

Tour the World: building a webscale landmark recognition engine

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Presenter: Cansın Yıldız

Problems

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- Discovering Landmarks in the World
- Mining True Landmark Images
- Efficiency

Problems

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- Discovering Landmarks in the World
 - Two complementary sources:
 - ✦ GEO-tagged photos from picasa.google.com
 - ✦ Travel guide articles from wikitravel.com
- Mining True Landmark Images
- Efficiency

Problems

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- Discovering Landmarks in the World
- Mining True Landmark Images
 - Visual clustering on the noisy image set
 - Further cleaning of clusters
- Efficiency

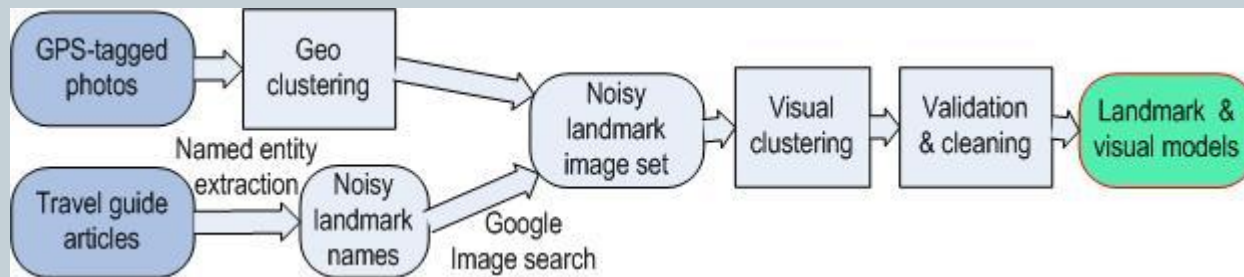
Problems

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- Discovering Landmarks in the World
- Mining True Landmark Images
- Efficiency
 - Parallel computing of landmark models
 - Efficient clustering algorithm
 - Efficient image matching

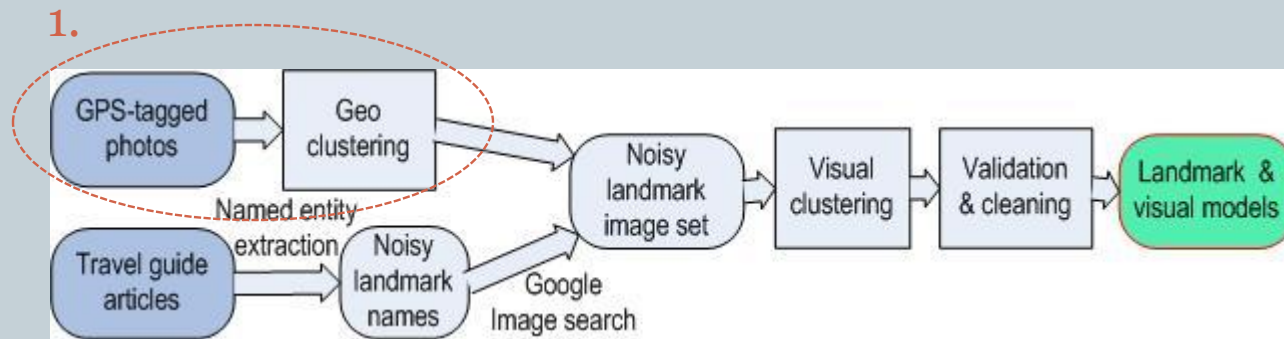
Overview

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GPS Tagged Photos

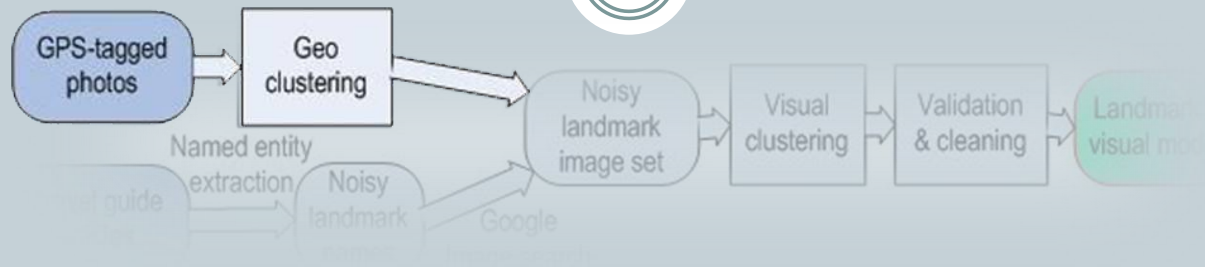
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1. Learning landmarks from GPS-tagged photos

