Visualizing Brand Associations from Web Community Photos

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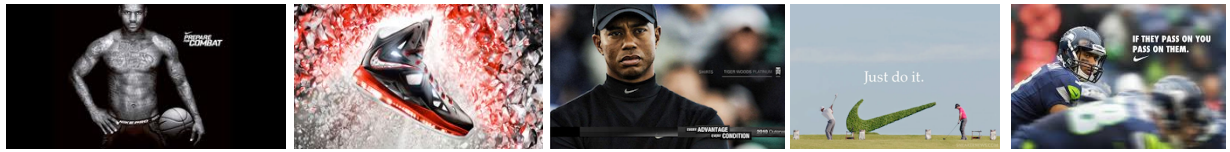
Brand Equity & Brand Associations
(What Comes to Mind When You Think of …)

- Brand Equity
  - A set of values or assets linked to a brand's name and symbol
- Brand Association
  - **Consumer-driven** brand equity
  - A set of associations that consumers perceive with the brand
  - Top-of-mind attitudes or feelings toward the brand

basketball, golf, …



swimming, diving, beach, …

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Photo-based Brand Associations

How can we find out people's brand associations?

- Traditional: textual data from consumer responses to questionnaires
- Our idea: Take advantage of large-scale ***online photo*** collections
- No previous attempts so far to leverage the pictures

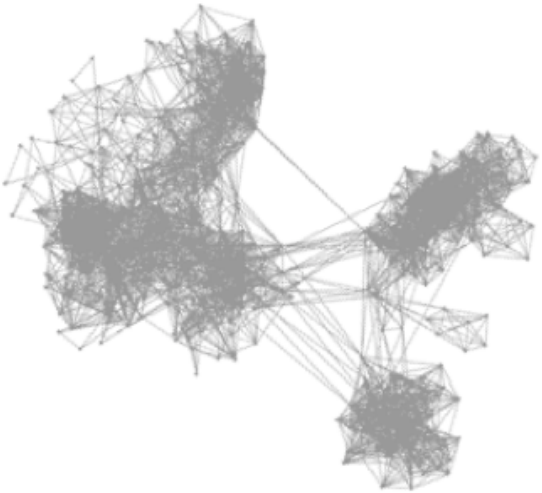
Traditional way:

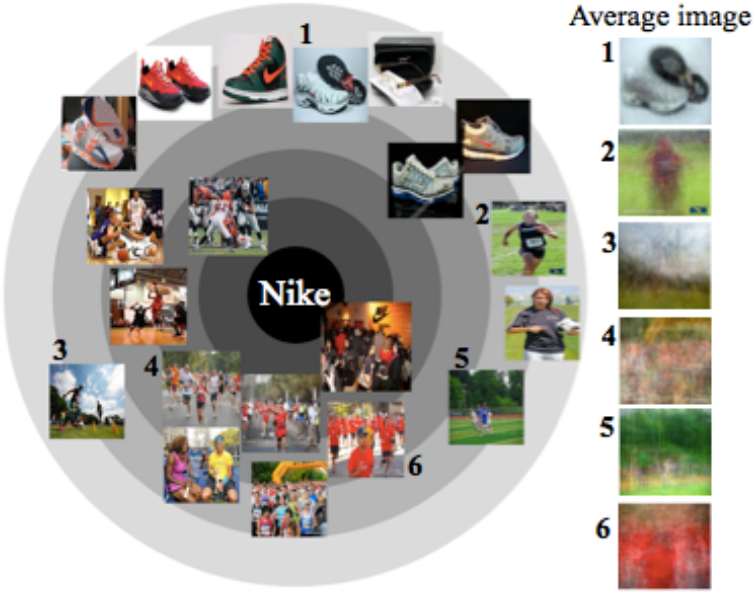
In-N-Out [Dane et al. 2010]

Our way:

Main Contributions

1. Visualize brand associations in both image and subimage level
2. Develop an algorithm to jointly
   1. Detect and cluster key pictorial concepts
   2. Localize the regions of brand in the images
3. Demonstrate and evaluate this approach on image dataset:
   1. From five websites
   2. ~5 million images of 48 brands of 4 categories





