Integration of urban growth models in urbanization monitoring

Giorgos Mountrakis

Department of Environmental Resources and Forest Engineering
State University of New York College of Environmental Science & Forestry, Syracuse, NY

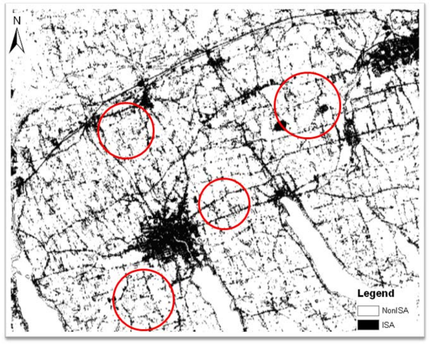
Hypothesis

- Can we harvest existing urbanization representations and ancillary data to enhance urban monitoring capabilities?
- What algorithmic developments are necessary to undertake such problem?

Tasks

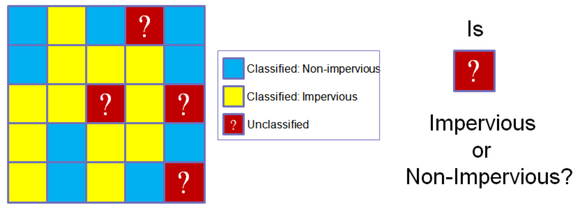
- A. Develop a novel urbanization classifier capable of global monitoring.
- B. Create an urban growth model based on ancillary data.
- C. Integrate the two to hintcast and forecast urbanization representations.

A. RS Urbanization Classifier

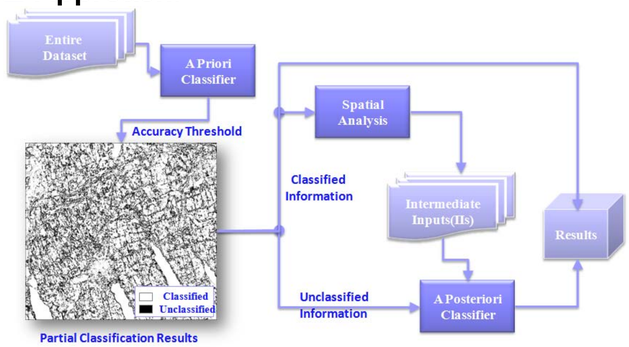


Typical **problems** in urbanization estimation.
e.g. Soil and urban pixels are difficult to separate

Solution: Statistics based on **partially classified results** from prior classifiers to assist classification in later steps.

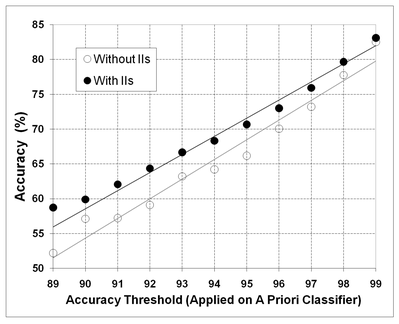


Approach:

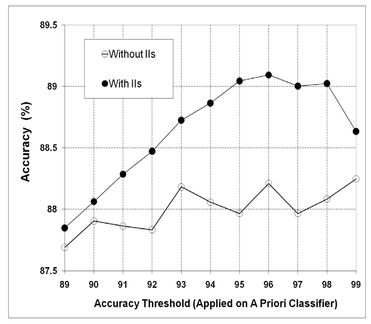


Results:

Performance of different accuracy thresholds



A Posteriori Classification Results

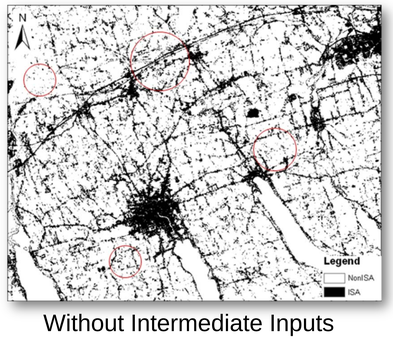


Combined Classification Results

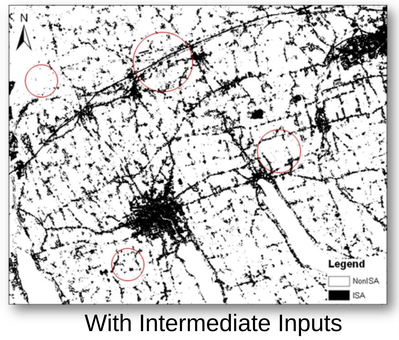
Classification Accuracies with and without Intermediate Inputs (IIs)

		Without IIs	With IIs
Producer's Accuracy	*ISA*	90.42	92.41
	NonISA	85.61	85.19
User's Accuracy	*ISA*	88.09	88.01
	NonISA	88.36	90.51
Overall Accuracy		**88.21**	**89.09**

Visual Comparisons



Without Intermediate Inputs

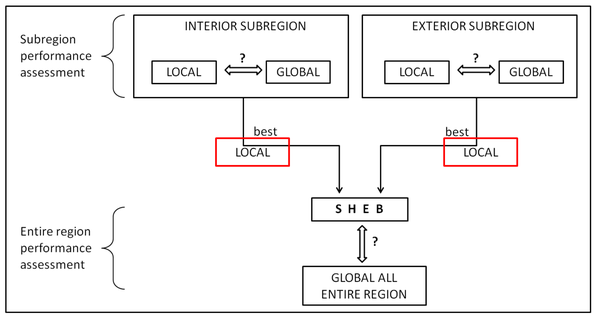


With Intermediate Inputs

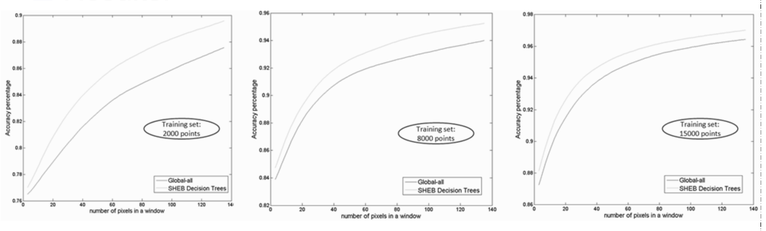
More Info: L. Luo, G. Mountrakis (2010). Integrating intermediate inputs from partially classified images within a hybrid classification framework: An impervious surface estimation example. Remote Sensing of Environment, 114(6):1220-1229.

B. Urban Growth Model

- Integrate multiple spatial models each operating in a different subregion.
- Increased modeling capabilities since spatial heterogeneity is more explicitly incorporated.



Results:



Conclusions and Remaining Qs

- A. The statistical evaluations suggest that classification improved using intermediate inputs as opposed to applying traditional classification models. *How does this process scale up for global application?*
- B. There is also room for improvement in urban growth models, *which are the minimal input parameters to tie predictions with RS data?*
- C. Work on the integration of urban growth models and RS classifiers will start this summer – still have one year left on NIP funding.
- The multi-region, multi-process classification/prediction models are not limited in the aforementioned problems. *We seek collaborations to enhance diverse global models (e.g. GCMs).*

Acknowledgement

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Papers and further discussion are available at: http://www.aboutgis.com