GPS Tagged Photos

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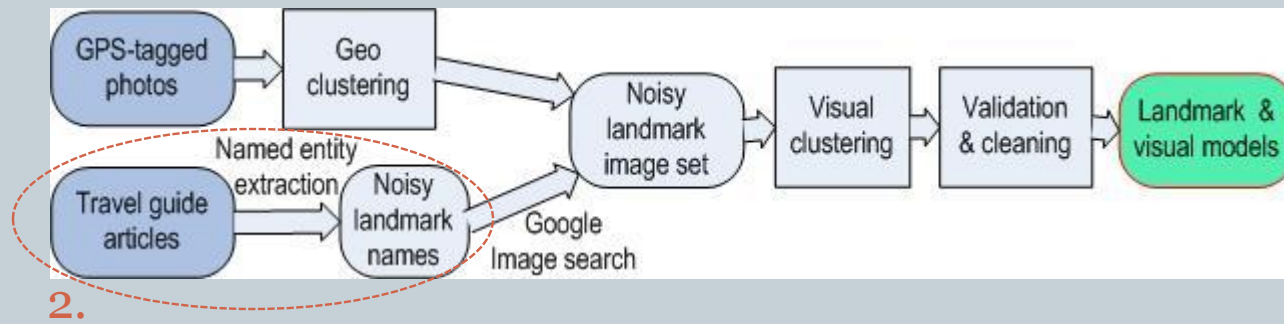
1. Geo-cluster

- Create clusters (I_1) based on GPS coordinates
- Delete clusters with not enough unique authors

- ~140k geo-clusters, ~14k visual clusters, 2240 landmarks

Travel Guide Articles

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2.

