

# Relearn

BEODay 2014

Lier

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# INTRODUCTION



# Introduction: Motivation

- HABISTAT project:
  - NATURA2000 : reporting each 6 years
  - Remote Sensing for habitat status reporting
- Remote sensing classification
  - Reference data: time consuming > expensive
- *Reduce dependency on reference data*
  - Use unlabeled reference data
  - Re-use existing reference data



Cloud compensation

# EXAMPLE PROBLEM



# Example Problem: 2 flight lines

Source

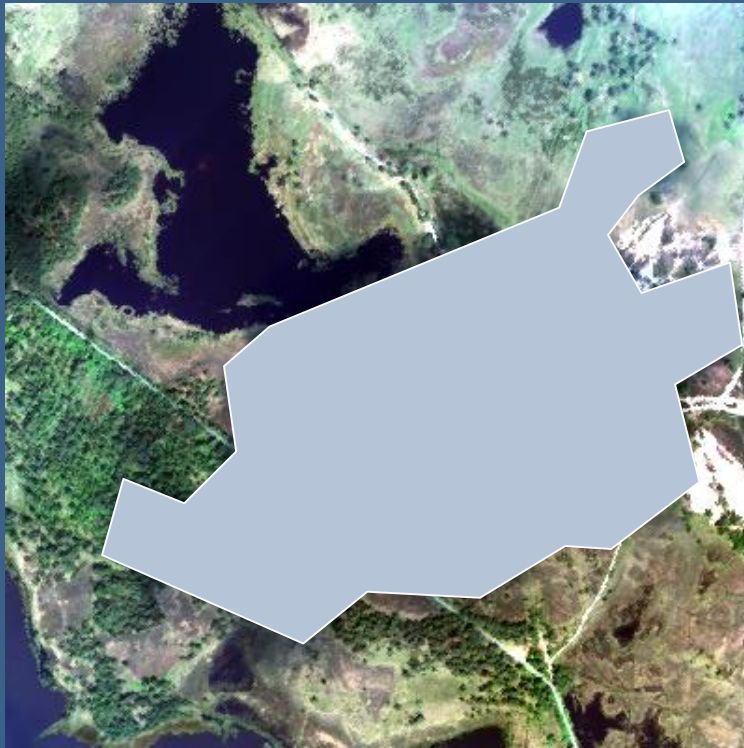


Target

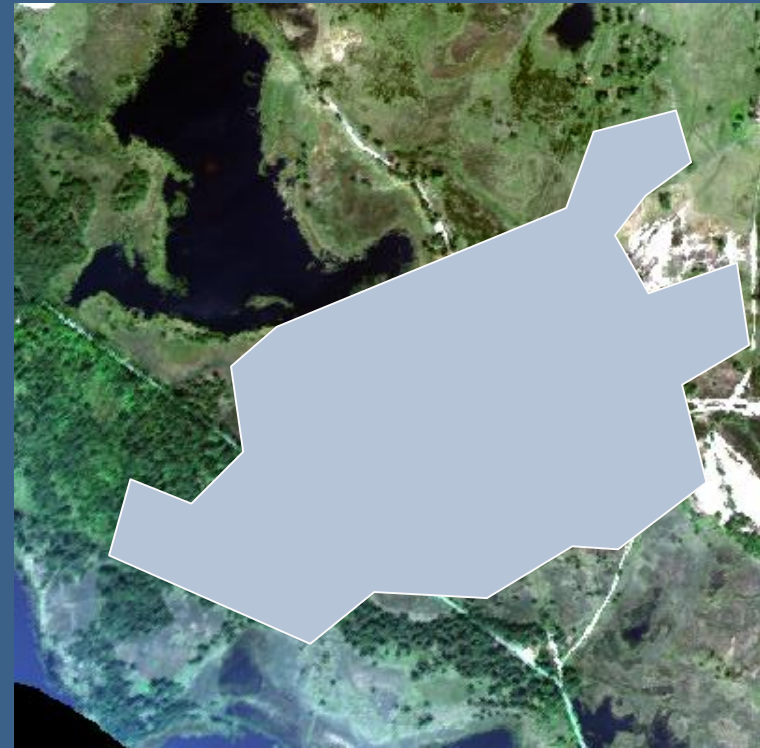


# Example Problem: 2 flight lines

Source



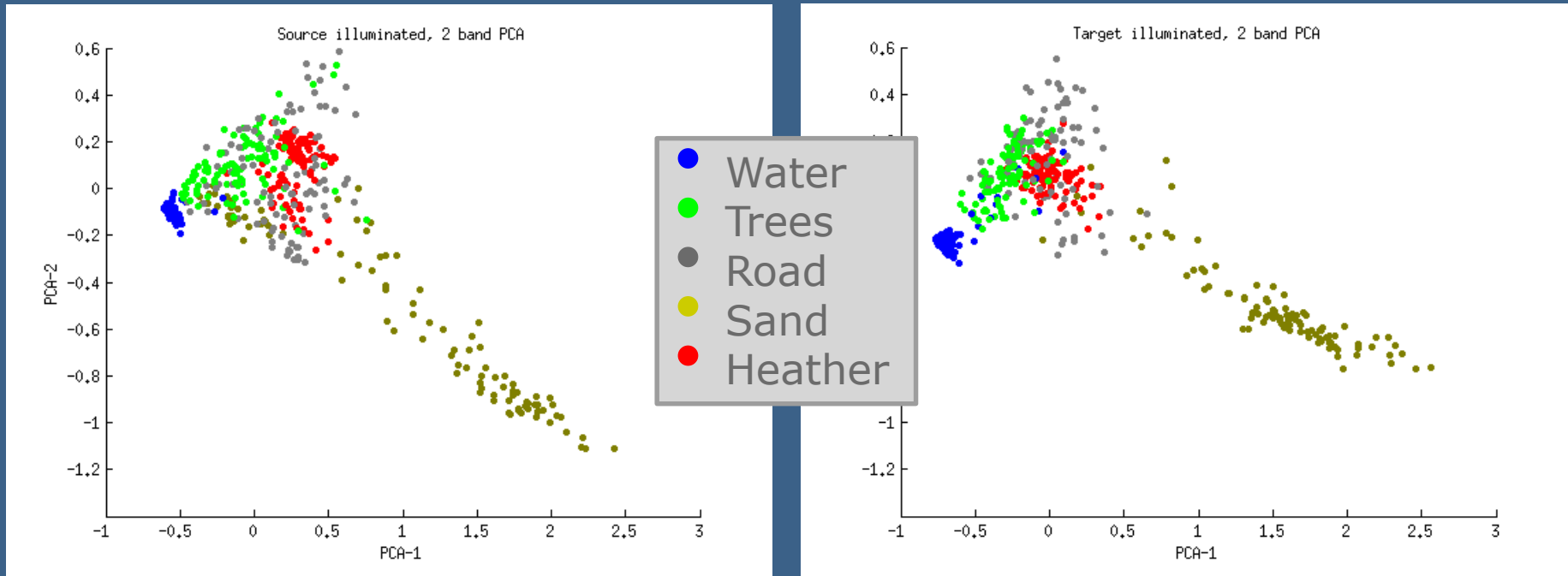
Target



# Flight lines: 2 PC illuminated

Source

Target

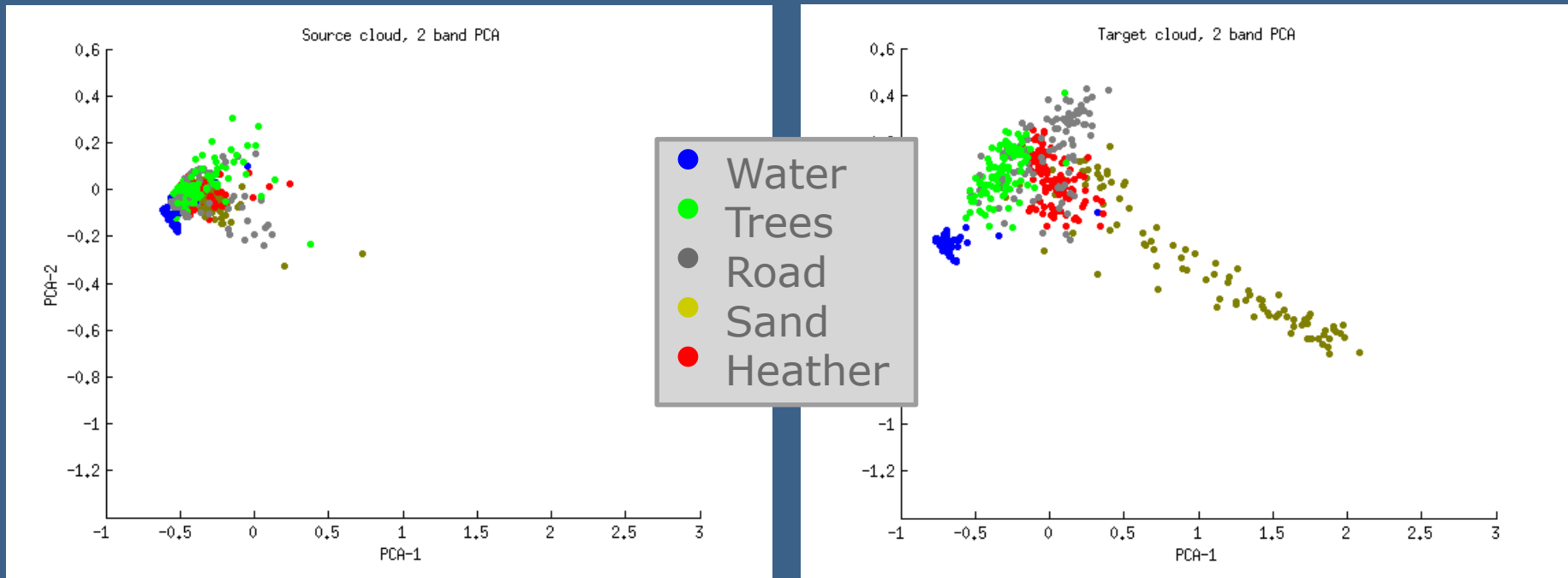




# Flight lines shadow in one

Source

Target



