# Lab 6 - Image Classification Supervised vs. Unsupervised Approaches

- <u>Supervised</u> image analyst "supervises" the selection of spectral classes that represent patterns or land cover features that the analyst can recognize **Prior Decision**
- <u>Unsupervised</u> statistical "clustering" algorithms used to select spectral classes inherent to the data, more computer-automated **Posterior Decision**

## Image Classification

- » Why classify?
- » Make sense of a landscape
  - Place landscape into categories (classes)
    - Forest, Agriculture, Water, etc
- » Classification scheme = structure of classes
  - Depends on needs of users

#### Example Uses

- » Provide context
  - Landscape planning or assessment
  - Research projects
- » Drive models
  - Global carbon budgets
  - Meteorology
  - Biodiversity

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#### Example: Near Mary's Peak

# Derived from a 1988 Landsat TM imageDistinguish types of forest



#### Basic Strategy: How do you do it?

- » Use radiometric properties of remote sensor
- » Different objects have different spectral signatures



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#### Basic Strategy: How do you do it?

- In an easy world, all "Vegetation" pixels would have exactly the same spectral signature
- » Then we could just say that any pixel in an image with that signature was vegetation
- » We'd do the same for soil, etc. and end up with a map of classes

#### Basic Strategy: How do you do it?

But in reality, that isn't the case. Looking at several pixels with vegetation, you'd see variety in spectral signatures.



The same would happen for other types of pixels, as well.

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### The Classification Trick: Deal with variability

- Different ways of dealing with the variability lead to different ways of classifying images
- To talk about this, we need to look at spectral signatures a little differently



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- In a Landsat scene, instead of two dimensions, we have 7 spectral dimensions
- Each pixel represents a point in 7-dimensional space
- To be generic to any sensor, we say "n-dimensional" space
- For examples that follow, we use 2-d space to illustrate, but principles apply to any n-dimensional space

#### Basic Strategy: Dealing with variability



#### Basic strategy: Dealing with variability

**Classification:** 

- Delineate boundaries of classes in n-dimensional space
- Assign class names to pixels using those boundaries



# Supervised Classification (Machine Learning)

Supervised classification requires the analyst to select training areas where he/she knows what is on the ground and then digitize a polygon within that area...

The computer then creates...





#### **Supervised Classification**



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#### The Result is Information--in this case a Land Cover map...



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