NEURAL INFORMATION PROCESSING SYSTEMS

SAM-CD: Change Detection in Remote Sensing Using Segment Anything Model

Faroq AL-Tam, Thariq Khalid,

Athul Mathew, Andrew Carnell,

Riad Souissi

Content

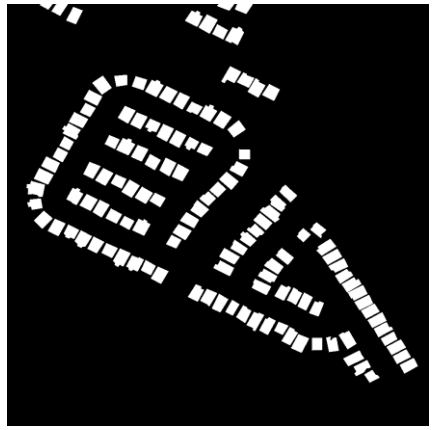
- Change detection
- SAM-CD
- Results
- Conclusions and future work
- Questions

Change detection

- Change Detection (CD) refers to locating surface changes in the same area over time.
- It can be applied in disaster management, urban development, and many other applications.

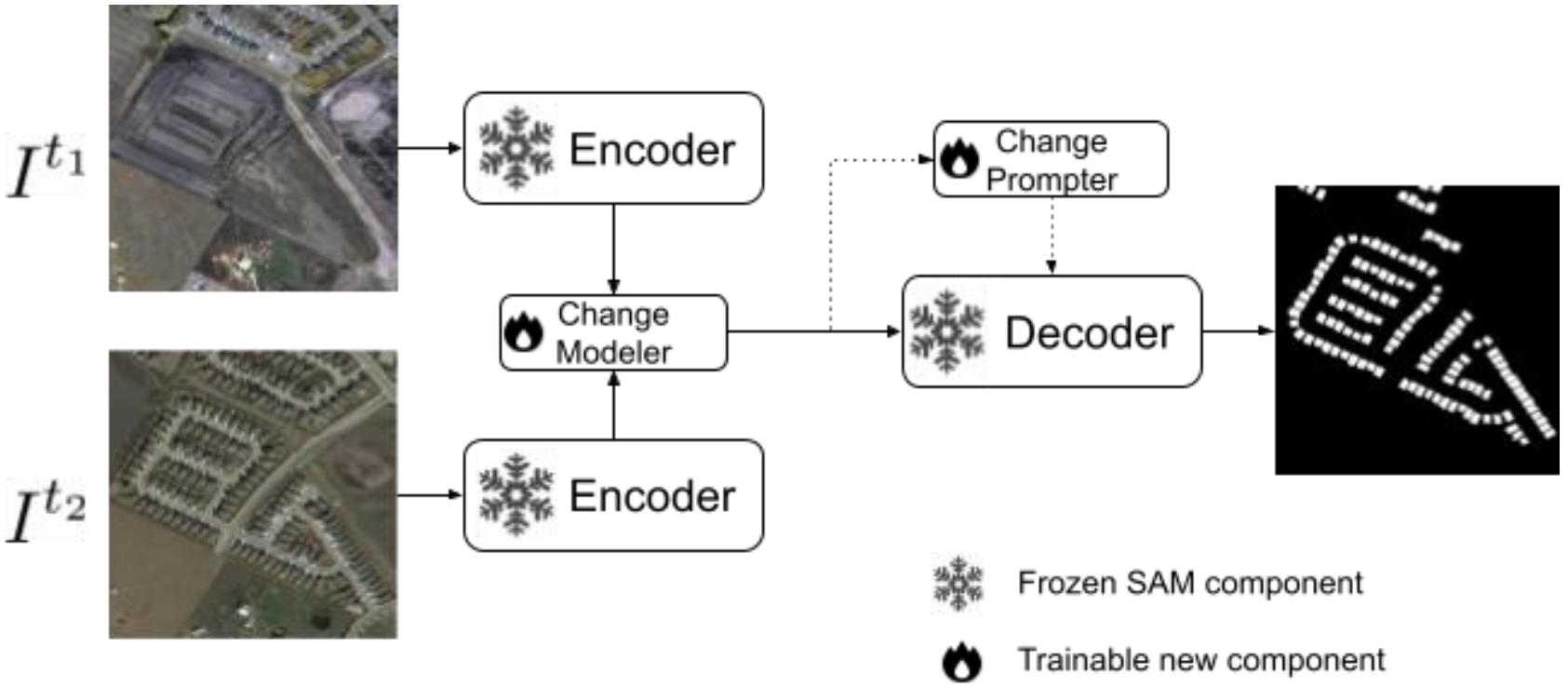
Pre-change

Post-change

