اصول پردازش تصویر

Principles of Image Processing

مصطفی کمالی تبریزی

۱۰ آبان ۱۳۹۹

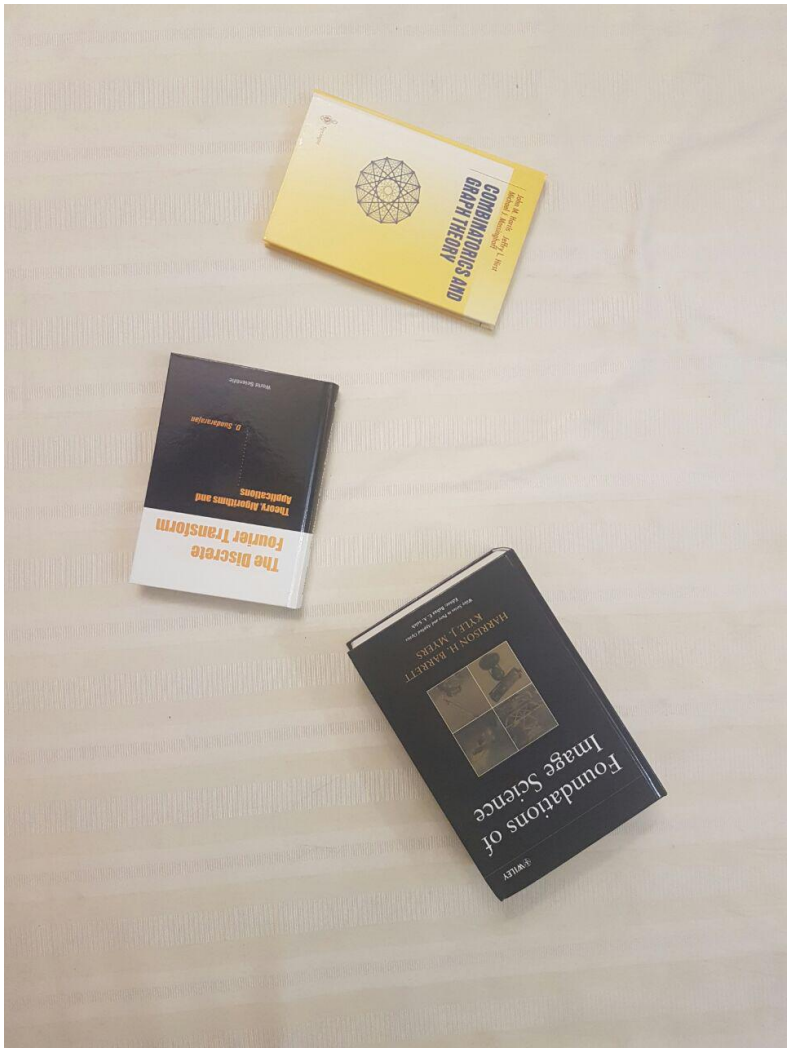
جلسه دوازدهم

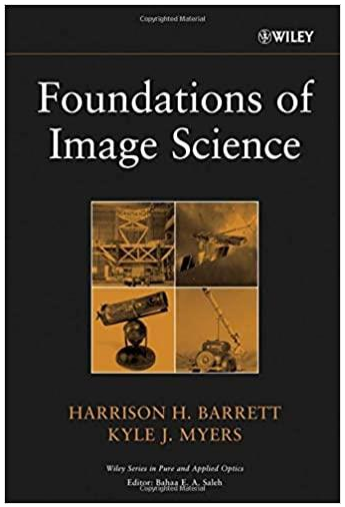
Homework 2

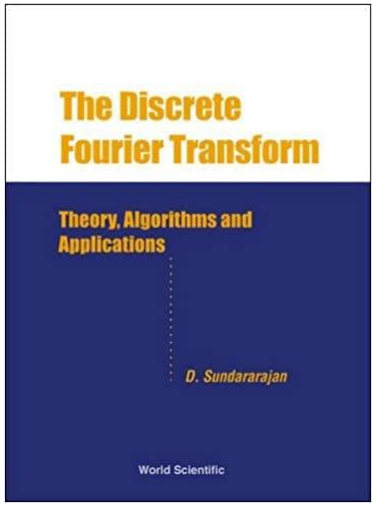
Q1: Sharpening

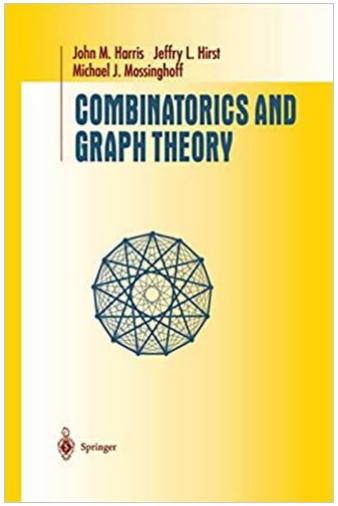
Q2: Template Matching

Q3:Homography and Warping

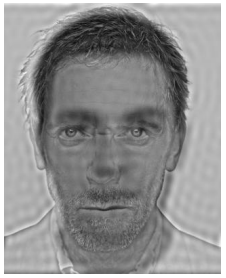








Q4: Hybrid Images



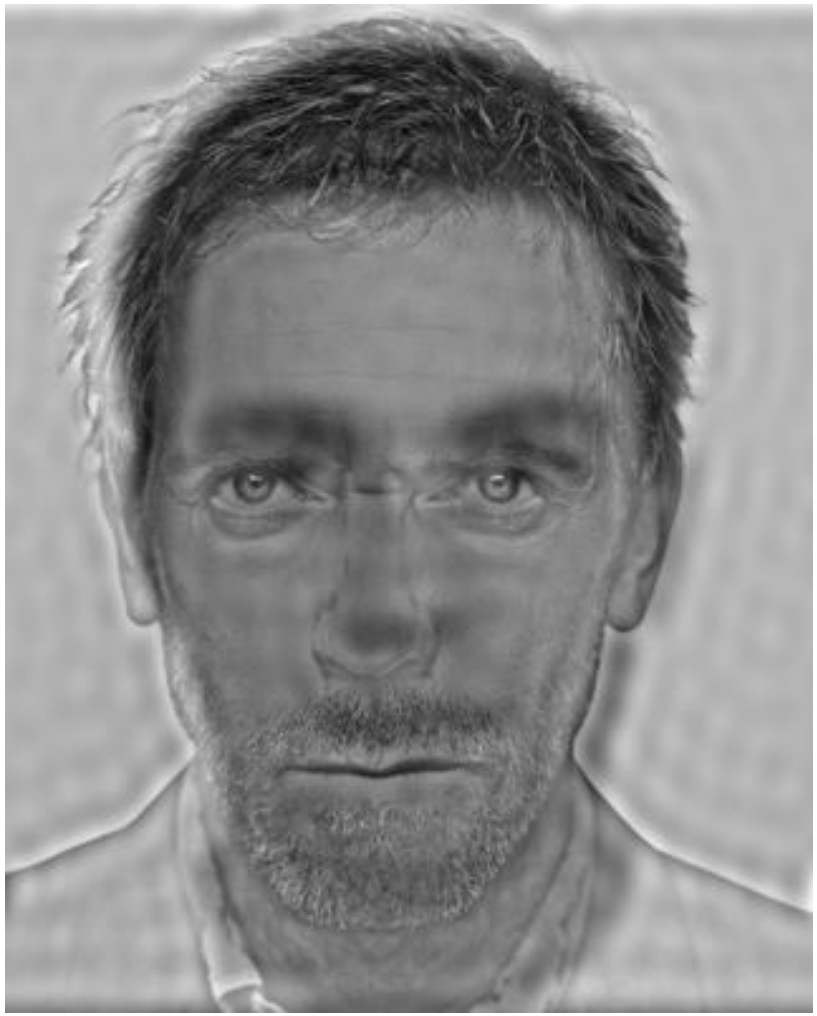
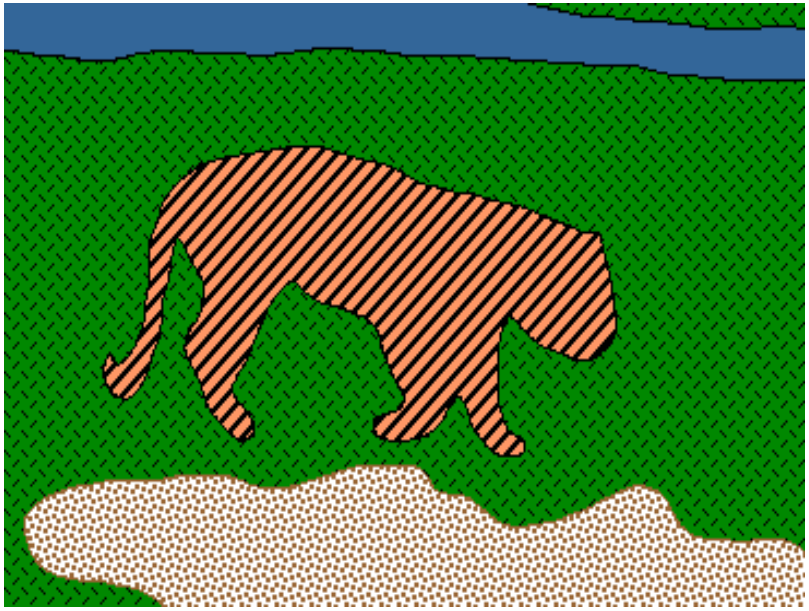