Approach – KNN Graph Generation

Feature extraction

- Dense feature extraction of Color SIFT and HOG

Image Similarity Measure

- Histogram intersection

Constructing K-Nearest Neighbor graph

- Repeat random divide-and-conquer process for several times

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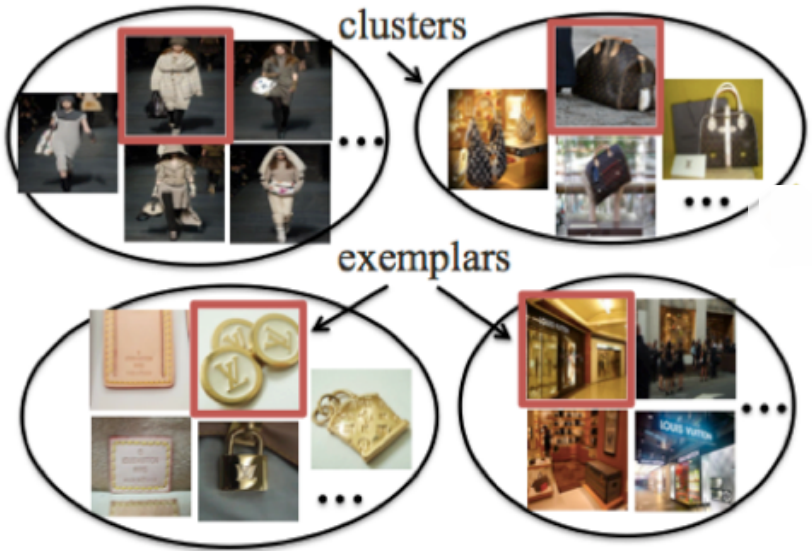
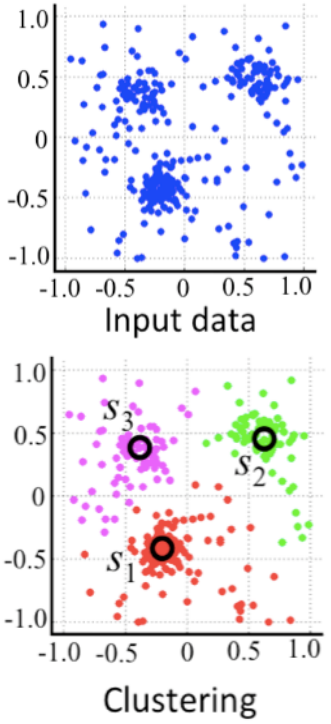
Approach – Exemplar Detection/Clustering





Detecting L number of exemplars

- A small set of representative images
- Diversity ranking algorithm (temperature maximization) [Kim & Xing 2011]
- Solving submodular optimization to obtain exemplars

Clustering

- Each image is associated with its closest exemplar
- Random walk model

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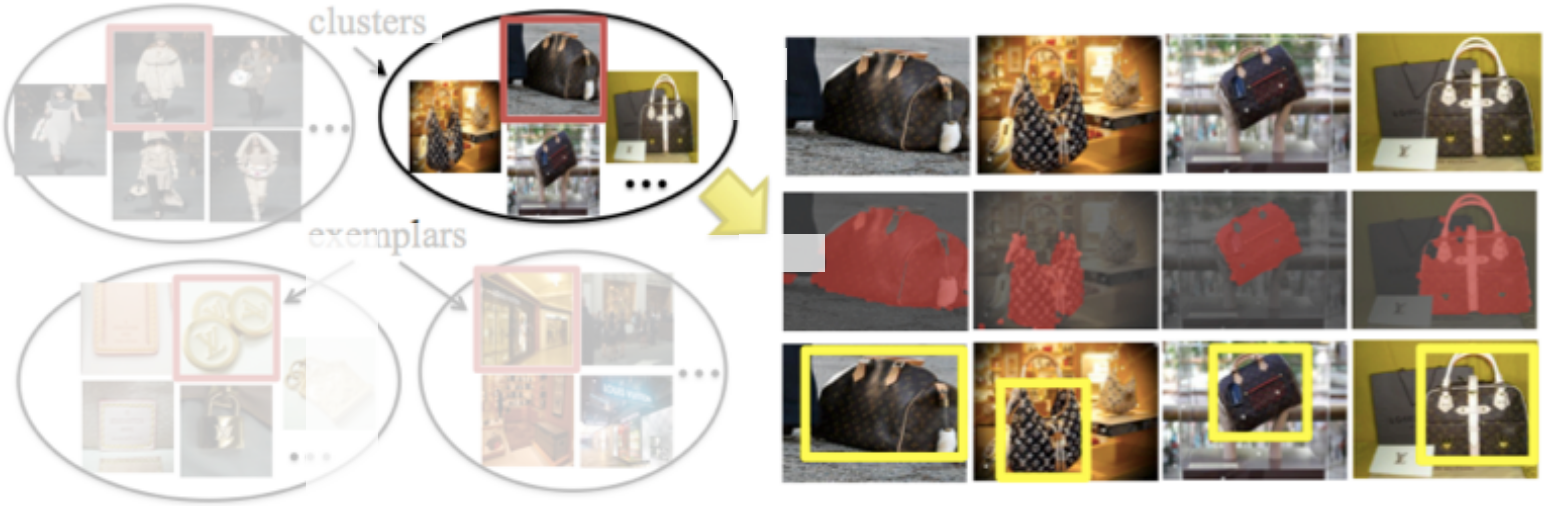
Approach – Brand Localization via Cosegmentation



