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Testing the Sensitivity of Vegetation Indices for Crop Type Classification using RapidEye Imagery

Mustafa Ustuner & Fusun Balik Sanli
Yildiz Technical University
Turkey

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About me

- From Istanbul, Turkey
- BSc & MSc degree in Geomatic Engineering
- Currently pursuing PhD in Remote Sensing
- Member of RSPSoc and ISPRS
- Working as a research assistant in Geomatic Engineering in YTU

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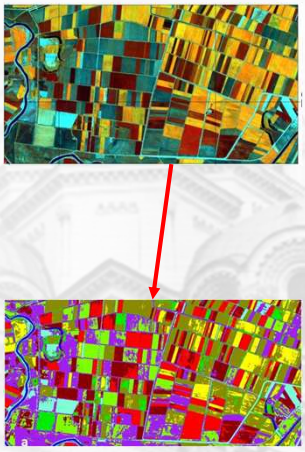
OUTLINE

- Introduction
- Objectives

- Study area
- Data (RapidEye Imagery)

- Vegetation Indices
- Image Classification

- Results&Conslusion



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INTRODUCTION

REMOTE SENSING AND AGRICULTURE

- increasing necessity of the food
- high population growth
- global climate change

Sustainable management of agricultural resources ⟷ **Economy!**

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INTRODUCTION

REMOTE SENSING AND AGRICULTURE

- ✓ Crop pattern identification
- ✓ Crop yield estimation
- ✓ Precision Agriculture
- ✓ Monitoring crop status

✓ Adaptation to Common Agricultural Policy (CAP)

✓ Sustainable agriculture

✓ Accurate and appropiate planning

DLR

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Objective

IMAGE CLASSIFICATION

INFORMATION FROM IMAGES

Which is the best?

Accurate Information?

- Maximum Likelihood,
- Support Vector Machines

and many more……..

Vegetation Indices

- ❖ Appropiate band selection
- ❖ Training/testing data
- ❖ Classification Methods
- ❖ Resolution
- ❖ Ancillary Data

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Image Classification Accuracy + Vegetation Indices = Classification Accuracy ?

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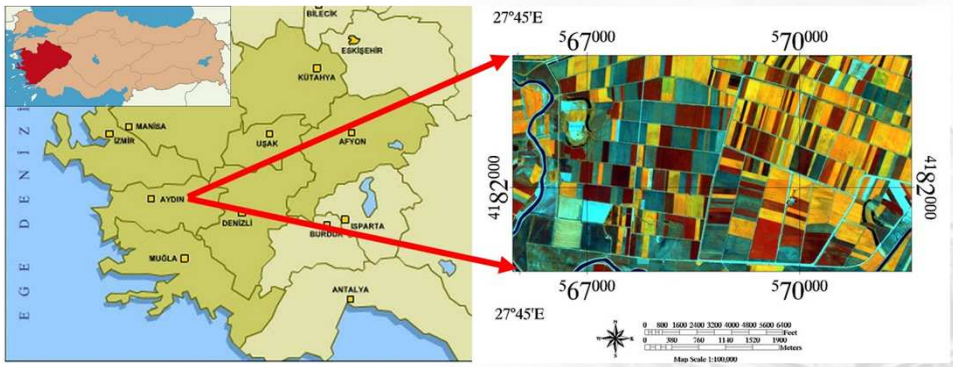
STUDY AREA



✓ Intensive crop farming (Modern Agriculture)

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Data (Satellite Imagery)

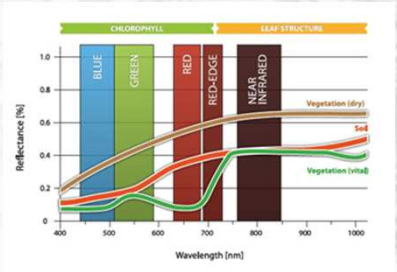
RapidEye Imagery

- 5m spatial resolution
- Orthoimage (Level 3A)