Image Segmentation

From Images to Objects



Extracting Objects

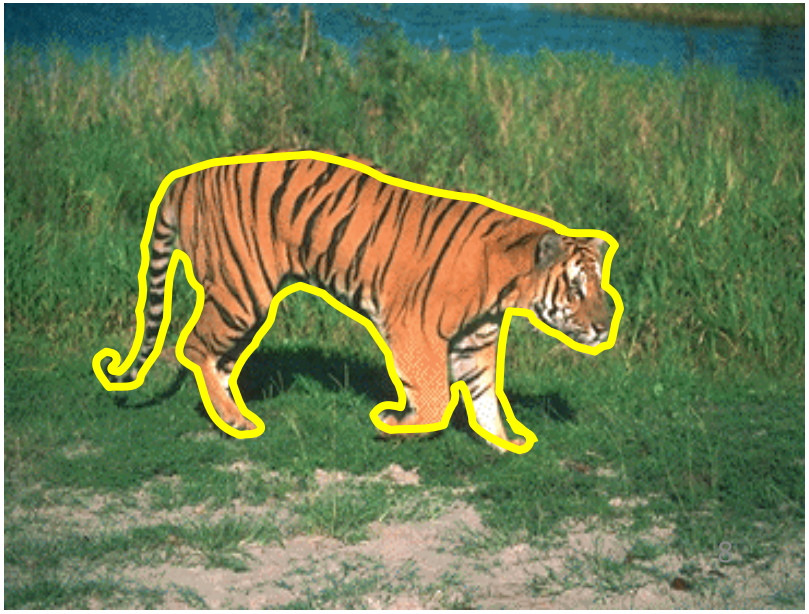
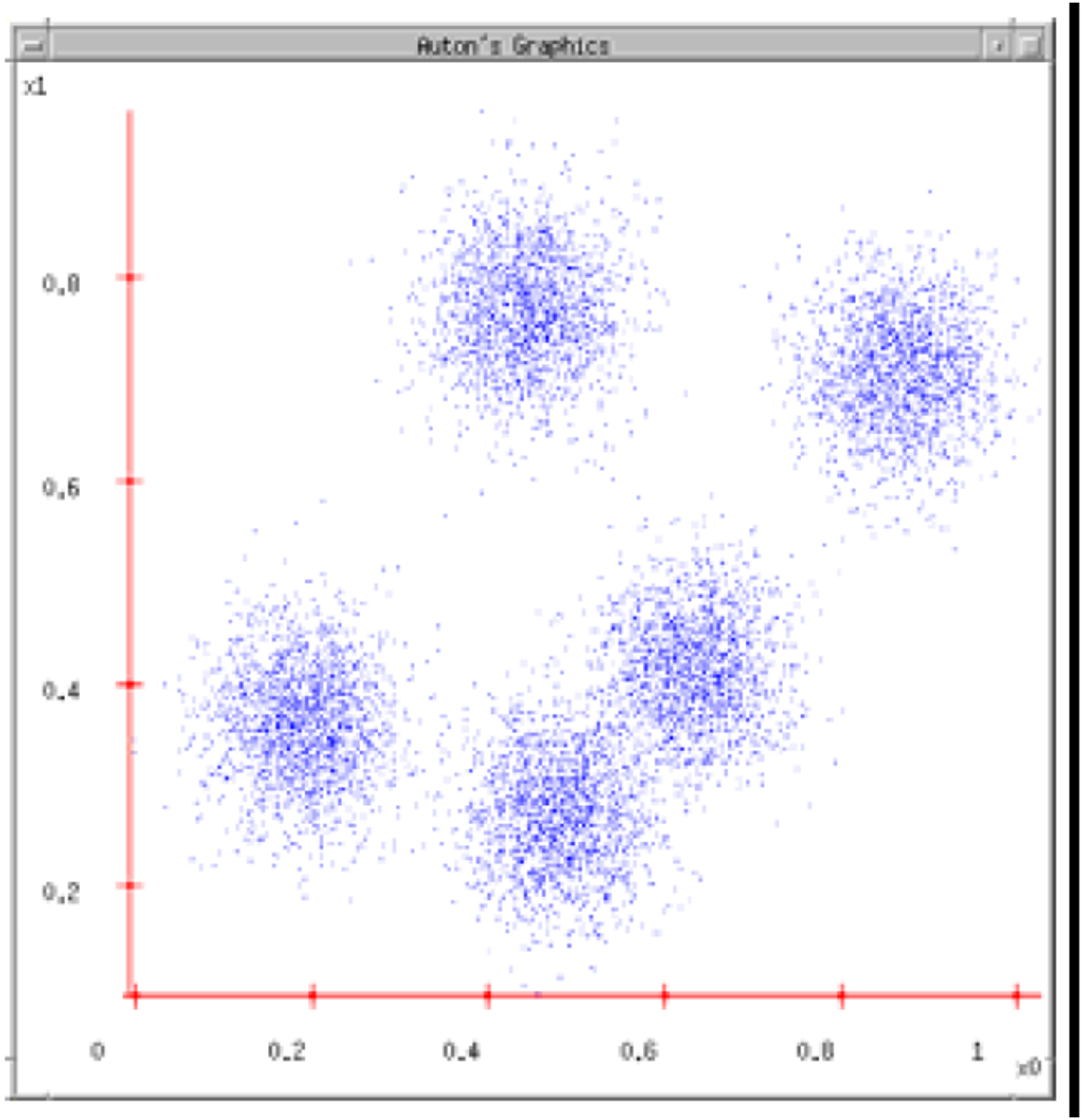


Image Segmentation

Segmentation as Clustering or Grouping (K-Means)

