



# CHANGE DETECTION IN HETEROGENEOUS REMOTE SENSING IMAGES BASED ON AN IMAGING MODALITY-INVARIANT MDS REPRESENTATION

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## Introduction

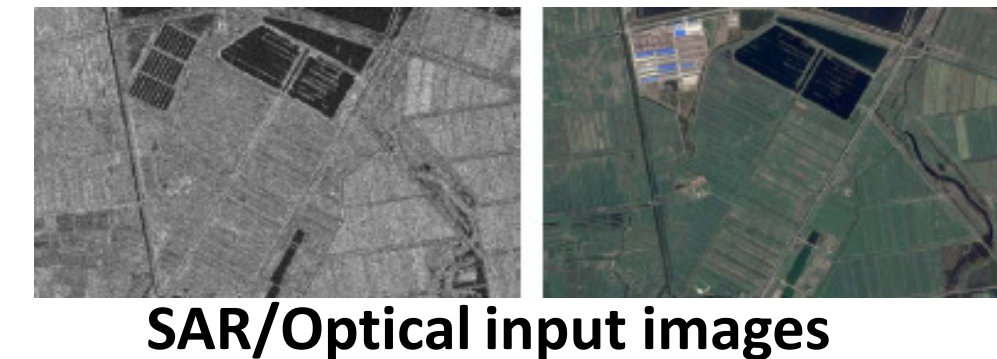
- Multimodal vs. monomodal change detection problem
- Benefits of the strengths of different imaging modalities
- Imaging modality-Invariant representation

## Proposed Change Detector

- Unsupervised change detector model
- Input as pair of temporal heterogeneous remote sensing images
- Different imaging modalities
- **Invariant projection of imaging modality**
- Transformation of the before and the after images
- Estimate a common feature space
- De-texturing of the two images
- Each pixel is characterized by a feature vector
- Local texture feature extraction
- Quantized gray level histogram  $q_L$
- Quantized gradient magnitude histograms  $q_G$
- Texture feature vector of dimension  $D = q_L + 4 * q_G$
- Projection of the local feature vector  $D$  to  $1D$  representation
- Multidimensional Scaling (MDS) technique
- **Double histogram matching**
- **Temporal differentiation and binarization**