Find the regions that are most relevant to the brand

- Separately applying the cosegmentation algorithm to each cluster
- Use MFC algorithm [Kim&Xing. 2012] to each cluster of coherent images
  - Foreground modeling
  - Region segmentation

Then, go back to graph generation – a closing loop

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Visualization – Brand Association Maps

Goal: Compute two coordinates (r,θ) of key clusters

- Radial distance: a larger cluster closer to the center
- Angular distance: the smaller, the higher correlation

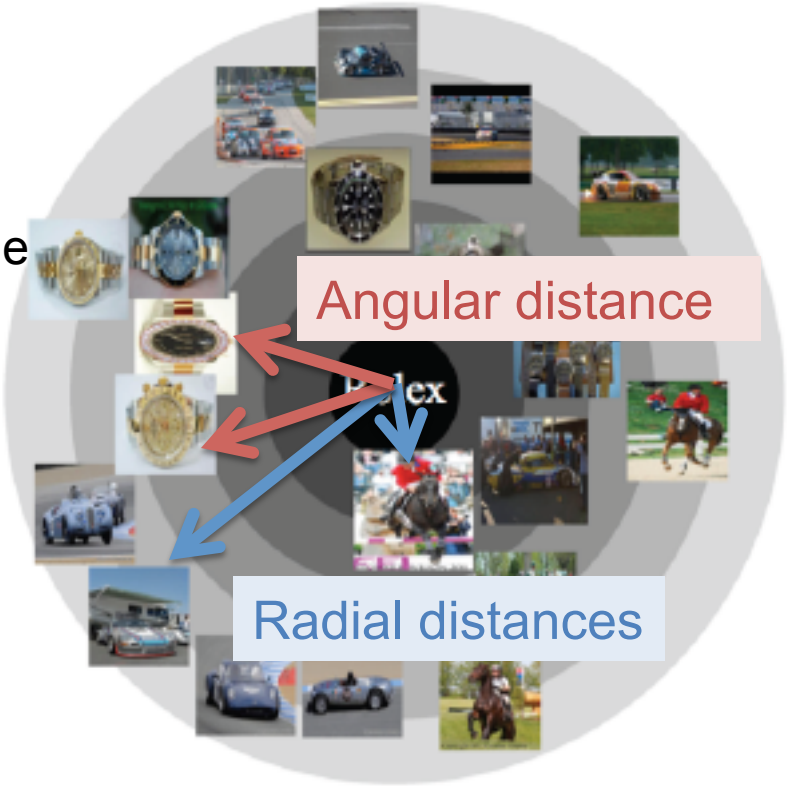
(Based on Nielson's BAM)

Radial distance

- Compute stationary distribution of nodes

Angular distance

- Pairwise similarity btw clusters ***S*** using the *random walk with restart* [Sun et al. 2005]
- Using spherical Laplacian eigenmap [Carter et al. 2009.]