K-means

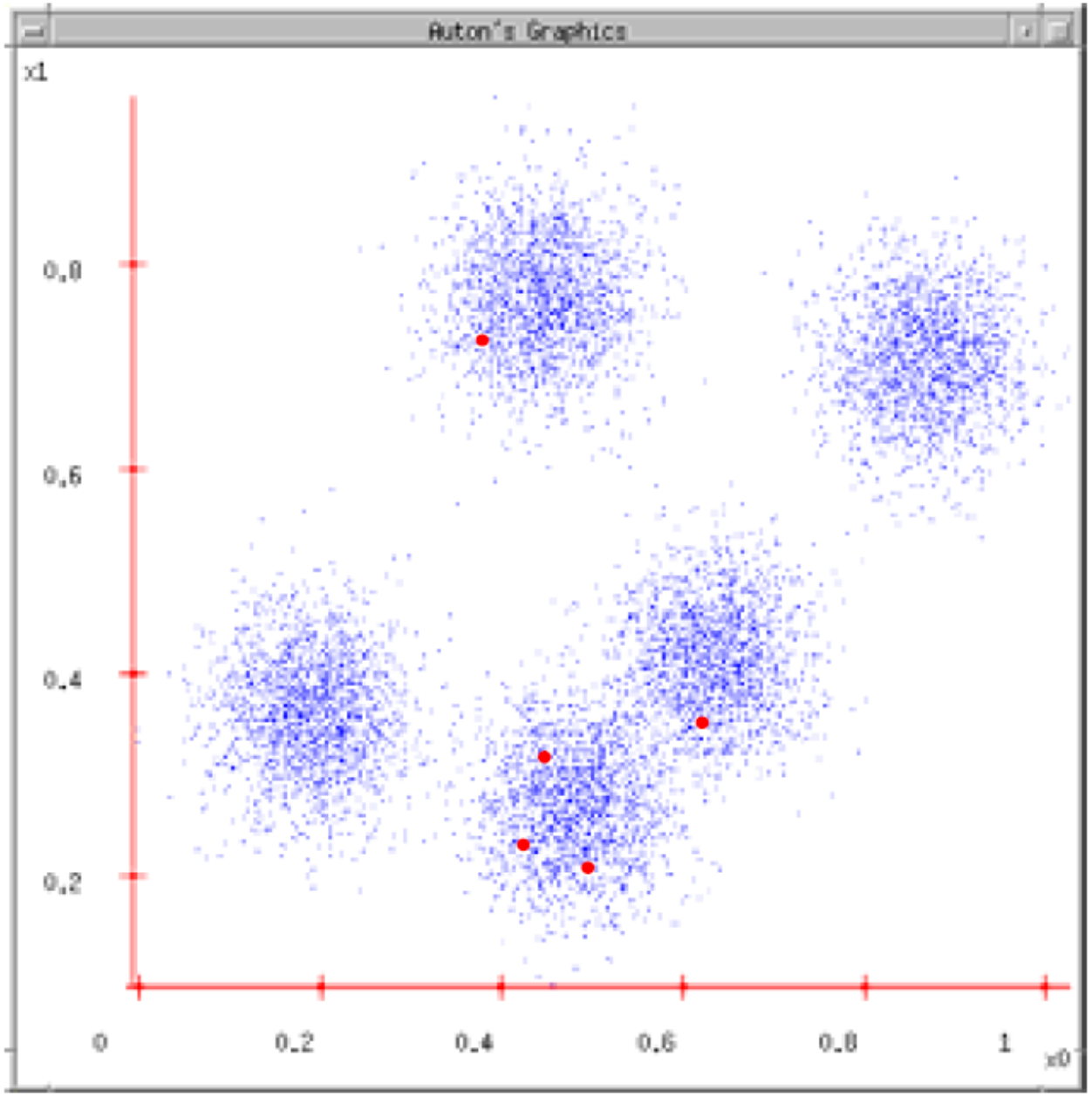
1. Ask user how many clusters they'd like. *(e.g. k=5)*



Slide: Andrew Moore

K-means

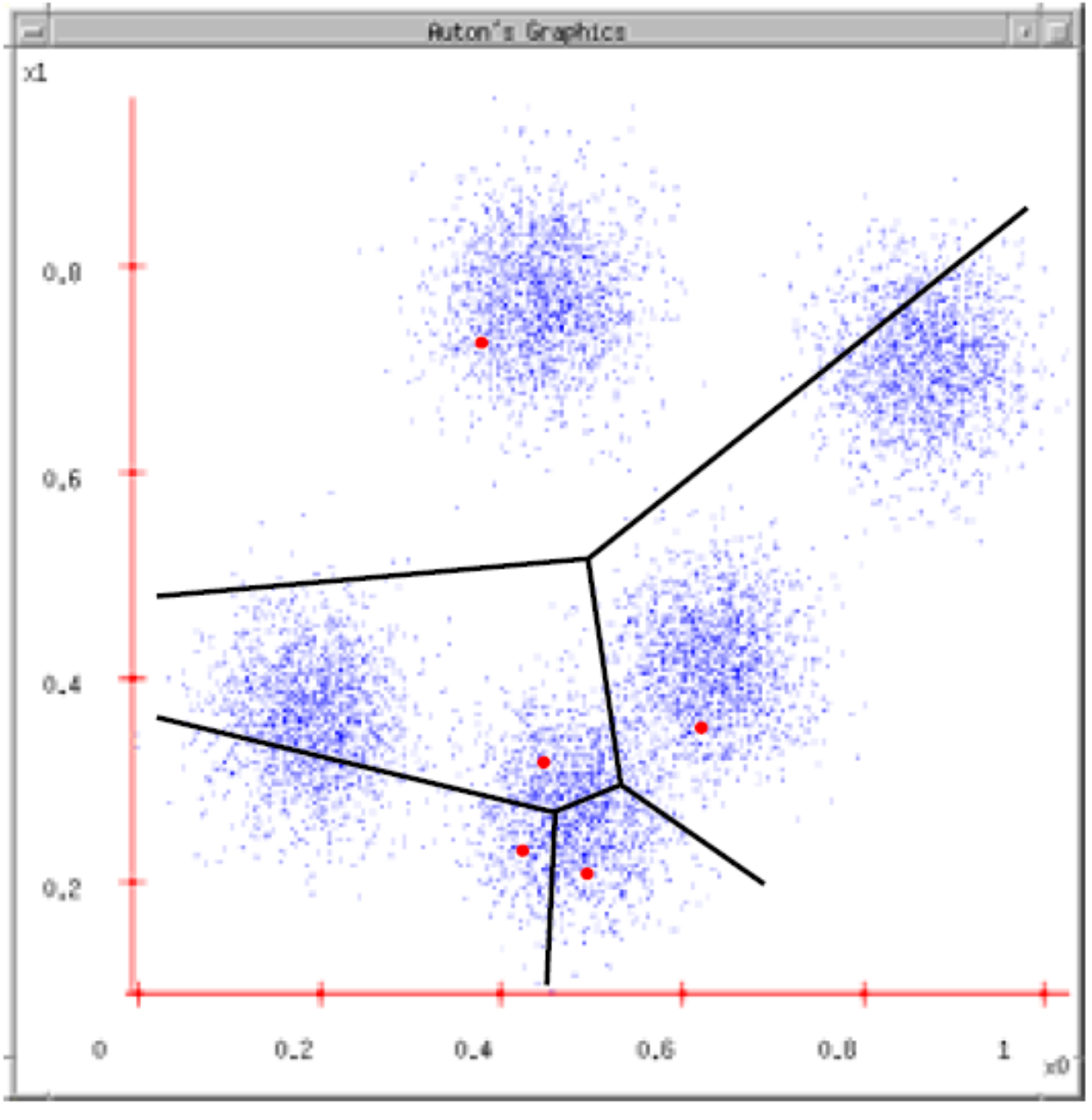
1. Ask user how many clusters they'd like. *(e.g. k=5)*
2. Randomly guess k cluster Center locations