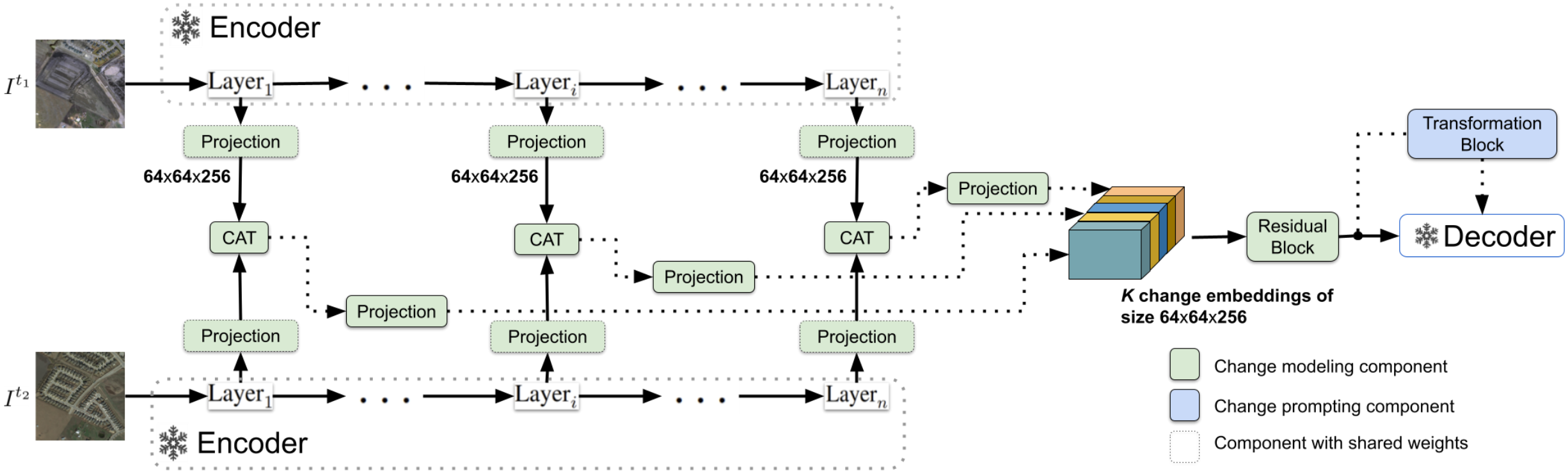


Change

SAM-CD


I^{t_1}
I^{t_2}
Encoder
Encoder
Change Modeler
Change Prompter
Decoder
Frozen SAM component
Trainable new component

SAM-CD (conti…)


Encoder
I^{t_1}
I^{t_2}
Layer$_1$
Layer$_i$
Layer$_n$
Projection
64x64x256
CAT
Projection
Projection
Projection
Projection
Projection
Projection
Projection
Transformation Block
Residual Block
Decoder
K change embeddings of size 64x64x256
Change modeling component
Change prompting component
Component with shared weights
Encoder

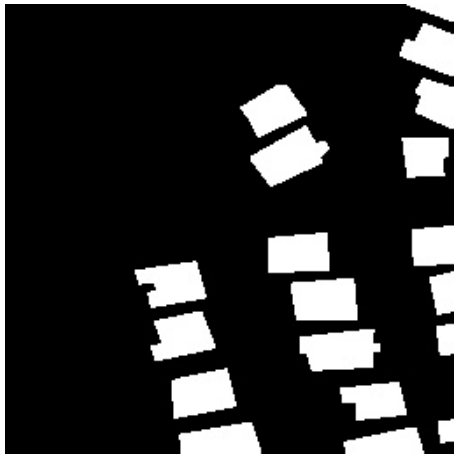
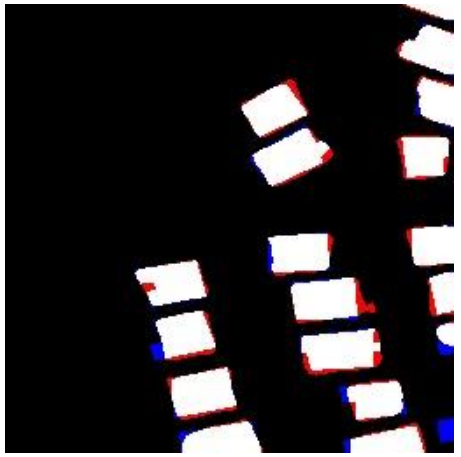
Results