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Experiments – Brand Association Maps

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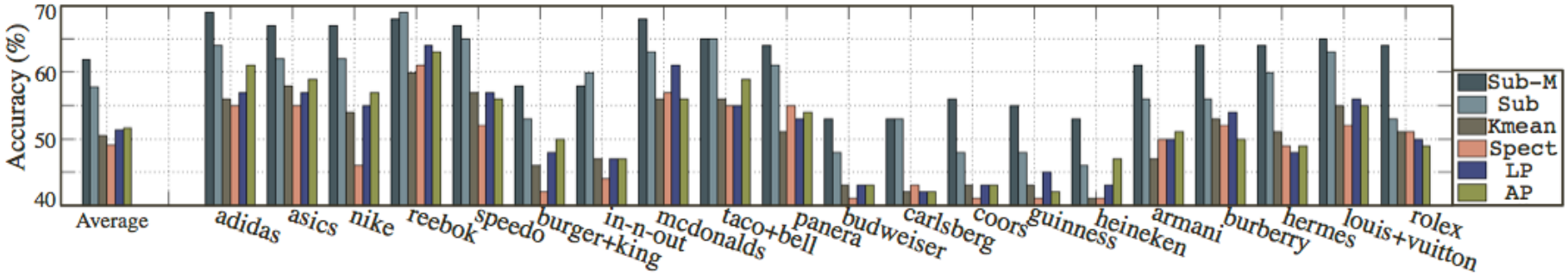
Experiments – Exemplar Detection/Clustering

Groundtruth for clustering accuracy

- Randomly select 2000 sets of three images
- Manually label which two images are more similar, in each set
- Compute the similarity using our approach
- Accuracy is measured by how many sets are correctly clustered



Sub-M: Multiple runs of our clustering + cosegmentation
Sub: Our clustering without cosegmentation Kmean/Spect: K-mean clustering / Spectral clustering
LP: Label propagation [Raghavan et al. 2007] AP: Affinity propagation [Frey & Dueck 2008]

Observations

Cosegmentation for brand localization improves the clustering performance

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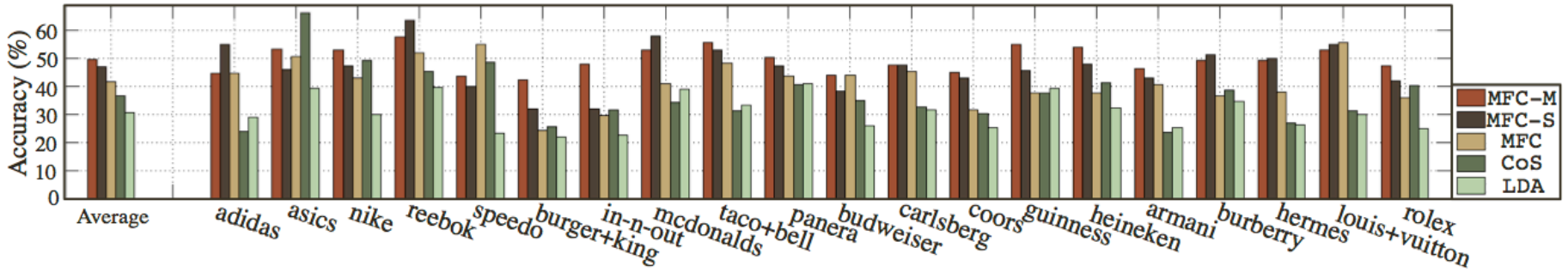
Experiments – Brand Localization

Task: Foreground detection

- Manually annotate 50 images per class
- Accuracy is measured by intersection-over-union $Acc = \frac{GT_i \cap R_i}{GT_i \cup R_i}$