Slide: Andrew Moore

K-means

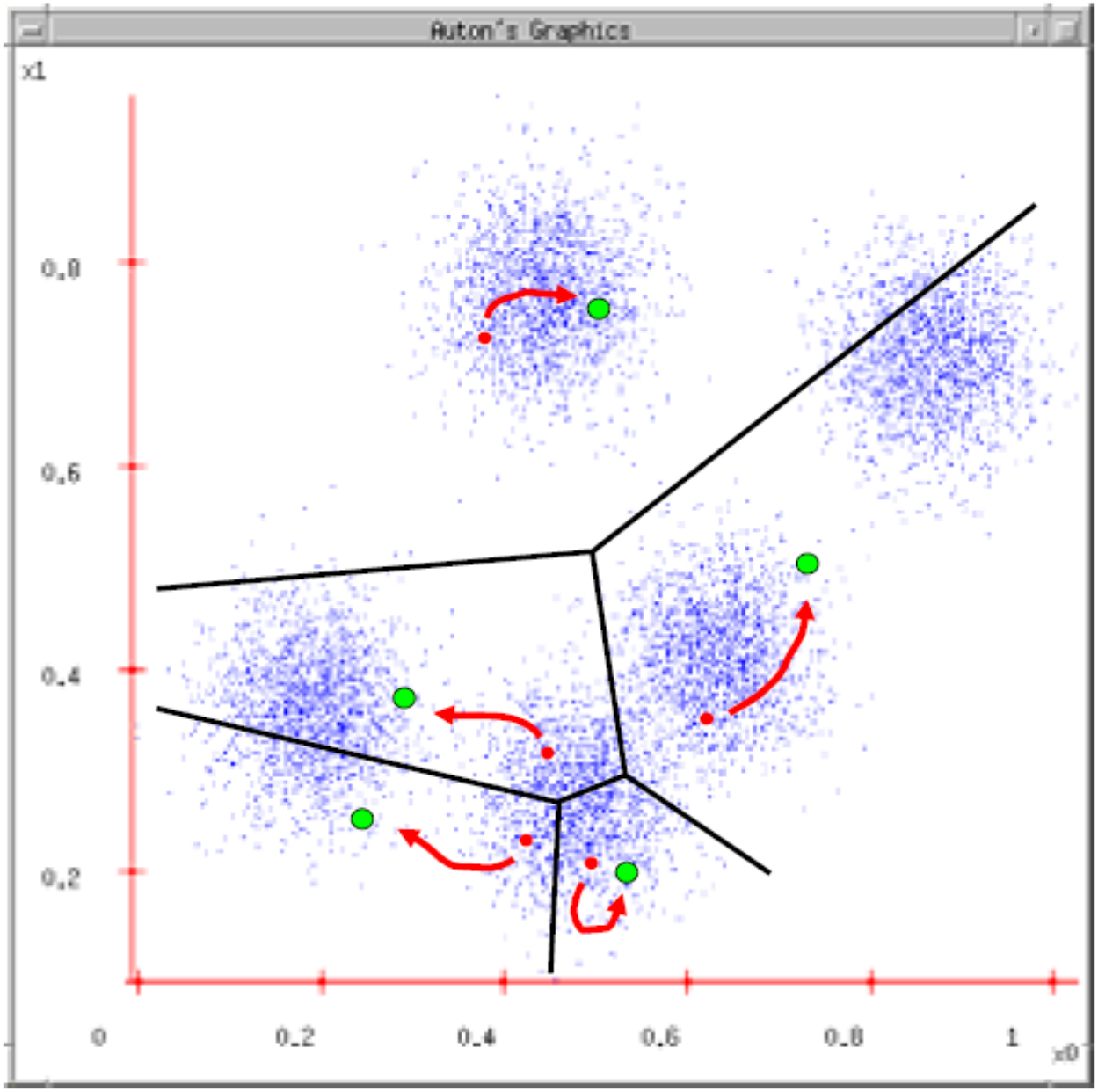
1. Ask user how many clusters they'd like. *(e.g. k=5)*
2. Randomly guess k cluster Center locations
3. Each datapoint finds out which Center it's closest to. (Thus each Center "owns" a set of datapoints)



Slide: Andrew Moore

K-means

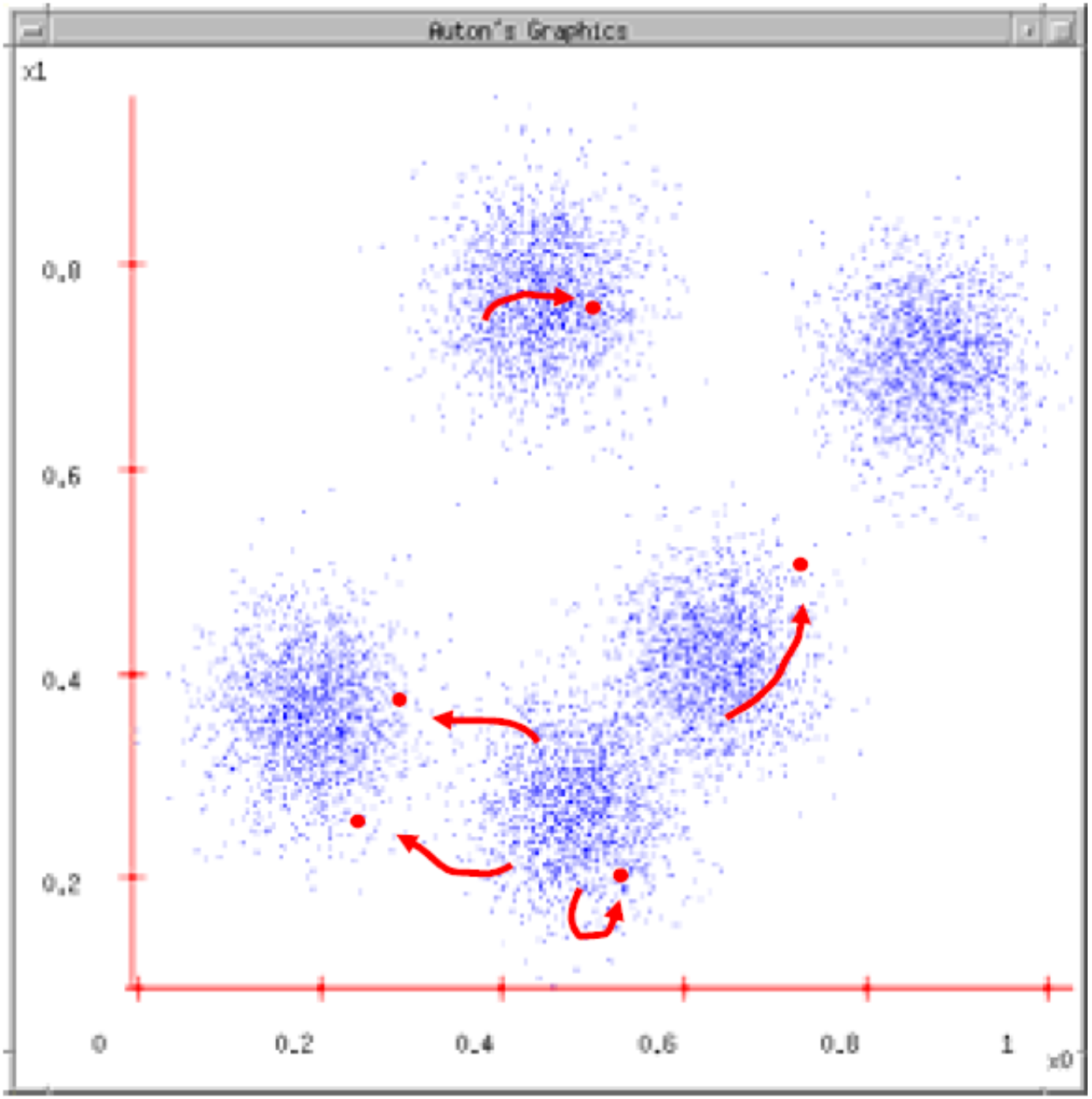
1. Ask user how many clusters they'd like. *(e.g. k=5)*
2. Randomly guess k cluster Center locations
3. Each datapoint finds out which Center it's closest to.
4. Each Center finds the centroid of the points it owns



