Active Image Segmentation Propagation

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http://vision.cs.utexas.edu/projects/activeseg/

Introduction

Weakly Supervised Image Collection

Goal: Segment Common Object

Active Human Annotation

Our method prioritizes human intervention for those images that are uncertain and influential in the graph, while also mutually diverse.

Through large scale experiments on nearly 1 million images we show that actively allocating human effort leads to substantial savings in annotation costs.

Joint Segmentation Propagation

Markov random field based segmentation propagation using a joint segmentation graph.

Images — Filtered Region Proposals — Joint Segmentation Graph — Joint Selection & Merging

Unary and Pairwise Potentials

Average region saliency

Match scores with human segmented images (using CNN features)

Pairwise region matching scores (using CNN features)

Very efficient (1 min for 1400 images) compared to pixel based approach (225 hours) [Rubinstein 2012]

Active Human Annotation

Stage-wise algorithm to actively select images for human annotation

Influence

Diversity

Active Human Annotation

Joint Segmentation Propagation

Stage-wise algorithm for active human annotation and segmentation propagation in image collections.

Existing methods are either passive or only select annotations during initialization.

Problem

Only weak supervision

Inexpensive but too inaccurate

Human labels everything

Accurate but too expensive

Microsoft COCO dataset ~ 2.5M object instances ~ $400,000K

Quantitative Results

ImageNet Dataset

MIT Object Discovery Dataset

Our proposed active segmentation propagation approach is able to generate high quality segmentations with significantly less human annotation cost.

Very efficient (1 min for 1400 images) compared to pixel based approach (225 hours) [Rubinstein 2012]

With nearly 1 million images, a performance gain of 4.44% means that we correctly localize 41,715 more images.

Weakly Supervised Segmentation - Results

MIT Object Discovery Dataset

State of the art performance in most cases

Subset Selection Problem

Greedy Maximization

Final Annotation Choices

Outperforms state of the art segmentation propagation approach [ImageNet-SegProp, Guillaumin et al. IJCV 2014] while requiring 26% less human annotated data.

Active Segmentation Propagation - Results

Example choices made by our active annotation algorithm

Microsoft COCO dataset – 2.5M object instances – ~ $400,000K

A stage-wise algorithm for active human annotation and segmentation propagation in image collections.

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