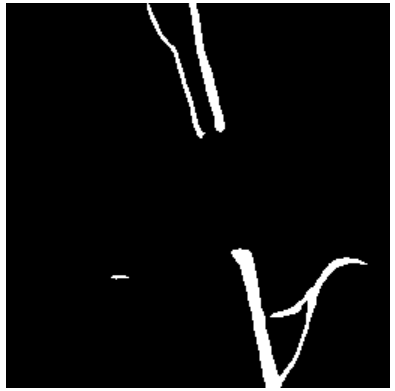
simulated post-disaster image

mask of predicted damaged road

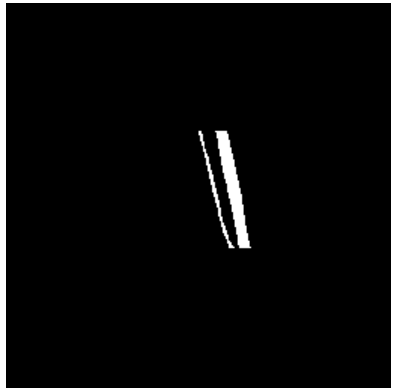
denoised mask of predicted damaged road



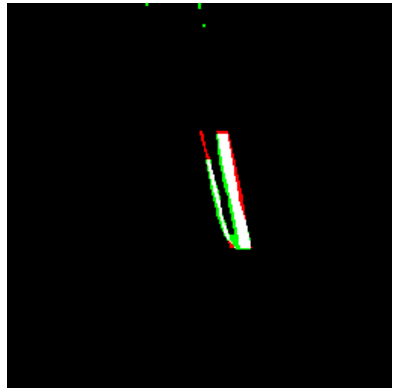
road mask of pre-disaster image



road mask of simulated post-disaster image



ground truth of predicted damaged road



assessment of the result

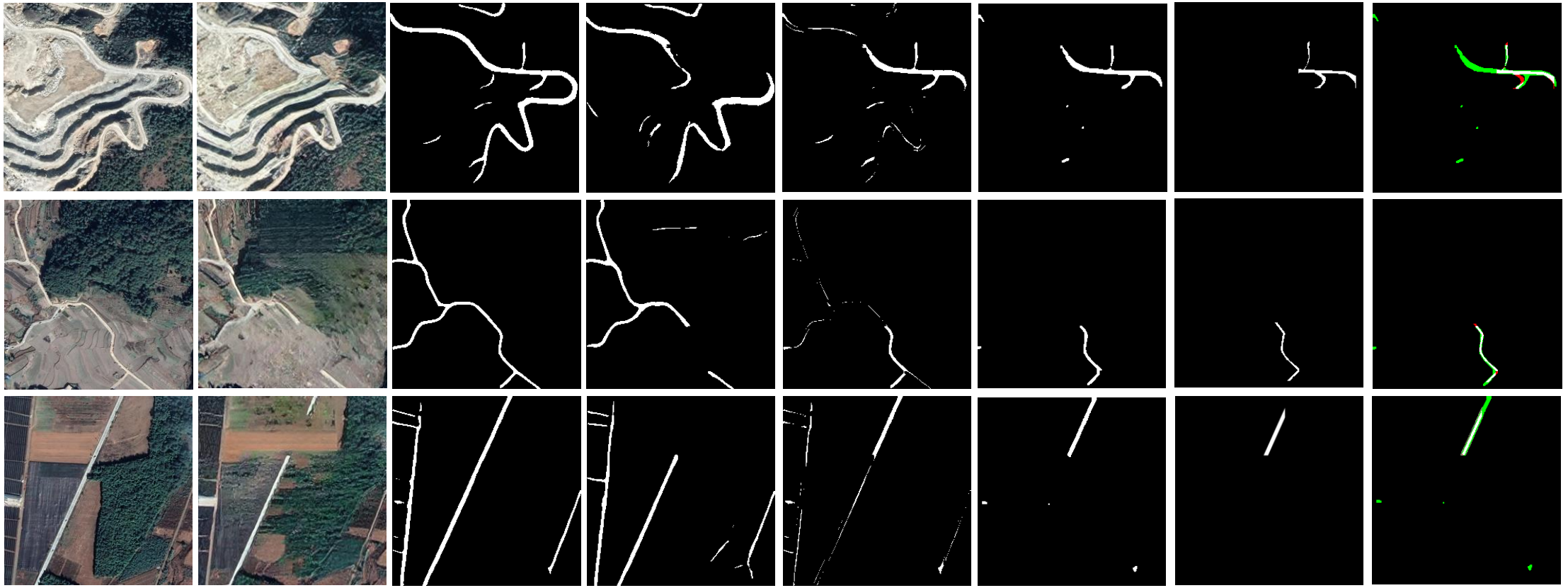
Green: false positive

Red: true negative

White: true positive

Black: false negative

Part Results of Damaged Road Extraction



pre-disaster image

simulated post-disaster image

road mask of pre-disaster image

road mask of simulated post-disaster image

mask of predicted damaged road

denoised mask of predicted damaged road

ground truth of predicted damaged road

assessment of the result

Green: false positive

Red: true negative

White: true positive

Black: false negative

Thank You for Listening!