Slide: Andrew Moore

K-means

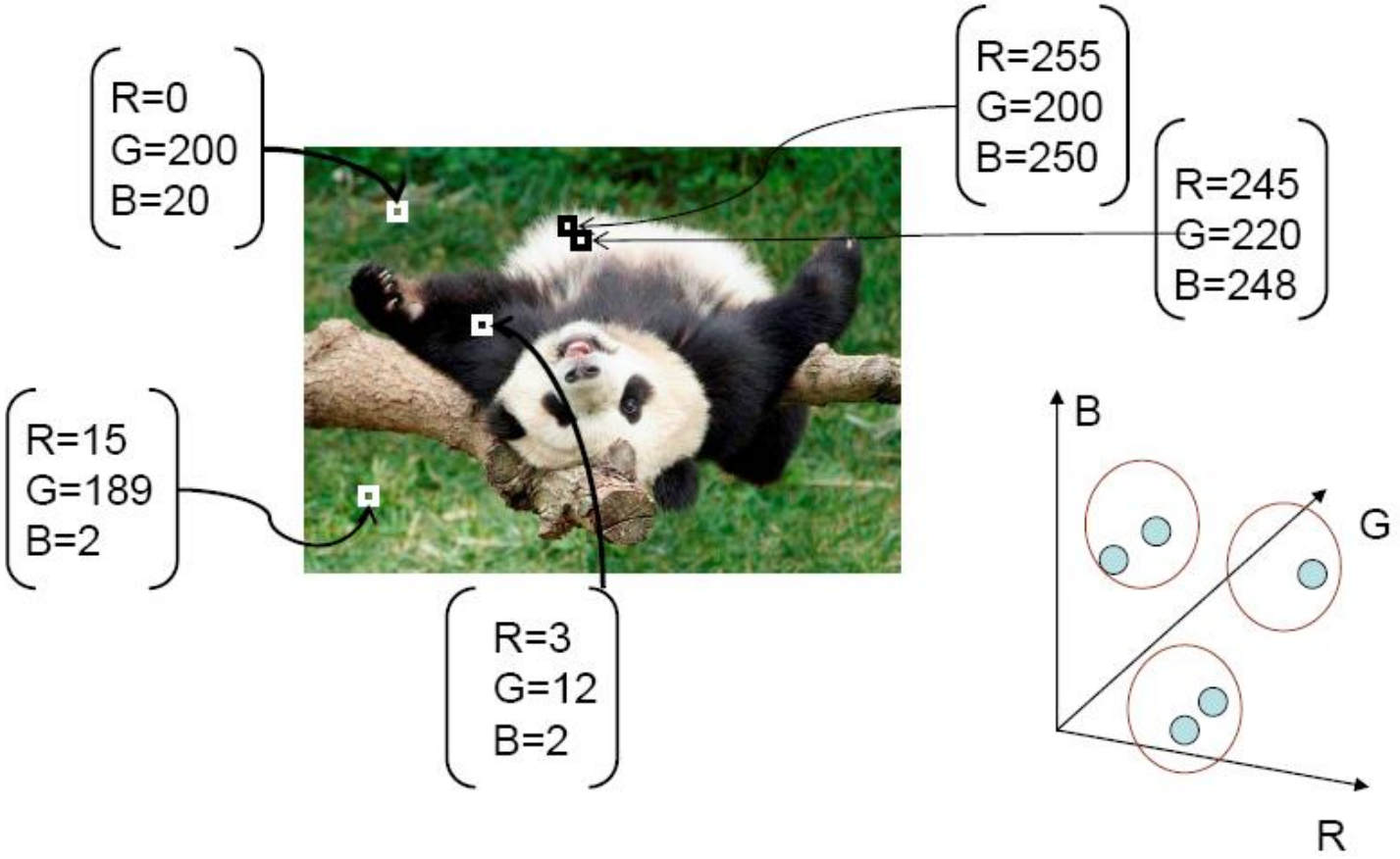
1. Ask user how many clusters they'd like. *(e.g. k=5)*
2. Randomly guess k cluster Center locations
3. Each datapoint finds out which Center it's closest to.
4. Each Center finds the centroid of the points it owns…
5. …and jumps there
6. …Repeat until terminated!