BlackBridge
Delivering the World

Prior (Common) Application Areas

- ✓ Agriculture
- ✓ Vegetation
- ✓ Forestry



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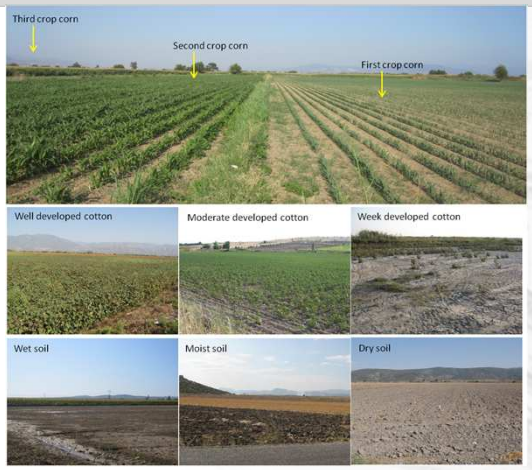
Crop types



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Vegetation Indices

Vegetation Index	Equation
NDVI	$NDVI = (R_{band5} - R_{band3}) / (R_{band5} + R_{band3})$
GNDVI	$GNDVI = (R_{band5} - R_{band2}) / (R_{band5} + R_{band2})$
NDRE	$NDRE = (R_{band5} - R_{band4}) / (R_{band5} + R_{band4})$

- Normalized Difference Vegetation Index (NDVI)
- Green Normalized Difference Vegetation Index (GNDVI)
- Normalized Difference Red Edge Index (NDRE)

The band numbers of 2,3,4,5 refer to
green (520 – 590nm), red (630 – 685nm),
rededge (690 – 730nm) and near-infrared (760 – 850nm), respectively

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Image Classification

- **Maximum Likelihood**
  and
- **Support Vector Machines**

ROI Name	Color	Pixels
1st_crop_corn	Red3	363
2nd crop corn	Red	558
well_cotton	Yellow	391
moderate_cotton	Yellow3	462
week_cotton	Green1	348
wet soil	Purple	319
moist soil	Aquamarine	355
dry soil	Chartreuse	627
water surface	Blue	218

Training Data

In-situ data collection

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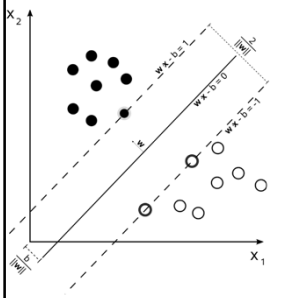
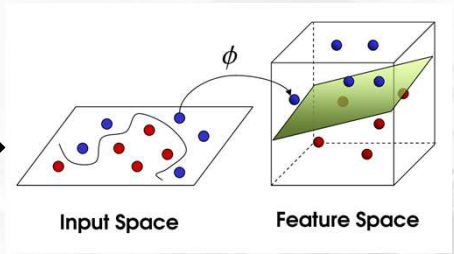
Image Classification

Support Vector Machines



http://en.wikipedia.org/wiki/Support_vector_machine



$$K(x_i.x_j) = \phi(x_i).\phi(x_j)$$

KERNEL FUNCTION

Radial Basis Function Kernel
(C, γ)= (100, 0.125)
Optimum Parameters

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Accuracy Assessment

Analysis	Overall Accuracy (%)	Kappa coefficient
MLC_5 (5 spectral band)	80,21	0,77
MLC_8 (5 band+ 3 vegetation indices)	73,38	0,70
SVM_5 (5 spectral band)	83,96	0,82
SVM_8 (5 band+ 3 vegetation indices)	86,01	0,84

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Accuracy Assessment

Image Classification Accuracy + Vegetation Indices = Classification Accuracy ?

