Image Features - 1

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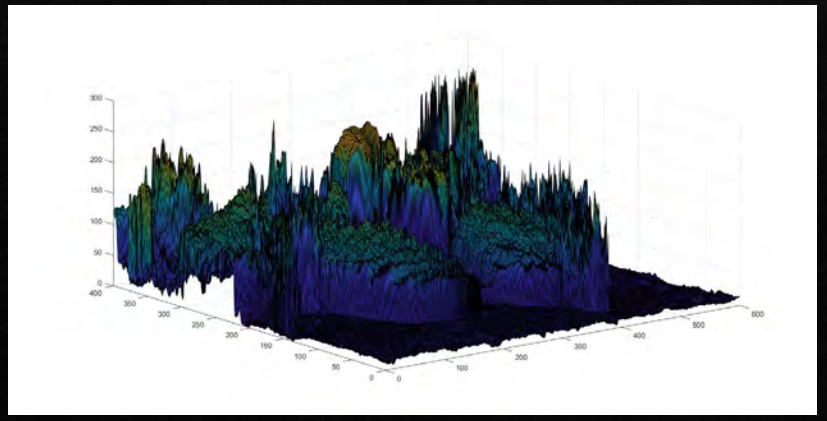
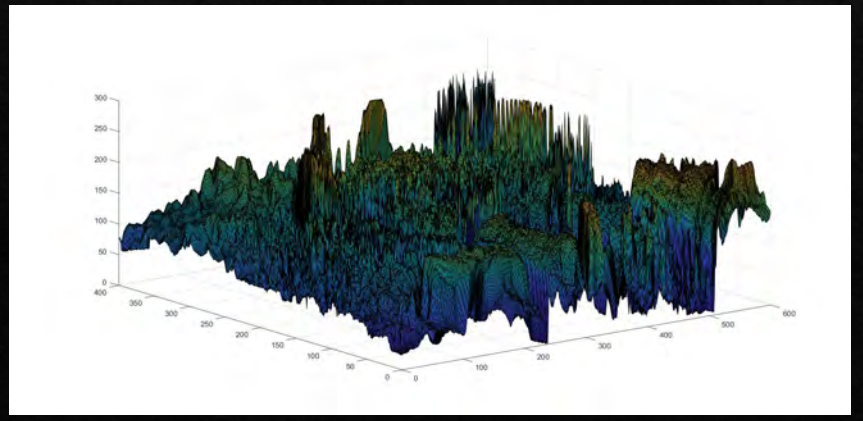
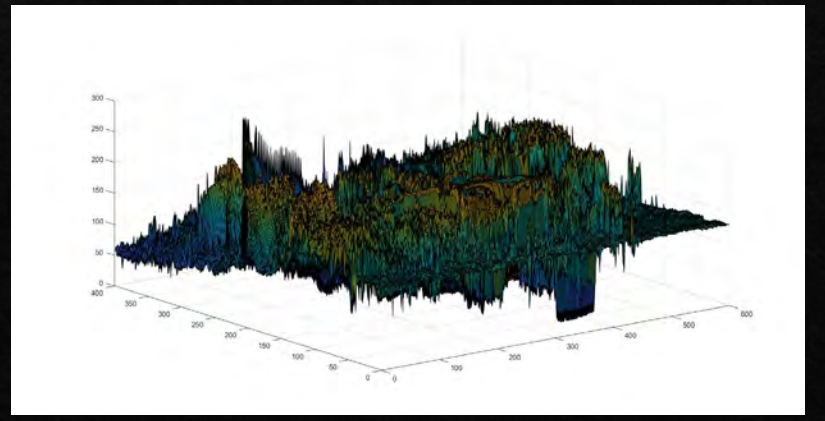
What the Computer Sees







Problems with this view:

- Too much useless data
- Highly dependent on viewpoint and lighting changes
- All parts of the image have equal importance
- Not discriminative enough (all images look similar)
- Not task-specific
- Dependent on size of image

The Solution: Features

- Reduce computation cost
- Can be invariant to change of viewpoint, illumination
- Information content high
- Uniqueness
- Can be tuned to a task at hand
- Can be made independent of image size