Slide: Andrew Moore

Segmentation as Clustering

- Cluster similar pixels (features) together

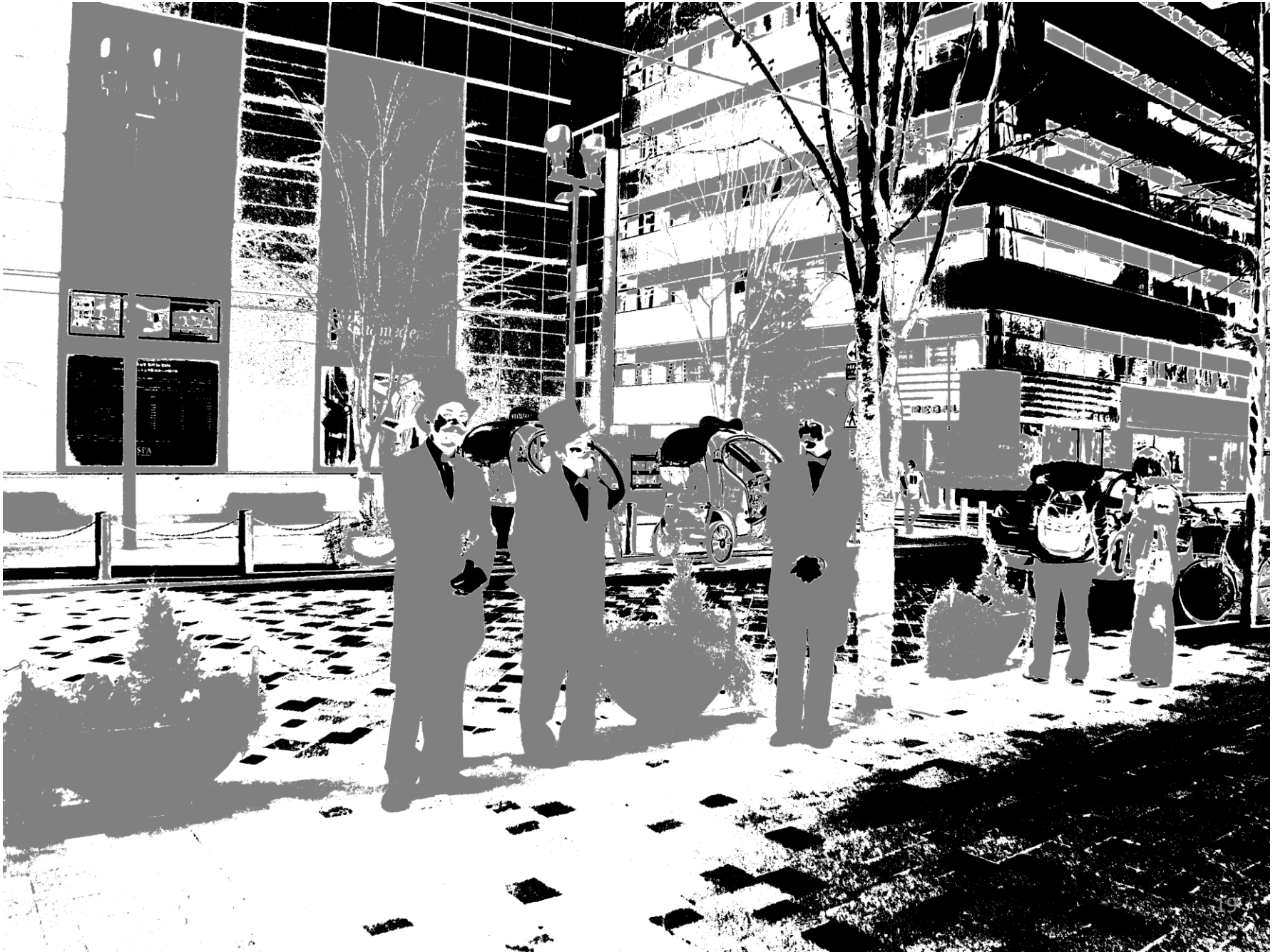


Slide: Kristen Grauman

Original Image

$K = 2$

K = 3

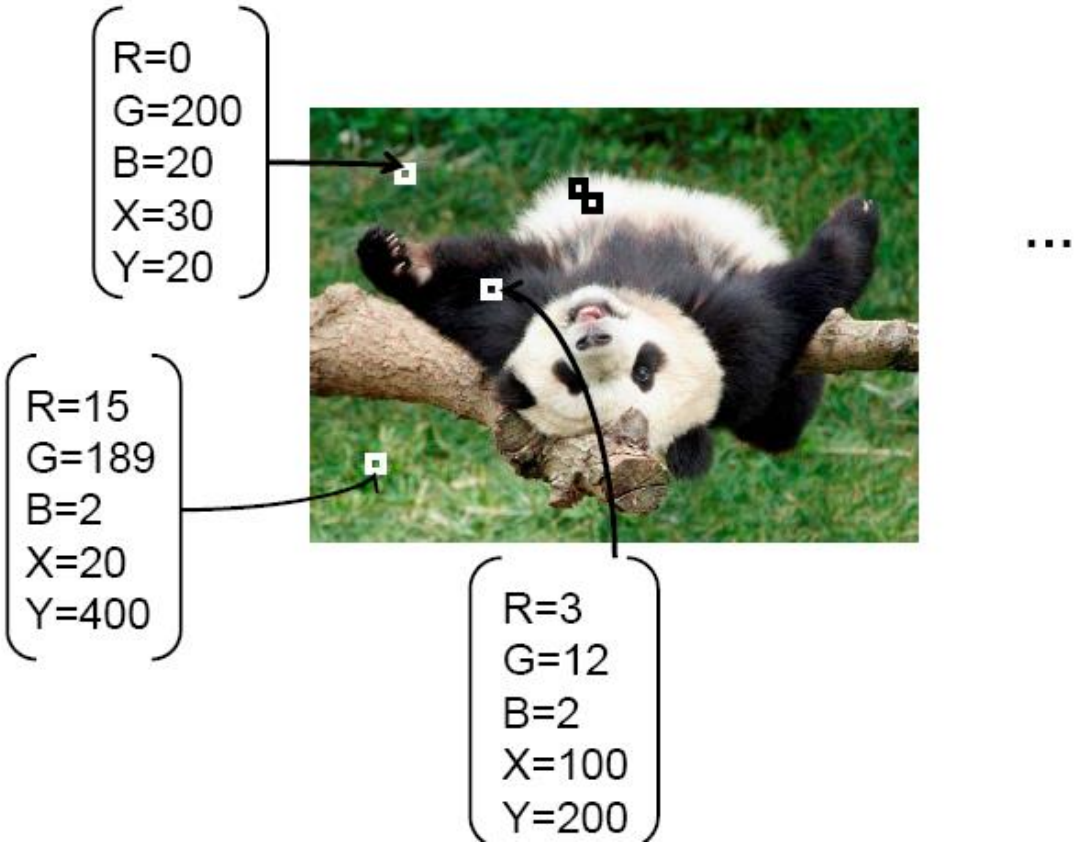


K = 5

K = 10

Segmentation as Clustering

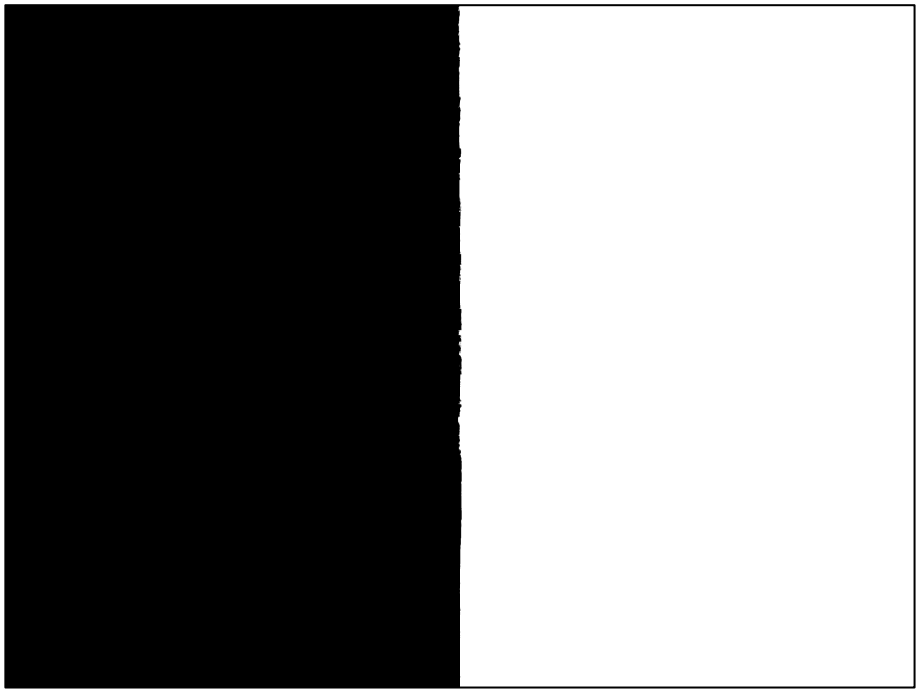
- Cluster similar pixels (features) together



Source: Kristen Grauman

K = 2

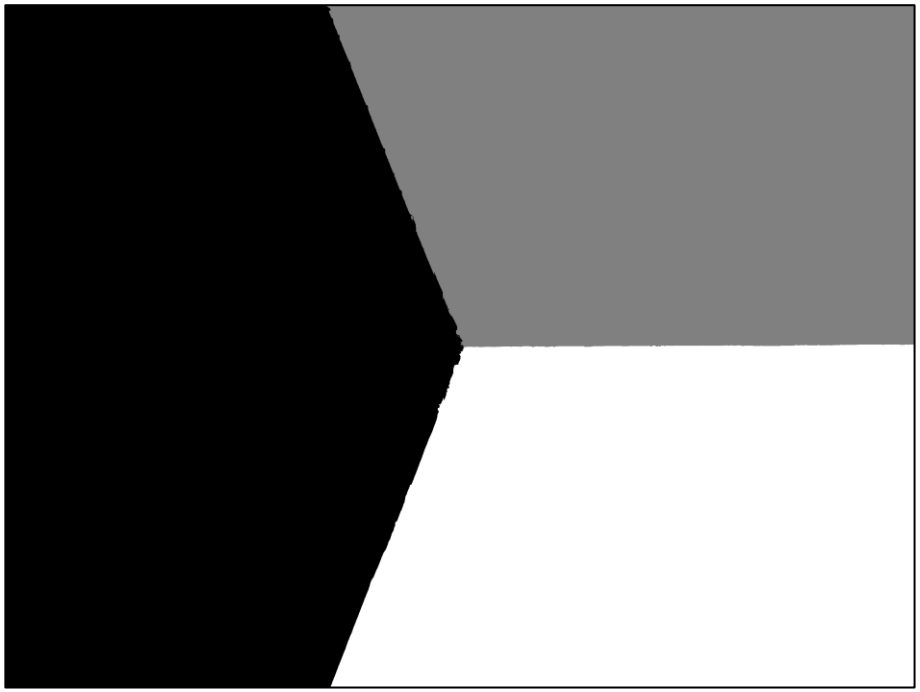
[R G B X Y]



