Integrating DL in OBIA in Remote Sensing

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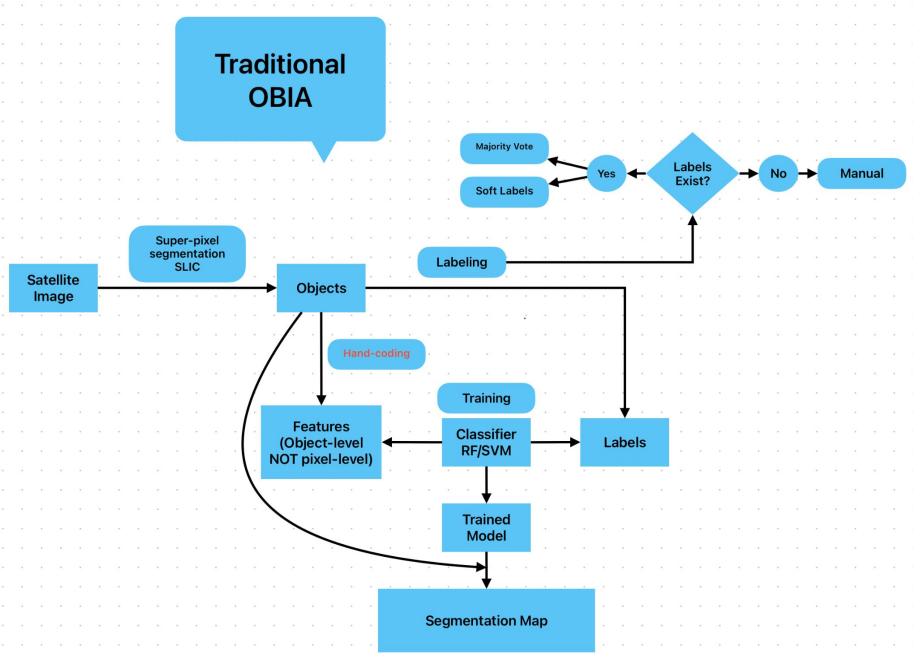

How to integrate DL in OBIA in image segmentation?

- To utilize pros from both methods: use object-level analysis and obviate manual feature extraction and hyperparameter tuning.
- “Can a hybrid DL+OBIA model incorporate pros from both methods and still perform better?”

How your project builds on prior work

Existing methods integrating DL in OBIA still need manual hyperparameter selection in segmentation step. DL models still work with pixels instead of incorporating features from object-level analysis

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Methods and experiments

- Used Contrastive Detection (DetCon) method (DeepMind) for DL+OBIA
- Model: ResNet 50;
  DetCon pretrained vs Imagenet weights
- Hypothesis: Detcon >> Imagenet

Geo Bench Dataset	Imagenet		Detcon		Precision	IoU
	mPrec	mIoU	mPrec	mIoU		
nz cattle	0.80 (0.75, 0.85)	0.67 (0.66, 0.67)	0.79 (0.75, 0.83)	0.68 (0.67, 0.68)	0.60 (0.57)	-2.89 (0.02)
neon tree	0.57 (0.53, 0.60)	0.17 (0.14, 0.19)	0.61 (0.57, 0.65)	0.16 (0.14, 0.19)	-2.21 (0.06)	0.46 (0.66)
pv4ger	0.98 (0.97, 0.99)	0.93 (0.90, 0.97)	0.99 (0.98, 1.00)	0.97 (0.96, 0.97)	-1.81 (0.11)	-2.47 (0.04)

Findings

- Detcon >> Imagenet (statistically significant for mIoU but not for mean Precision
- Detcon did not perform well on Neon-Tree dataset (more hard to learn features)

Detcon pre-training is **more effective** than traditional DL methods for learning object-level features. However, pre-training on **similar domain** data would be more useful than using vanilla Imagenet weights. **More experiments** with bigger, multi-label, multi-band images need to be done for validating further usefulness.