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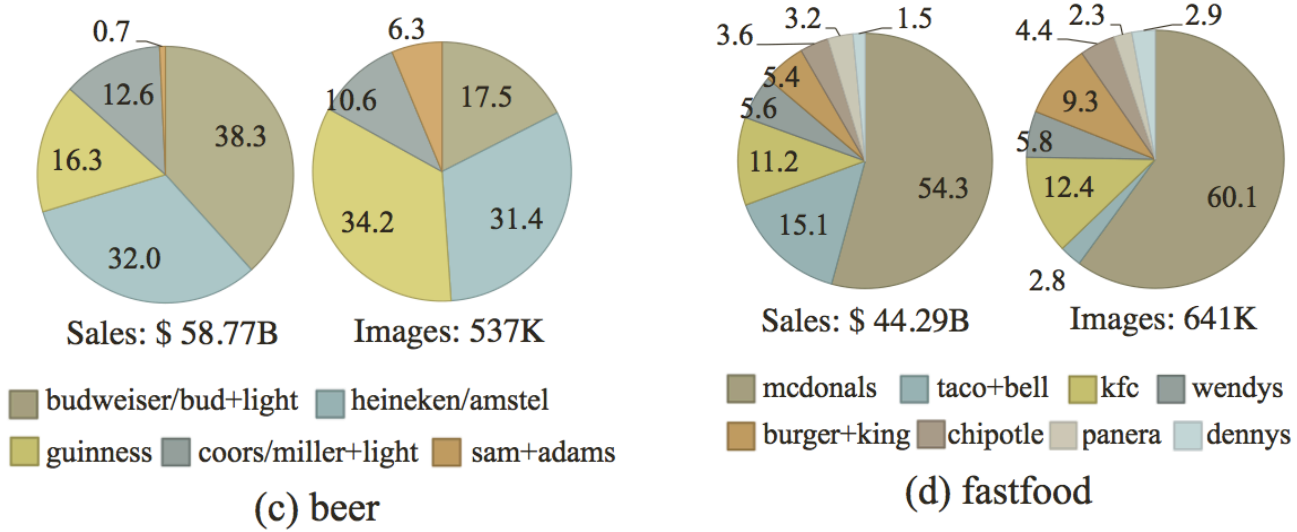
Experiments – Correlation with Sales Data

Photo volumes vs. Market share

- Nike's market share is 57.6% in sports brands. How's about image volumes?
- Based on brands' annual reports



Observations

- Ranking are roughly similar, but the proportions do not agree.

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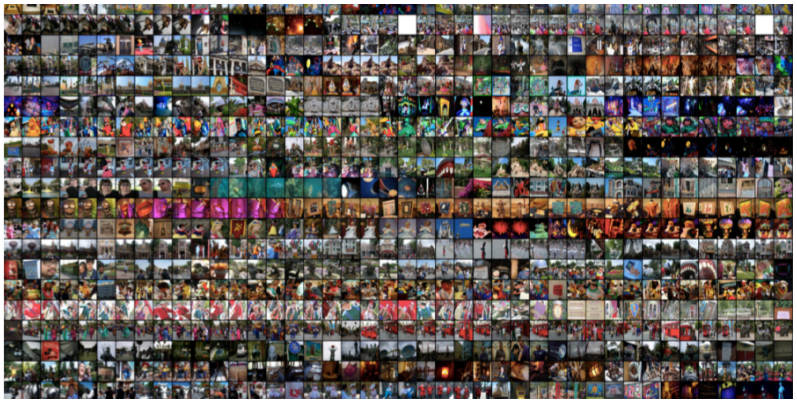
Discussions

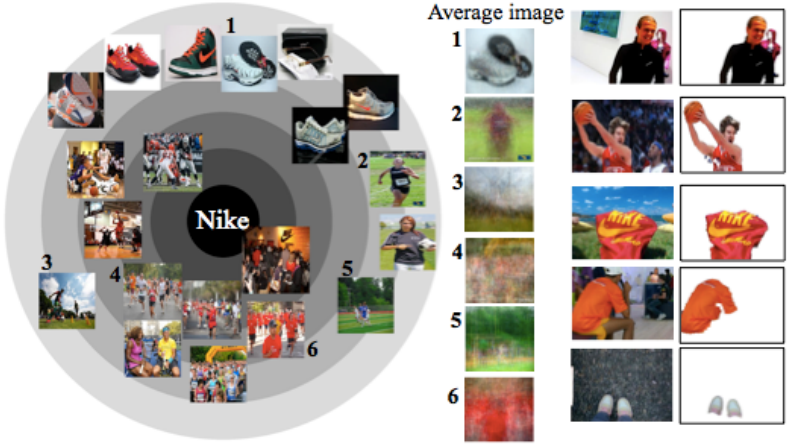
- Strength/Benefits
  - Get images from social media – cheap, instantaneously
  - Large amount of images
  - Reach a large crowd of potential customers



  - Introduce a novel source of data for the analysis.
  - Exploring the images conveys complementary views on the brand associations over the texts.
- However, need to handle redundant/noisy clusterings, and polysemous brand names

Conclusion

Study of brand associations from millions of Web images



Jointly achieving two levels of visualization tasks

- Visualizing core pictorial concepts associated with brands
- Localizing the regions of brand in images

Various potential applications

- Online multimedia contextual advertisement, competitor mining

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