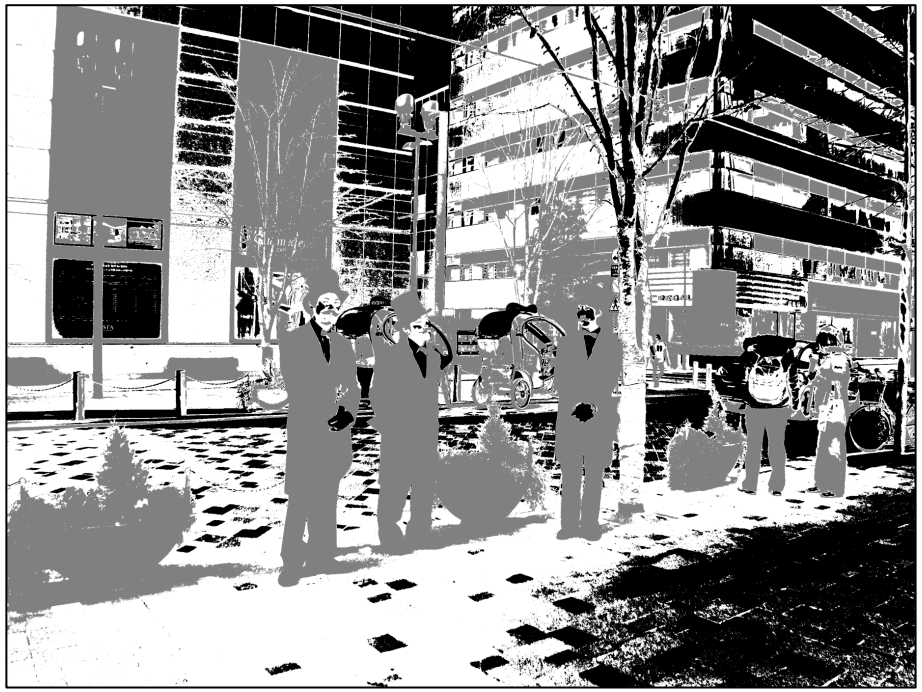
[R G B]

K = 3

[R G B X Y]

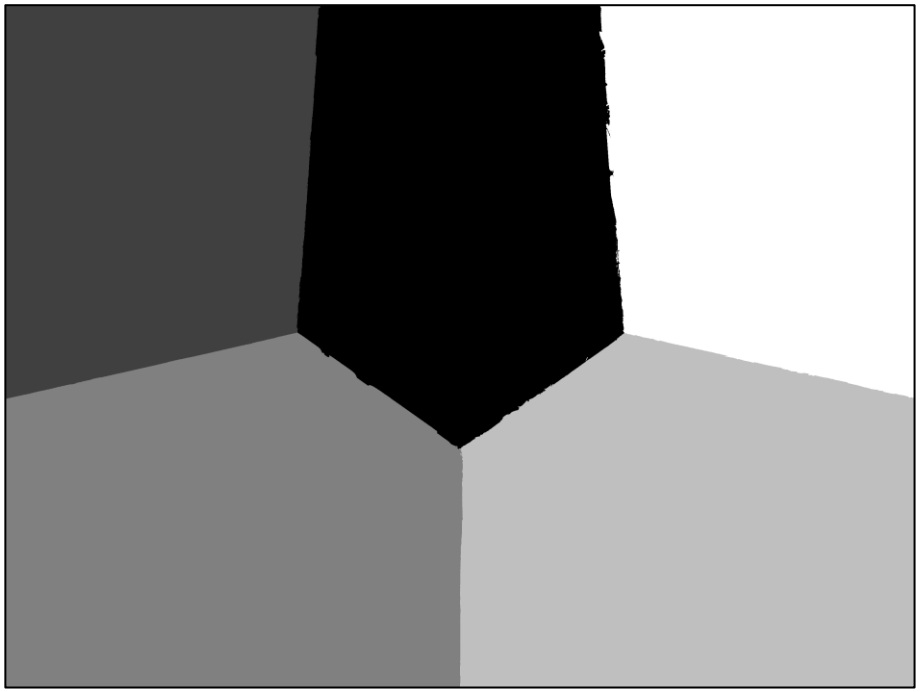


[R G B]



K = 5

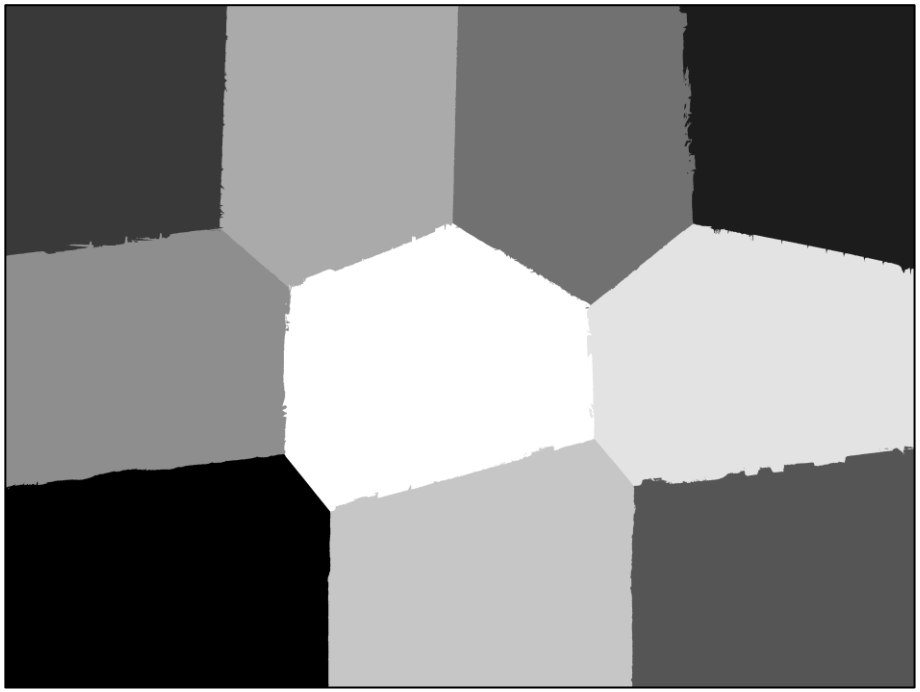
[R G B X Y]



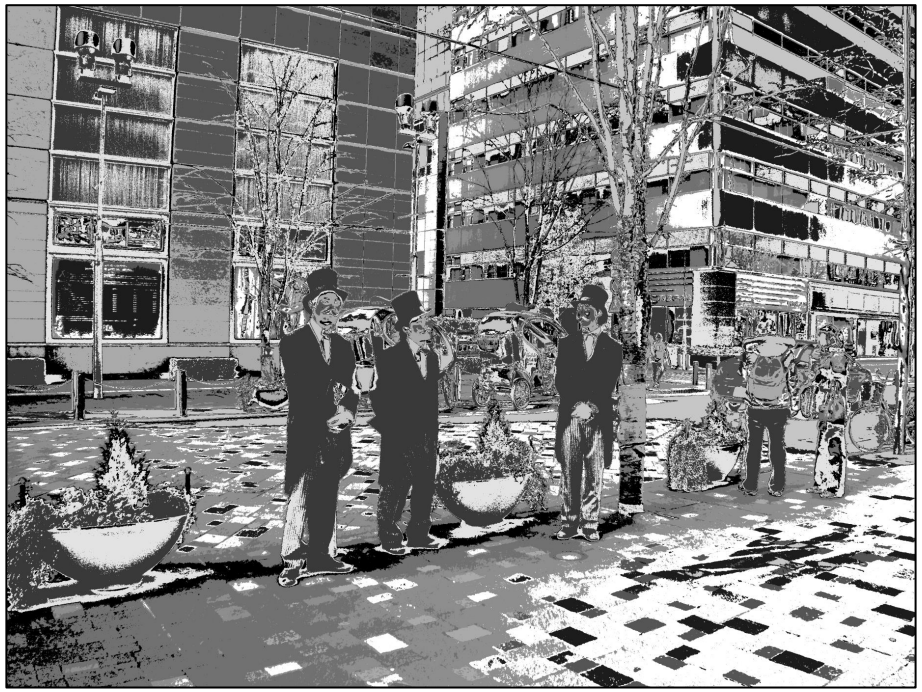
[R G B]

K = 10

[R G B X Y]