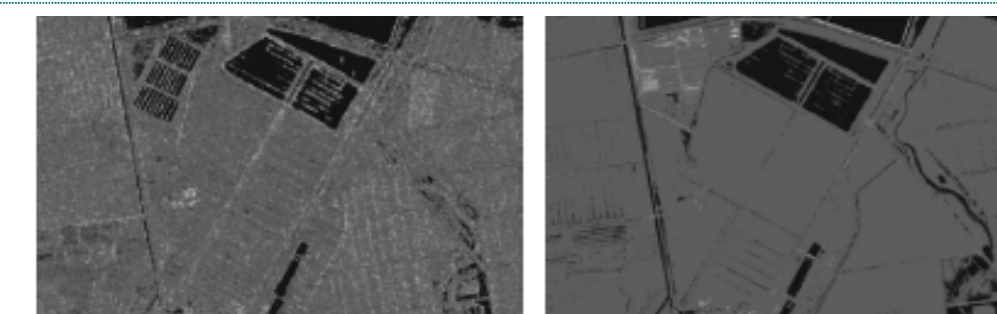
## Proposed Change Detector Steps

### Step 0



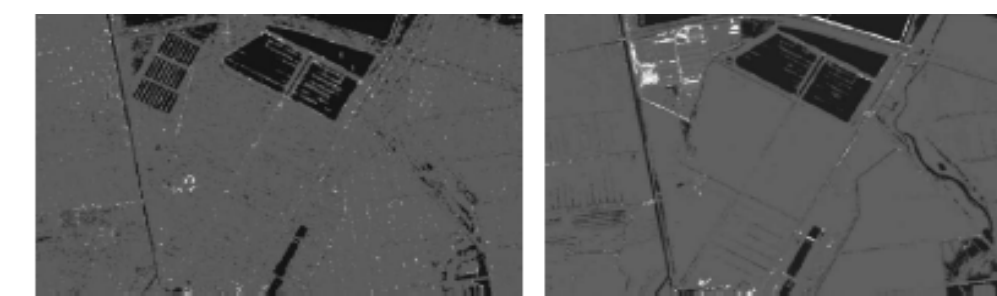
SAR/Optical input images

### Step 1



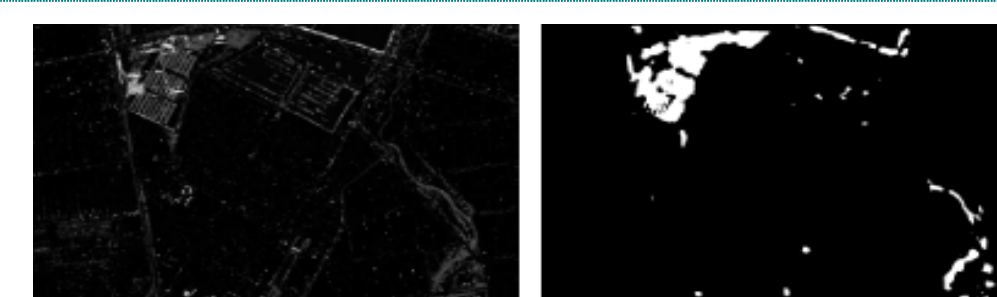
Modality-invariant MDS representation

### Step 2



Double histogram matching

### Step 3

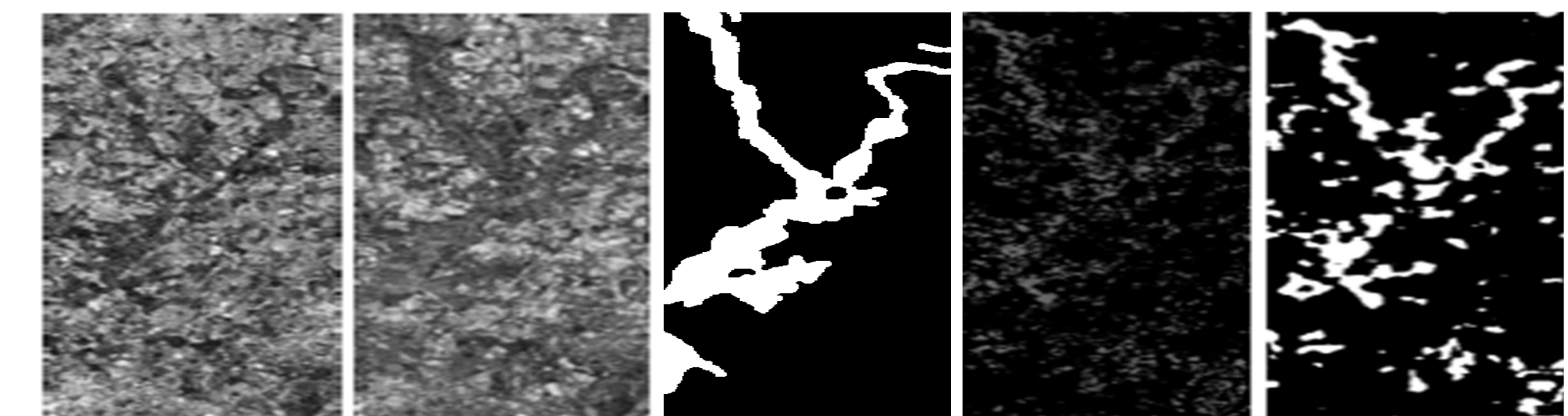


Differentiation and binarization

## Change Detector Validation



Multi-sources dataset: one optical and one SAR image



Multi-looking dataset: one SAR 1-look and one SAR 5-looks image



Multi-sensor dataset: one NIR-band and one optical image

## Results comparison with recent Supervised and Unsupervised multi-modal CD methods

SAR/Optical	% match
<b>Proposed method</b>	<b>0.967</b>
Liu <i>et al</i>	0.976
PCC	0.821

SAR 1-look/SAR 5-looks	% match
<b>Proposed method</b>	<b>0.827</b>
Chatelain <i>et al</i>	0.732
Correlation	0.521

NIR- band/Optical	% match
<b>Proposed method</b>	<b>0.942</b>
Zhang <i>et al</i>	0.975
PCC	0.882

## Conclusion

- A new and a simple model for multi modal change detection.
- Based on an imaging modality-invariant MDS representation.
- Without radiometric and noise pre-processing steps.
- Deal with different change detection conditions.

## Acknowledgement

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