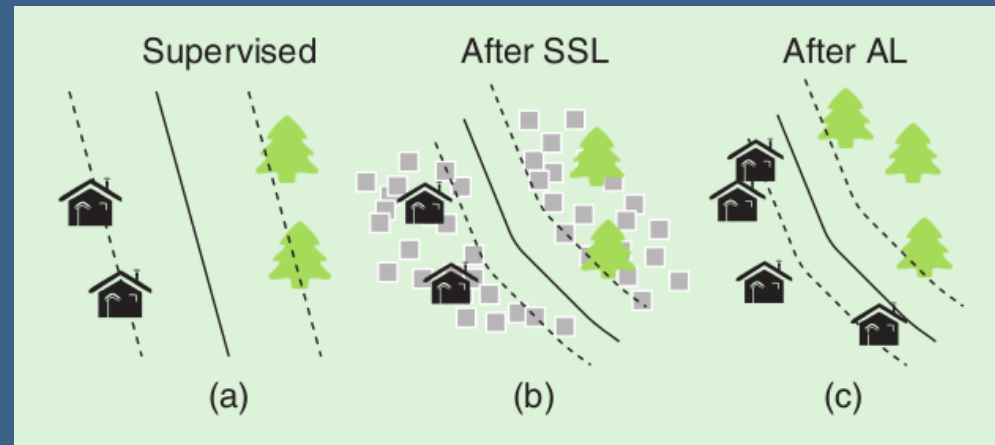
Techniques for

# DOMAIN ADAPTATION



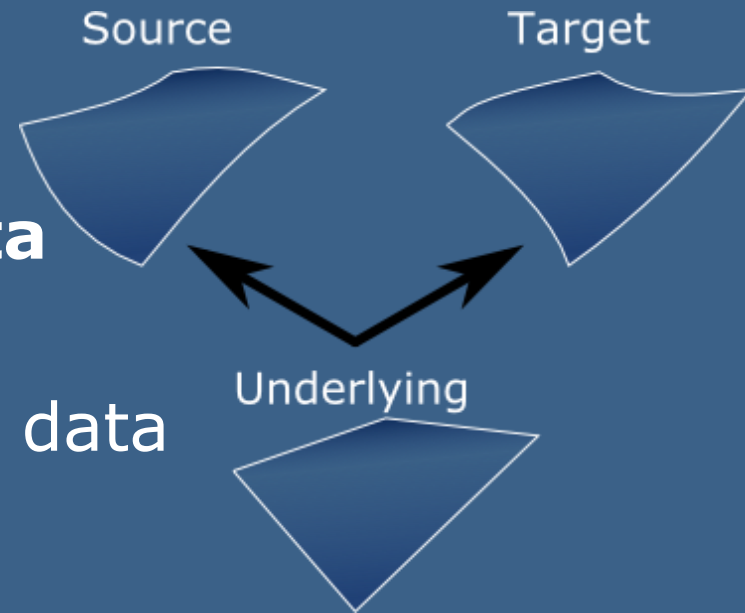
# Solutions: SSL & AL

- Semi supervised learning
  - Exploit unlabeled data
- Active Learning:
  - Train & Classify
  - Find interesting points
  - Expert adds labels
  - Add to training data



# Domain adaptation for remote sensing (DARS)

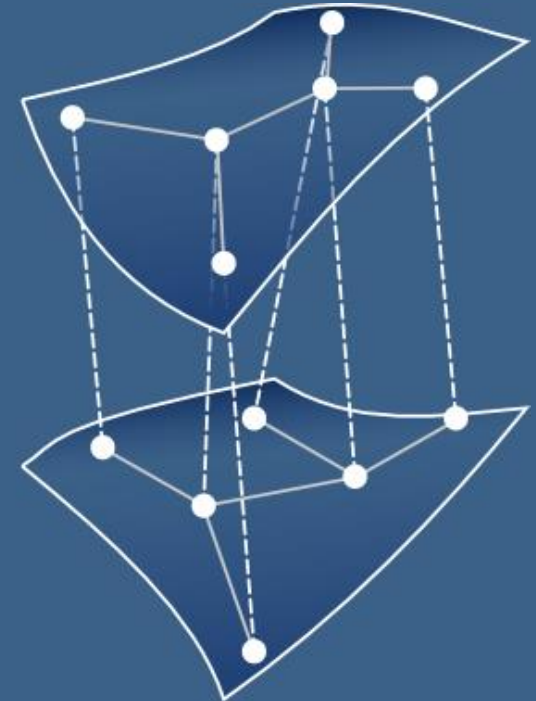
- 2 domains
- 2 realizations
- But: **Same underlying data**
- Idea: use relations between data points in Source, to find matching points in Target



# Domain adaptation for remote sensing (DARS)

- Graph matching
  - Find corresponding vertices
  - Keep graph structure

Source



Target

# DARS Results: Kalmthoutse Heide

- Kalmthoutse Heide

Source



(a)

Target



(b)

# UDARS Results: Kalmthoutse Heide

- Kalmthoutse Heide
- Histogram

GMARS

DARS



(a)