2. Learning landmarks from travel guide articles

Travel Guide Articles

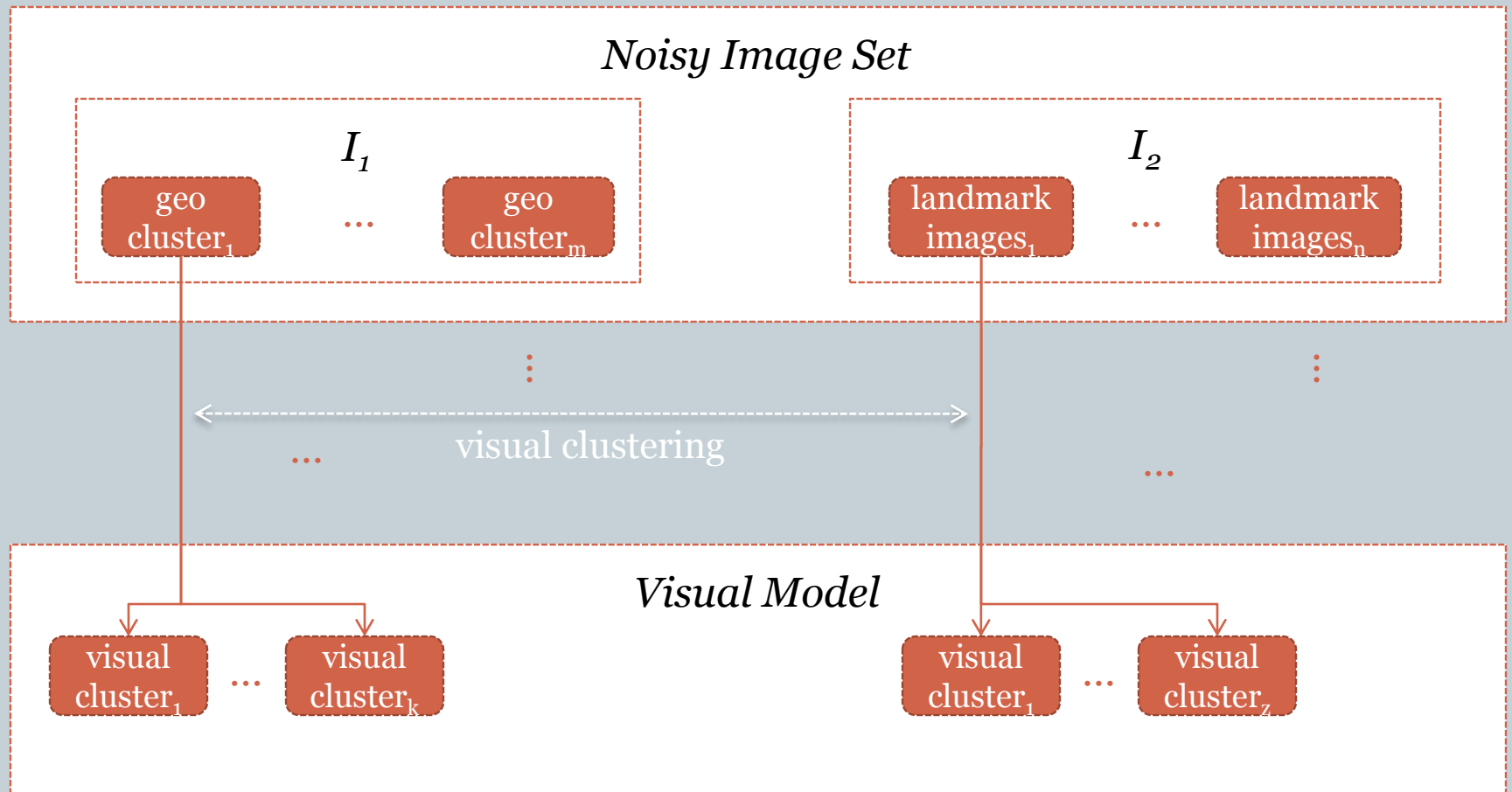
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1. Download wikitravel articles of every city on earth
2. Mine landmark names from articles if,
 - *Text* is within Section “See” or “To See”
 - *Text* is within a bullet list.
 - *Text* is written in bold.
3. Retrieve landmark images (I_2) from google image search
 - 7315 landmark candidates, 3246 landmarks

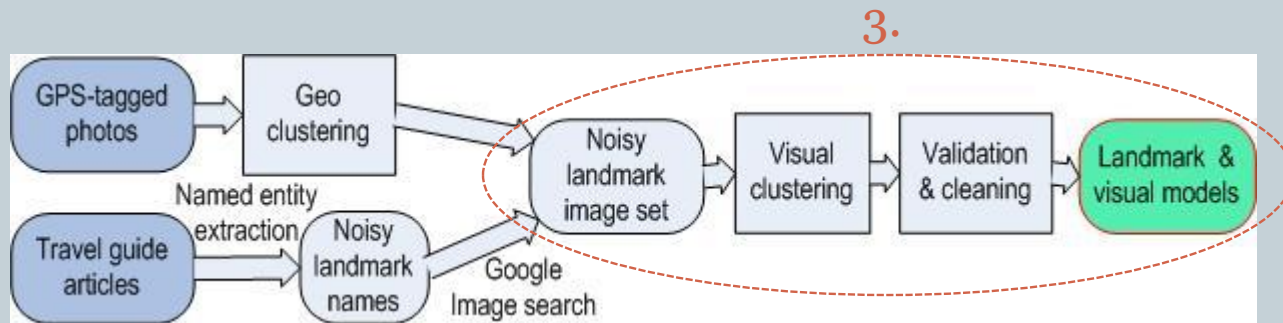
Noisy Landmark Image Set

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Visual Clustering and Cleaning

