

Training patches and prediction codes of deep learning (LANA) model for Landsat 8/9 cloud/shadow mask

Dong Luo and Hankui Zhang

Geospatial Sciences Center of Excellence, Department of Geography and Geospatial Sciences, South Dakota State University, Brookings, SD 57007, USA

This documentation introduce (i) the image patches dataset and (ii) application/prediction (not training) codes for Landsat 8 cloud and cloud shadow masking used in a paper in review and uploaded here:

Hankui Zhang, Dong Luo, David Roy, A learning attention network algorithm (LANA) for accurate Landsat-8 cloud and shadow masking, *Remote Sensing of Environment*

(i) The image patches dataset

The dataset contains a total of 16,861 image patches each with 512×512 30m pixels. The patches were derived from (1) 27 Landsat 8 images annotated by USGS and refined by the experts from South Dakota State University (SDSU), (2) 69 SPARS image subsets each with 1000×1000 30m pixels, (3) 4 images annotated by the experts from SDSU. These images and image subsets (Fig.1) are randomly distributed on different land cover types (Barren, Forest, Grass/Crops, Shrubland, Snow/ice, Urban, Water, and Wetland) and across different season (Spring, Summer, Fall, and Winter).

The patch for the annotated cloud and cloud shadow mask (CLD.tif) has four unique pixel values :

128: clear

192: thin cloud

64: cloud shadow

255: cloud

FMS = (iii) USGS Fmask derived cloud and cloud shadow mask patch image

The patch for the annotated cloud and cloud shadow mask (FMS.tif) has three unique pixel values (thin cloud is not derived by Fmask):

128: clear

64: cloud shadow

255: cloud

There is no filled pixels in the derived patches as we designed this on purpose to avoid their impact on model training.

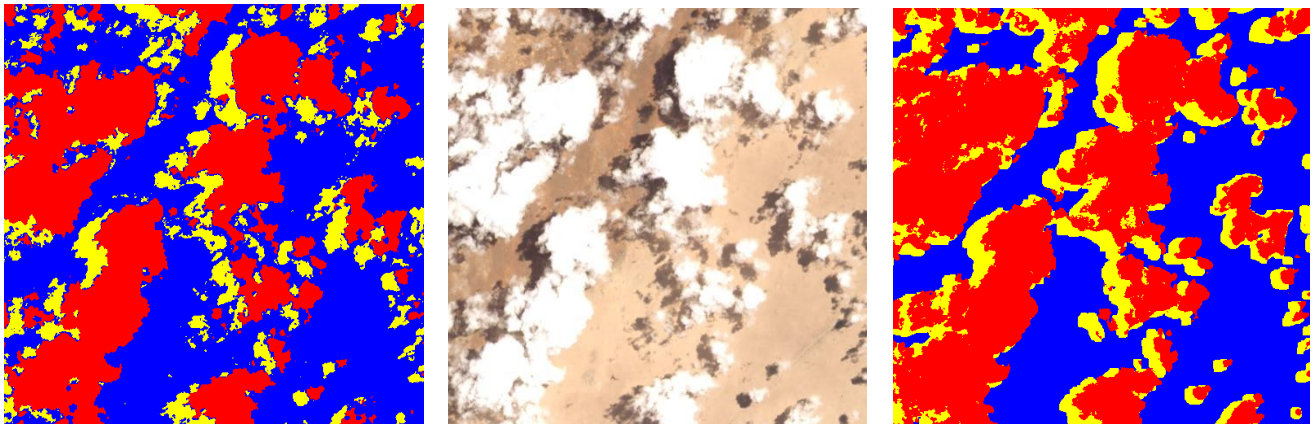


Figure 2. Patch (i.e., 512×512 pixels) example (021LC81620582014104LGN00) from the dataset. Left is the cloud mask generated from USGS dataset, Middle is the TOA GRB browse, Right is the Fmask result.

(ii) The application/prediction (not training) codes

The codes are available in file [LANA-model-code-Landsat-8-9.zip](#) with read me.

The shared code also can be found at github: <https://github.com/hankui/LANA-cloud-mask-codes-for-Landsat-8-9>

Acknowledgements

The US Government's rights to these data are detailed in FAR 52.227-14 and IA 52.204-713b.

The USGS is thanked to provide the USGS Landsat 8 Cloud Cover Assessment Validation Data: <https://landsat.usgs.gov/landsat-8-cloud-cover-assessment-validation-data>

The SPARCS data source: <https://www.usgs.gov/landsat-missions/spatial-procedures-automated-removal-cloud-and-shadow-sparcs-validation-data>

Appendix A: List of annotated Landsat 8 images and image subsets

The list of USGS cloud and cloud shadow annotated data (ONLY SHOW 27 USED IN THE STUDY):

000LC80640452014041LGN00
002LC82020522013141LGN01
004LC81020802014100LGN00
007LC81820302014180LGN00
012LC81220312014208LGN00
014LC81930452013126LGN01
021LC81620582014104LGN00
025LC81770262013254LGN00
028LC80070662014234LGN00
030LC81750622013304LGN00
031LC81620432014072LGN00
033LC80160502014041LGN00
034LC80010732013109LGN00
039LC81640502013179LGN01
042LC82290572014141LGN00
045LC80750172013163LGN00
046LC82150712013152LGN00
058LC80290372013257LGN00
062LC81310182013108LGN01