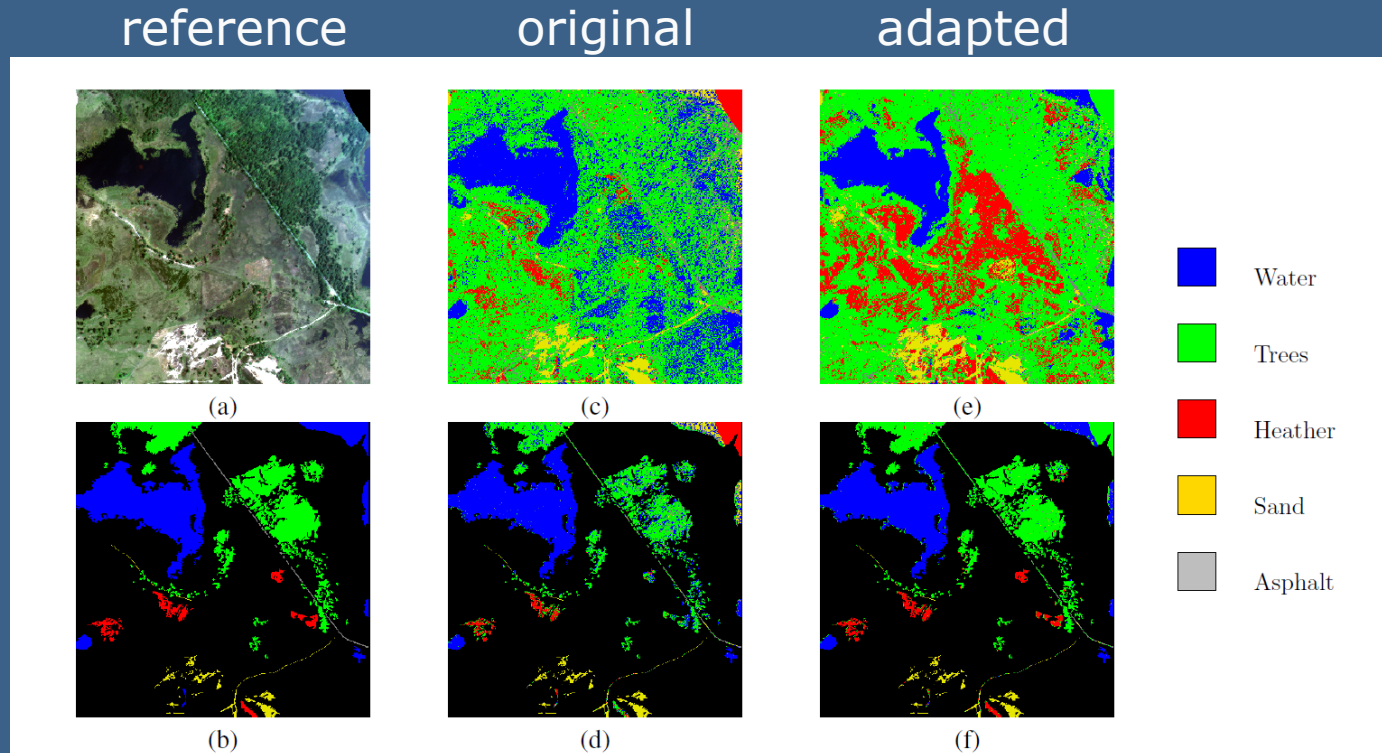


(b)



(c)

# UDARS Results: Kalmthoutse Heide



**Fig. 4.** Classification results. Left column: (a) true color representation of the target and (b) corresponding ground reference. Center column: (c) classification using original spectra on the entire image and (d) only on reference areas. Right column: (e) and (f) classification using the transformed spectra.



# Current Research: Multimodal DARS

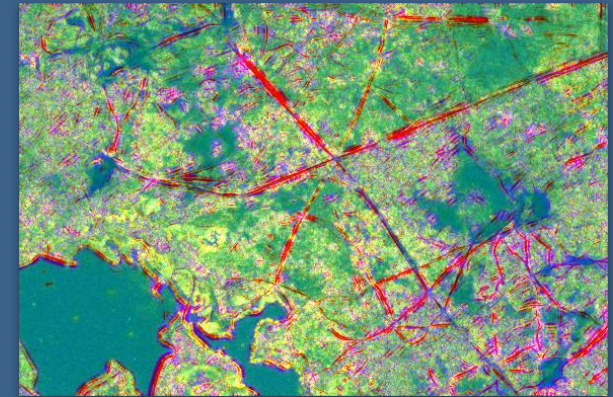
- Match multiple graphs simultaneously
  - Combine spectral and edge information
  - Combine different data types (hyperspectral / contextual / LiDAR / ... )



- Hyperspectral images
  - 2 flight lines, same area
  - Spectral artefacts (blue haze, ...)
- Optical VHR image
  - Rotation and scale invariant Gabor textural features
- Apply Multi-graph DARS



# IGARSS2014: Flight line adaptation



- Kalmthoutse Heide
- 2 Hyperspectral flight lines
- 1 VHR optical image:
  - Rotation and scale invariant Gabor textural features
  - Invariant between Source and Target

# Matching Results

Method	RMSE vs. Target
No action	0.0386
UDARS	0.0379
MDARS	0.0368



Project results

# CONCLUSION & PERSPECTIVE



# Conclusions

- UDARS : Unsupervised DA technique
  - Not limited to classification problems
- MDARS
  - UDARS + Combine heterogeneous data
- Future:
  - Journal paper
  - Testing on geographically disjoint sites
  - Applications



Thank you for your attention  
**QUESTIONS?**



# Bibliography

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[2]

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