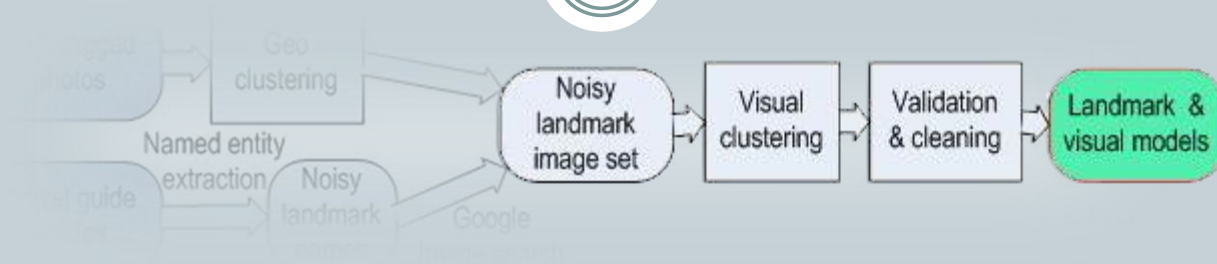
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3. Visual Clustering and Cleaning

Visual Clustering and Cleaning

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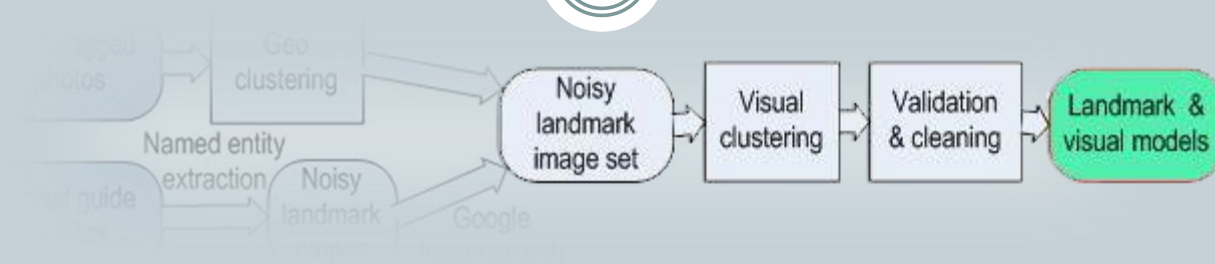


Perform visual clustering for each set in set $I = I_1 + I_2$

1. Object matching based on local features
2. Constructing match region graph
3. Graph clustering on match regions
4. Cleaning visual model

Visual Clustering and Cleaning

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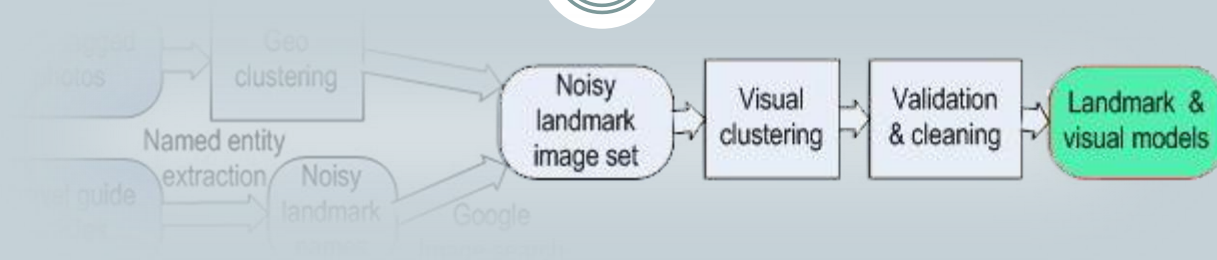