064LC80200462014005LGN00

073LC81010142014189LGN00

076LC80980712014024LGN00

077LC81750512013208LGN00

079LC80320382013278LGN00

085LC81490432014141LGN00

091LC81910182013240LGN00

095LC81130632014241LGN00

The list of the SPARCS image subsets:

097LC08_L1TP_001081_20131231_20170427_01_T1

097LC08_L1TP_002062_20130901_20170502_01_T1

097LC08_L1TP_005015_20140621_20170421_01_T1

097LC08_L1TP_005056_20140317_20170425_01_T1

097LC08_L1TP_015024_20140526_20170306_01_T1

097LC08_L1TP_019035_20140319_20170307_01_T1

097LC08_L1TP_020046_20140801_20170304_01_T1

097LC08_L1TP_025040_20130902_20170309_01_T1

097LC08_L1TP_025048_20140313_20170307_01_T1

097LC08_L1TP_031043_20130726_20170309_01_T1

097LC08_L1TP_032028_20130701_20170309_01_T1

097LC08_L1TP_034041_20130512_20170310_01_T1

097LC08_L1TP_038036_20130524_20170310_01_T1

097LC08_L1TP_039015_20130803_20170309_01_T1

097LC08_L1TP_043035_20130831_20170309_01_T1

097LC08_L1TP_047025_20140814_20170304_01_T1

097LC08_L1TP_050016_20140904_20170419_01_T1

097LC08_L1TP_063046_20130710_20180202_01_T1

097LC08_L1TP_075072_20140122_20170426_01_T1

097LC08_L1TP_076091_20140113_20170426_01_T1

097LC08_L1TP_080014_20140618_20170304_01_T1
097LC08_L1TP_090083_20130808_20180203_01_T1
097LC08_L1TP_091089_20140106_20170427_01_T1
097LC08_L1TP_094080_20140402_20170424_01_T1
098LC08_L1TP_102064_20140104_20170427_01_T2
098LC08_L1TP_106077_20140305_20170425_01_T1
098LC08_L1TP_111082_20131015_20180204_01_T1
098LC08_L1TP_114027_20130918_20170502_01_T1
098LC08_L1TP_114062_20131004_20170429_01_T1
098LC08_L1TP_118060_20140426_20170423_01_T1
098LC08_L1TP_122024_20140828_20170420_01_T1
098LC08_L1TP_125062_20130627_20170503_01_T1
098LC08_L1TP_128042_20140315_20170425_01_T1
098LC08_L1TP_133049_20140521_20170422_01_T1
098LC08_L1TP_134042_20130914_20170502_01_T1
098LC08_L1TP_136016_20130608_20170504_01_T1
098LC08_L1TP_136016_20140729_20170420_01_T1
098LC08_L1TP_137045_20140314_20170425_01_T1
098LC08_L1TP_140037_20140607_20170422_01_T1
098LC08_L1TP_146044_20131020_20170429_01_T1
098LC08_L1TP_148035_20130714_20170503_01_T1
098LC08_L1TP_149037_20131228_20170427_01_T1
098LC08_L1TP_150041_20140901_20170420_01_T1
098LC08_L1TP_150044_20130525_20170504_01_T1
098LC08_L1TP_155023_20140515_20170422_01_T1
098LC08_L1TP_158044_20140520_20170422_01_T1
099LC08_L1TP_161071_20130810_20170503_01_T1
099LC08_L1TP_167051_20140401_20170424_01_T1
099LC08_L1TP_170025_20140321_20170425_01_T1

099LC08_L1TP_170080_20140116_20170426_01_T1
099LC08_L1TP_172064_20141130_20170417_01_T1
099LC08_L1TP_173054_20141004_20180526_01_T1
099LC08_L1TP_173074_20140326_20170424_01_T1
099LC08_L1TP_175083_20140308_20170425_01_T1
099LC08_L1TP_180033_20130527_20170504_01_T1
099LC08_L1TP_181059_20130806_20170503_01_T2
099LC08_L1TP_183024_20140401_20170424_01_T1
099LC08_L1TP_186043_20140812_20170420_01_T1
099LC08_L1TP_195028_20130605_20170504_01_T1
099LC08_L1TP_195050_20140811_20170420_01_T1
099LC08_L1TP_201033_20140415_20170423_01_T1
099LC08_L1TP_215110_20131226_20170427_01_T2
099LC08_L1TP_216066_20140526_20170422_01_T1
099LC08_L1TP_221066_20140817_20170420_01_T1
099LC08_L1TP_226073_20131223_20170427_01_T1
099LC08_L1TP_229056_20140606_20170422_01_T1
099LC08_L1TP_229078_20131009_20170429_01_T1
099LC08_L1TP_229087_20140113_20170426_01_T1
099LC08_L1TP_231094_20131210_20170428_01_T1

The list of the SDSU image images:

096LC08_L1GT_015034_20210222_20210303_02_T2
100LC08_L1TP_017039_20210308_20210317_02_T1
101LC08_L1TP_115027_20210118_20210306_02_T1.2.3
102LC08_L1TP_129039_20210221_20210303_02_TC