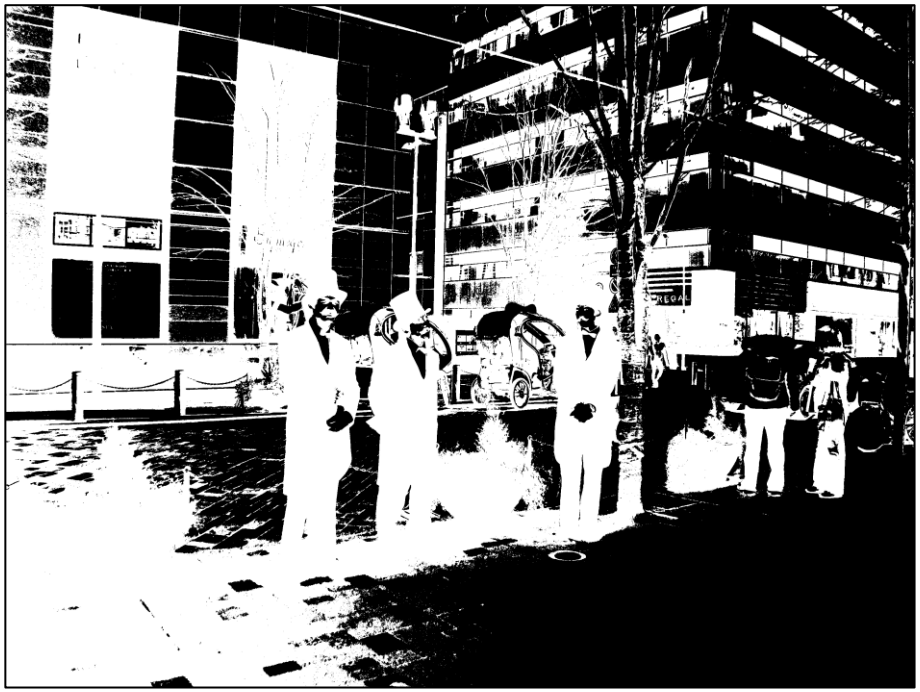


[R G B]



K = 2

Normalized [R G B X Y]

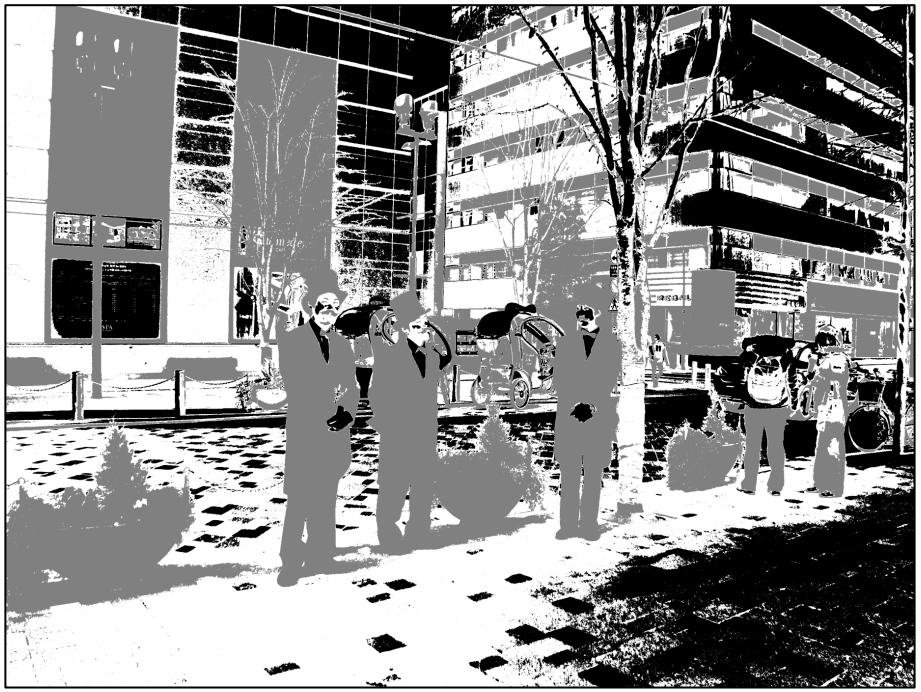


[R G B]

K = 3

Normalized [R G B X Y]

[R G B]



K = 5

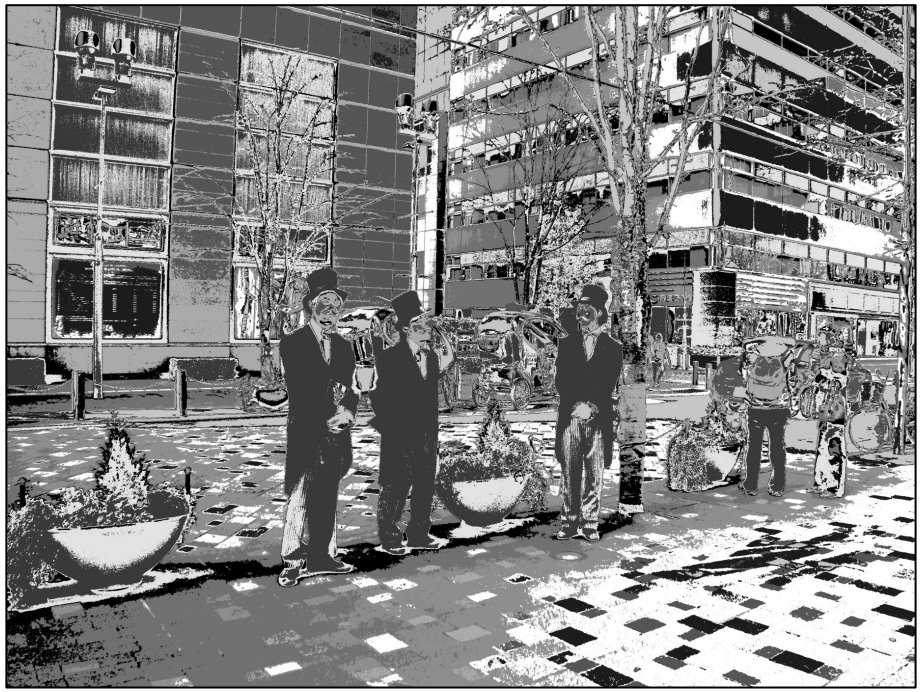
Normalized [R G B X Y]

[R G B]

K = 10

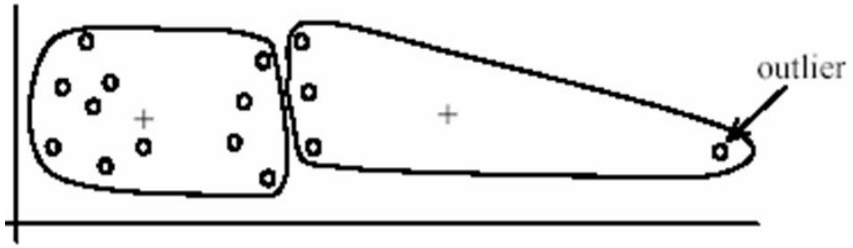
Normalized [R G B X Y]

[R G B]

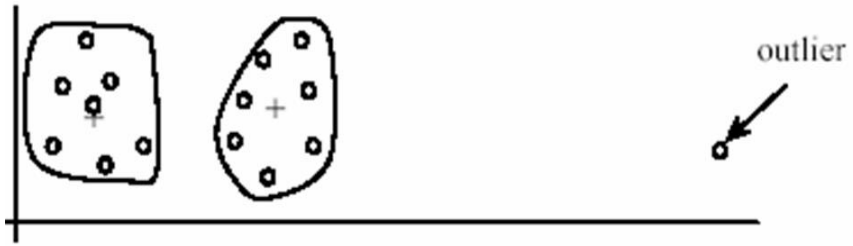


K-Means for Segmentation

- Pros
  - Very simple method
  - Converges to a local minimum of the error function
- Cons
  - Memory-intensive
  - Need to pick K
  - Sensitive to initialization
  - Sensitive to outliers
  - Only finds “spherical” clusters



(A): Undesirable clusters



(B): Ideal clusters

Slide: Svetlana Lazebnik

References

- Image Segmentation
  Gonzalez: Chapter 10
  Szeliski: Chapter 5