1. Object matching based on local features

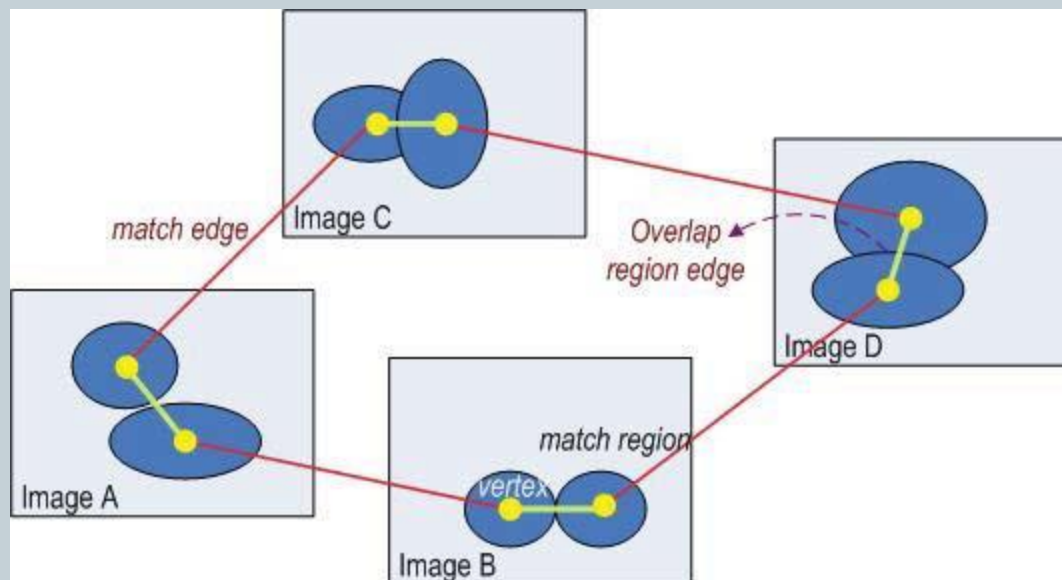
- Use *LOG filters* to detect interest points
- Use *SIFT* for local descriptors
- Get *match score* and *match region*

Visual Clustering and Cleaning

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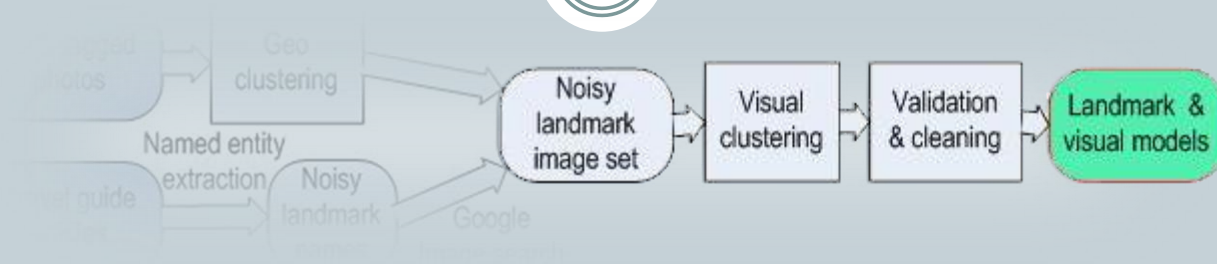


2. Constructing match region graph



Visual Clustering and Cleaning

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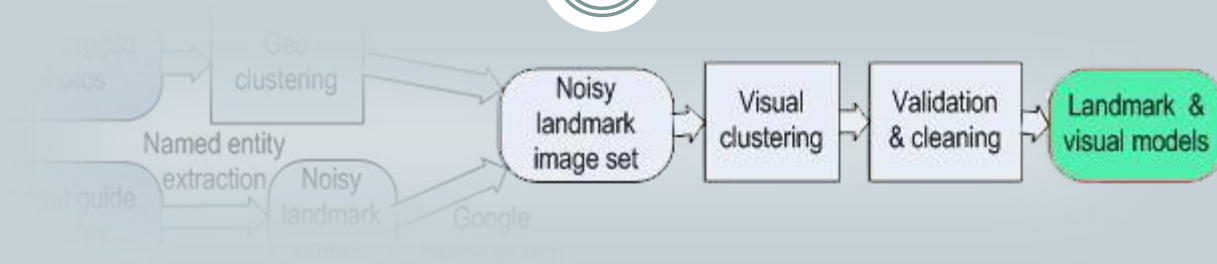


3. Graph clustering on match regions

- Lack of priori knowledge, can't use *k-means*
- Use *hierarchical agglomerative clustering* instead.