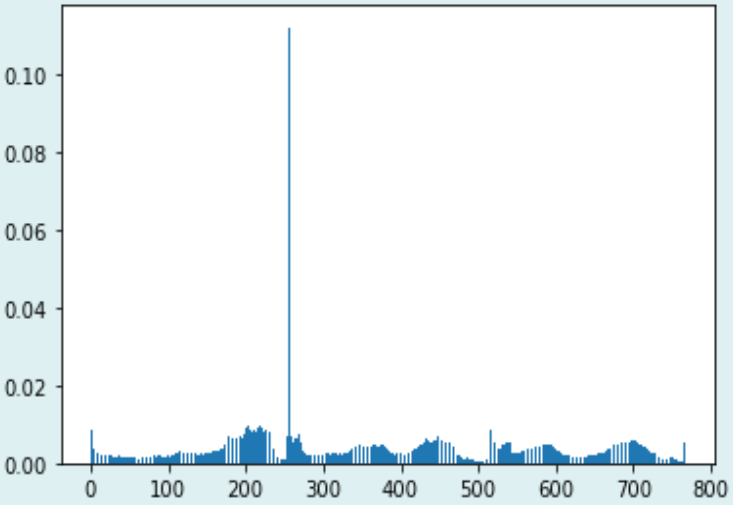
Features

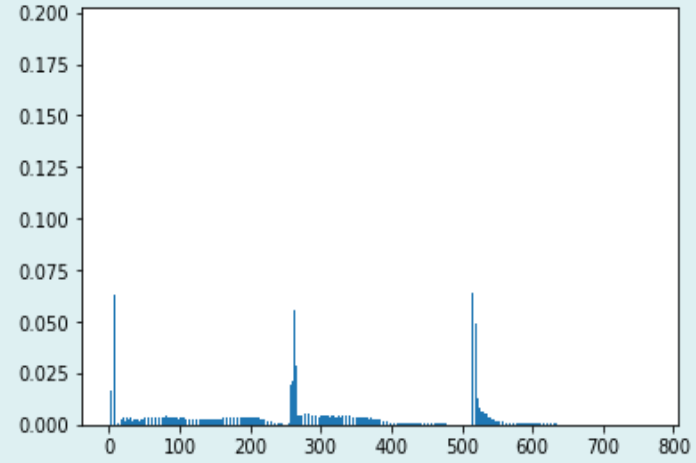
- Features can be global or local
- Global
  - Collected from the whole image
  - Examples: Color histogram, LBP histogram
- Local
  - Collected from meaningful parts of the image, such as edges or corners.
  - Examples: SIFT features, HOG features

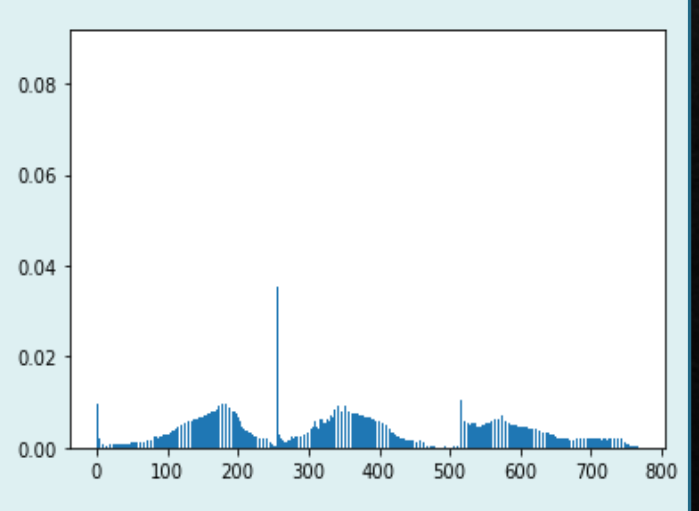
Color Histogram

- Global feature
- A frequency distribution of pixel intensity values in an image
- For grayscale images, there are at most 256 possible intensities
- For color images, there are at most 768 (256*3) possible intensities
- Needs to be normalized for image size
- Not very effective, but very simple to compute

Color Histogram







Distance Measures

- If A, B and C are points in space, then their distance D(A,B) is any function that follows these rules:
  - D(A, A) = 0
  - D(A, B) > 0 if $A \neq B$
  - D(A, B) = D(B, A) [Symmetry rule]
  - D(A, B) + D(B, C) >= D(A, C) [Triangle inequality]

Common Distance Measures

- Hamming Distance
- Euclidean Distance
- Manhattan Distance
- Cosine Distance
- Many, many more