Support Vector Machines

Maximum Likelihood

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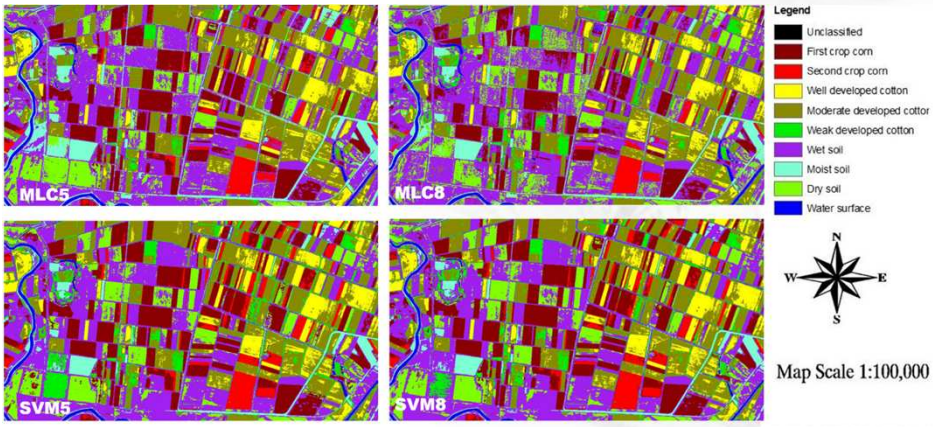
Classified Images



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Conclusions

- ✓ RapidEye imagery for crop classication and satisfactory results
- ✓ Efficient use of SVM for crop classication
- ✓ vegetation indices(VIs) have different sensitivity on classification methods
- ✓ SVM increase , MLC decrease.....when VIs added

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Invitation

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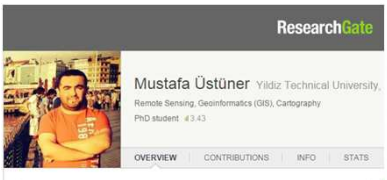
Thank you for your attention !



Contact
mustuner@yildiz.edu.tr

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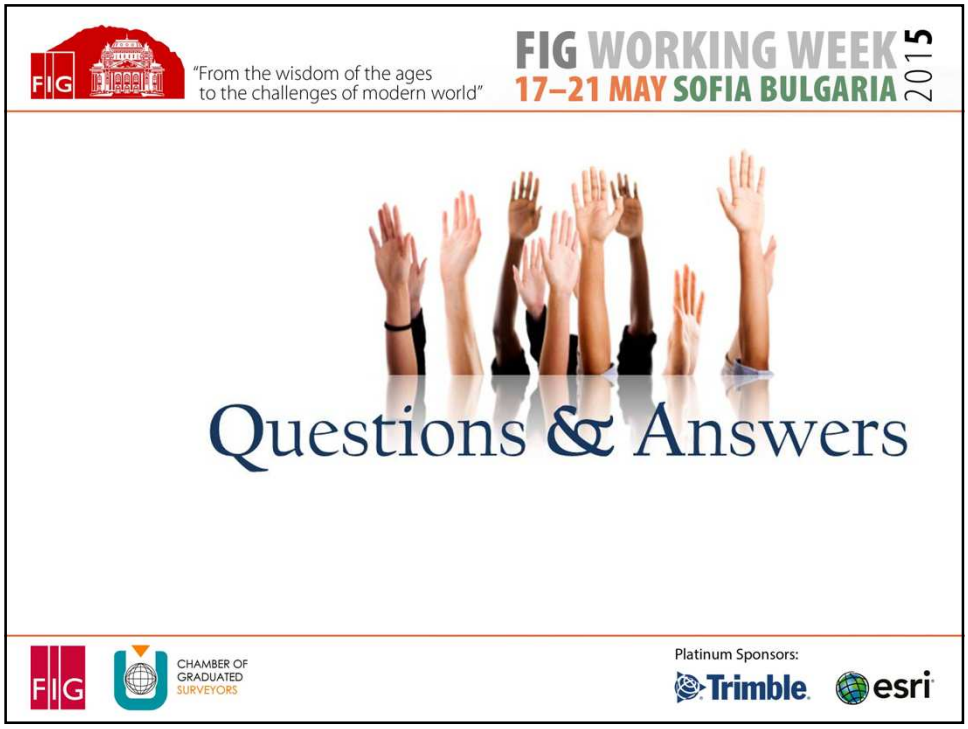
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Questions & Answers
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