Visual Clustering and Cleaning

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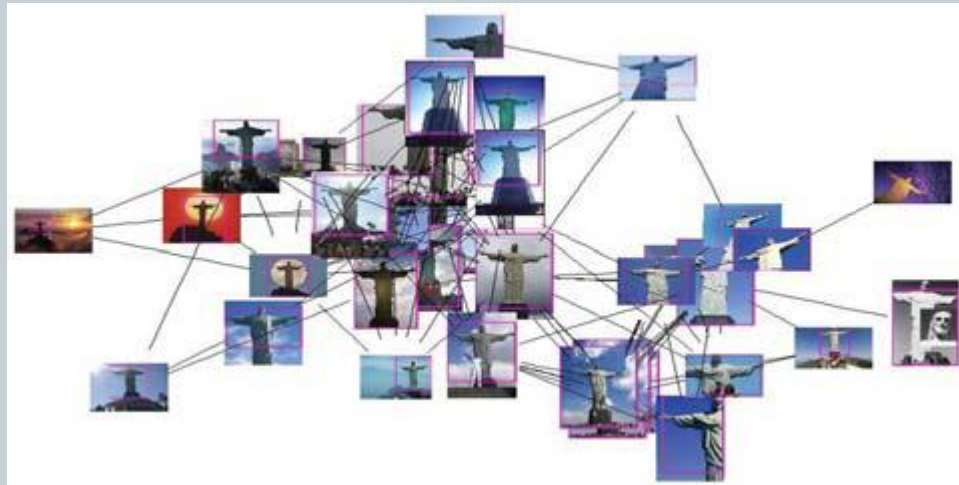


4. Cleaning visual model

- Clean clusters having map images using *photographic vs. non-photographic image classifier*.
- Clean clusters having not enough number of authors.
- Clean clusters having images dominated by people using *multi-view face detector*.

Visual Clustering and Cleaning

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Sample Visual Cluster

Results - Distribution

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Distribution of Recognized Landmarks

Results – True Positives

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Examples of True Positives

Results – False Positives

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Landmarks can be locally visually similar



Regions in landmark model can be non-representative

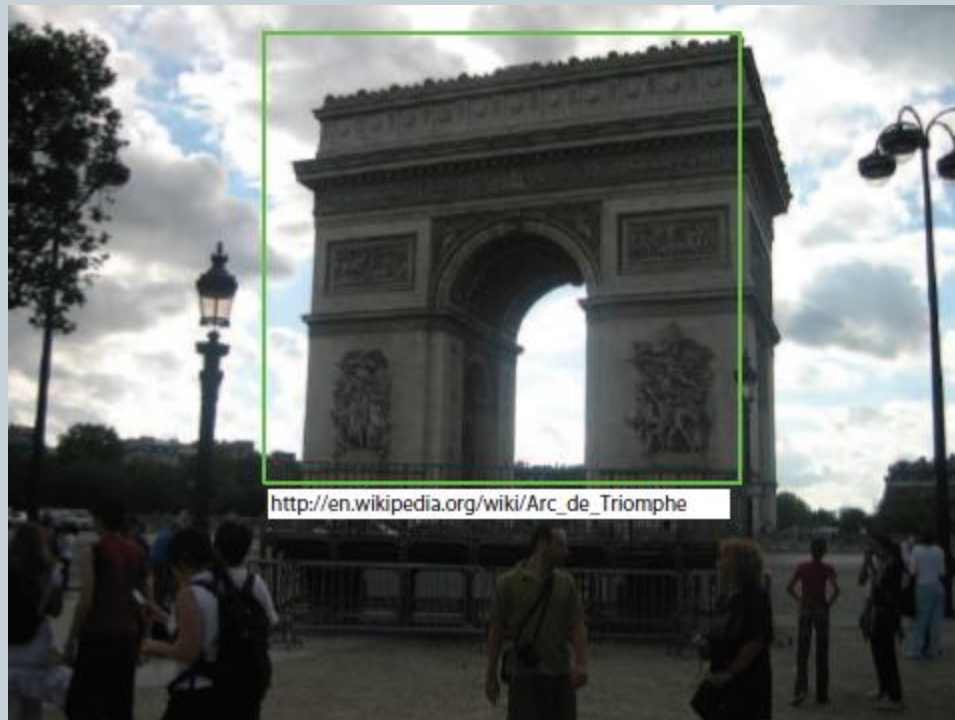


Negative images and landmark model images can be similar

Related Work

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- I know what you did last summer: object-level auto-annotation of holiday snaps, *T. Quack et al., ICCV 2009*



Thank You

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QUESTIONS ?