1. Background & Objective

- Web is the largest image DB.
- It is also a very noisy DB.
- To remove noise, we apply object recognition methods.

```text
- "Web Image Re-ranking"
  - We assume no feedback and fully automatic "Web Image Re-ranking".
  - It is desirable for gathering visual knowledge of many concepts for object recognition from the Web.
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In this paper, we import region-based bag-of-features (BoF) to Web image re-ranking.

1.1. Image representation
- region-based bag-of-features
  - [Ravinovich et al., ICCV 07]
  - sMIL (sparse multiple instance learning)
  - [Bunescu et al., ICML 07]
  - Probabilistic latent topic models with pLSA and LDA
  - [Yanai et al., MM05, Monay et al., PAMI 07]

2. Related Work

- General Framework: Web image search + object recognition methods
- key words: Gather images from Web using search engines
- image analysis: ML methods
- re-ranked images

3. Methods

3.1. Prepare Keywords
- e.g., "sunrise", "lion" and "apple fruit"

3.2. Gather Web images
- Send the given keyword to several search engines, and gather thousands of Web images (Google Image Search, Google Text Search, MSN, ask.com, Yahoo Image, Yahoo Search)

3.3. Select pseudo-positive images
- Evaluate HTMLs containing images based on the simple heuristics [Yanai ACMMM03] and select pseudo-positive images automatically

3.4. Extract region-based BoF vectors
- Carry out region segmentation with JSEG and extract BoF from each region

3.5. Train a model
- Two discriminative and two generative
  - [5-1] standard SVM
  - [5-2] sparse MIL [Benescu et al., ICML07]

4. Experiments for 15 words
- 4 scenes + 6 objects + 5 objects
- Sunse, mountain, waterfall, beach, noodle, flower, lion, airplane, guitar, jeep, motorcycle, bike

4.1. Methods:
- [raw data] raw (only HTML analysis)
- [baseline1] GMM-based region prob. Model (acmmir05)
- [baseline2] whole-image-based BoF + SVM
- [sMIL] region-based BoF + sparse MIL
- [pLSA] region-based BoF + pLSA
- [ACM MIR05]

4.2. Evaluation: precision at 15% recall

5. Conclusions

- We confirmed that region-based BoF is effective for "object" words.
- S-MIL outperformed pLSA and LDA-based probabilistic methods.

- We plan to use Folksonomy, more sophisticated HTML analysis, and various image features.