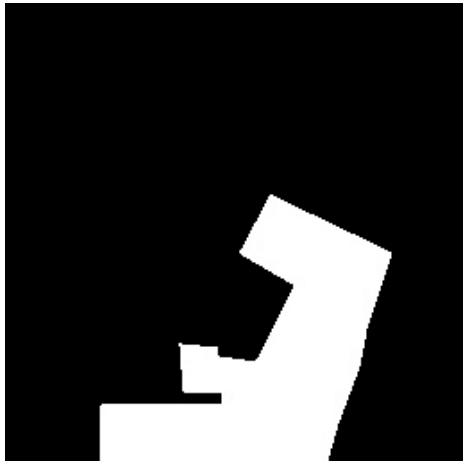
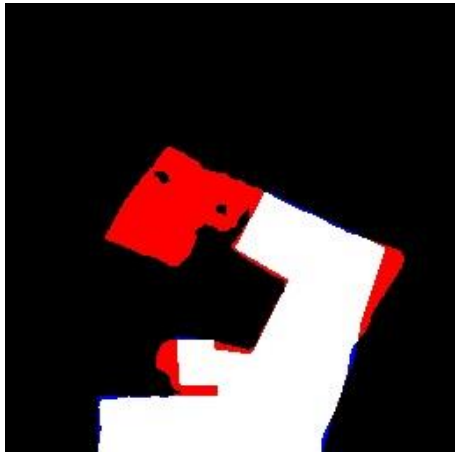
Model	Year	LEVIR-CD				DSIFN-CD			
		Pre	Rec	IoU	F1	Pre	Rec	IoU	F1
FC-Siam-Conc [3]	2018	91.99	76.77	71.96	83.69	59.08	62.80	43.76	60.88
STANet [9]	2020	83.81	91.00	77.40	87.26	51.48	36.40	27.11	42.65
BIT [2]	2022	89.24	89.37	80.68	89.31	56.36	62.79	42.25	59.40
USSFC-NET [18]	2023	89.70	**93.42**	84.36	91.04	63.73	**76.32**	53.20	69.47
SAM-CD (proposed)		**92.16**	90.91	**84.38**	**91.52**	**68.42**	74.25	**55.64**	**71.02**

Table 1: The change detection results of the LEVIR-CD and DSIFN-CD *test* sets.

Results (LEVER-CD)



Time 1

Time 2

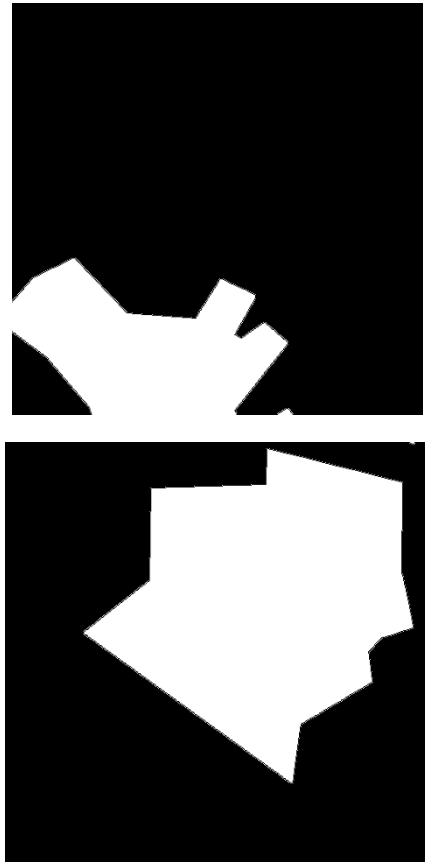
GT

SAM-CD

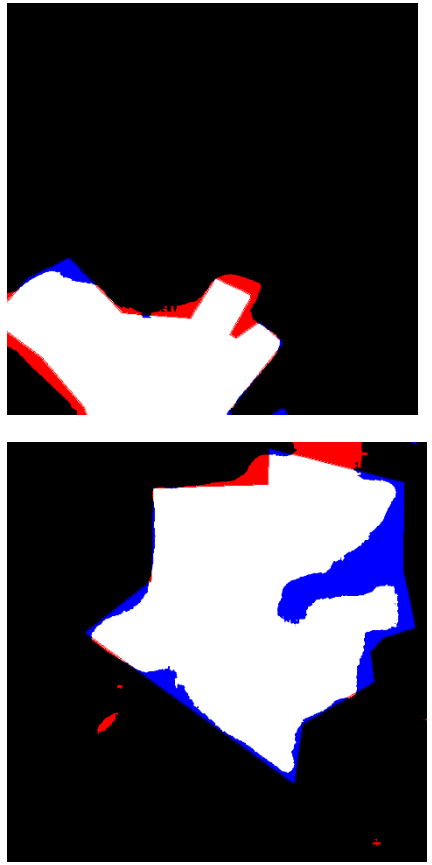
Results (DSIFN-CD)

Time 1

Time 2



GT



SAM-CD

Conclusions and future work

- SAM-CD model for change detection has been presented
- It adapts segment anything model (SAM) without finetuning
- A change modeler is used to create change representation space
- The change representation space is then prompted to SAM decoder using a prompter
- During training, the change modeler and prompter are trained while SAM is kept frozen
- The results show the efficacy of the proposed model
- In the future SAM-CD will be extended and tested on more use-cases

References

- Hao Chen and Zhenwei Shi (2020) . A spatial-temporal attention-based method and a new dataset for remote sensing image change detection. Remote Sensing, 12(10), 2020.
- Chenxiao Zhang, Peng Yue, Deodato Tapete, Liangcun Jiang, Boyi Shangguan, Li Huang, and Guangchao Liu (2020). A deeply supervised image fusion network for change detection in high resolution bi-temporal remote sensing images. ISPRS Journal of Photogrammetry and Remote Sensing,183–200, 2020.
- Alexander Kirillov, Eric Mintun, Nikhila Ravi, Hanzi Mao, Chloe Rolland, Laura Gustafson, Tete Xiao, Spencer Whitehead, Alexander C. Berg, Wan-Yen Lo, Piotr Dollár, and Ross Girshick. Segment anything, 2023.

Thank you

Questions?